Significant Details: Alternate Practices

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Beauty results from the form and correspondence of the whole in respect to its several parts, of the parts with regard to each other, and then again to the whole
- Palladio

With the complexity of their practices, architects are increasingly remote from constructive processes. Non project specific details, cut and paste drawings result in fragmented buildings, mere assemblies of standard parts. Who bestows the "Art" of detailing? This paper focuses on connections between drawings and construction and presents practices that resist the split between drawings and construction. It assumes that details signify the care and attention that design and building team pay to design.

Three case studies compare alternatives to the US prevalent practice, where design and construction are separate; they span the spectrum of contractors' intervention in the design and architects' participation in construction. Each building exhibits craftsmanship and strong overall visual impact. Case study #1 investigates the development of cladding details in Renzo Piano's IRCAM, in Paris. Case study #2 explores Line and Space's design/build of the Arizona Sonoran Desert Museum Restaurant, Tucson, following the detail of the entry covered walkway. Case study #3 presents the story of the "kaleidoscope" details of Ventana Vista Elementary School, Tucson, designed by Antoine Predock's in Albuquerque and Burns Walt-Hopkins's.

Each case study focuses on the story of a detail elaboration, as a means to define patterns in practices that link the Art and the Act of building. Intended results (ranging from high precision to rustic abstraction) require different processes (from rigor to gesture). Architects' control over project execution builds in the process a flexibility that allows reality to inform design and vice versa and is the prerequisite for technical innovation or ingenuity. In the case of Open drawings, the design process evolves through construction; the resulting architecture manifests congruence between the whole and the parts. On the other hand, closed drawings that predetermine construction conditions do not benefit from contractor's input; innovation is limited to formal manipulation; Art and technique are divorced.

The crisis facing American architects is increasingly worrisome, as Thomas Fisher recently summarized in his article "Can the Profession be saved?"[1]. The banality of US city-landscapes is distressing. Many buildings lack craftsmanship and the Beauty as defined by Palladio: "Beauty results from the form and correspondence of the whole in respect to its several parts, of the parts with regard to each other, and then again to the whole", suggested Palladio[2]. Who bestows the "Art" of detailing? Is this absence of craftsmanship the result of unskilled labor? What is the responsibility of architects? The vibrancy of American architecture is of course still alive; the impact of US signature designs around the world gives testimony. Can we learn from the "star" architects? Can architects still be Masterbuilders in the twenty-first century?

Welde Coxe's study of international architectural practices[3] offers one explanation worth investigating. Architects enjoy a credibility that empowers them to produce vigorous and well-crafted pieces of architecture in countries where they act as both designer and builder. The US scene today differs from this model. With the increased complexity of construction systems, the weight of codes and regulations on daily practices, the excess of participants in design processes, the pressure of accelerated schedules, the entanglement of contractual battles, architects are remote from constructive processes. Cut and paste drawings result in fragmented buildings, in random assembly of standard parts. Details are sloppy and often non project-specific.

This paper focuses on connections between drawings and construction. It assumes that details signify the care and attention that the design team (including contractor) pays to design, which is in turn reflected in the built product. Analysis of detailing processes serve to define practices that link the Art and the Act of building and make room for quality, both at macro and micro scales. This essay presents creative solutions that resist the prevalent split between drawings and construction and avoid stories of details lost through budget cuts and poorly crafted products.

Three case studies compare alternatives to the familiar and conventional practice in the US, where design and

construction are separate. Each building exhibits craftsmanship and strong overall visual impact. The three examples span the spectrum of contractors' intervention in the design and architects' participation in construction. Selected firms were small to medium (10 to 30 employees) with projects equally small to medium, yet complex. Each case study focuses on the *story* of a detail elaboration[4]. **Case study #1** (Fig. 1) investigates the development of cladding details in Renzo Piano's IRCAM, Institute of Research & Coordination in Acoustic and Music, in Paris. It is an example of sensitive and technically innovative architecture, where detailing involves contractors during and after design. The IRCAM ten-story tower, inaugurated in 1990, houses 1,200 square meter of office spaces. **Case study #2** (Fig. 2) explores Line and Space's design/build of the Arizona Sonoran Desert Museum Restaurant, Tucson, following the detail of the covered walkway that leads to the entrance. This 15,000 SF, $2 millions dining facility represents ingenious and cost sensitive detailing, where the architect maintains control over design and execution. **Case study #3** (Fig. 3) presents the story of the "kaleidoscope" details of Ventana Vista Elementary School, Tucson. The project evolved across two distant offices, Antoine Predock's in Albuquerque and Burns Walt-Hopkins's, the Tucson architectural firm in charge of Construction Documents (CD) and Construction Administration (CA). A Construction Manager (CM), Landeco, also supervised construction. This public school accommodates 600 students from grades K through 5 and was publicly bid for $6.5 millions.

I. ELABORATION OF DRAWINGS: APPROACH, INTENT, APPLICATION

This section presents three different approaches to CD, and three detailing processes that explore the degree to which production includes constructive logic.

I.a- Integration of constructive logic and design: Case #1 and case #2

Case study #1: While Renzo Piano spends approximately a week per month in the Parisian Building Workshop, he controls "everything" that goes out of the office. He encourages staff to follow their projects from beginning to end, to understand drawing consequences during construction. To work in the office, staff must be capable of proposing at least ten alternative ways of detailing a building component or system[5]. For Piano, construction techniques and aesthetic expressions are completely integrated. In fact, Paul Vincent, Principal, criticizes vigorously architects who relegate their constructive thinking to other firms: "They destroy the profession, lose their intellectual capacity to think. Standards decline. Developers are no longer capable of distinguishing a good from a bad edifice. They simply notice after construction that life is hard in those buildings[6]."

Contractual delays extended the design of the IRCAM over a period of two years (1986-87), permitting a slow maturation process. Not including Piano, only two architects were involved in the project, Vincent for the enclosure and one for the interiors. Construction Documents (*Dossiers de Consultation*) were completed in 4-5 months with limited additional help (total of 4-5). Construction, which lasted 1-2 years, was supervised by one architect full time, and Vincent part time.

Piano and Vincent developed an elaborate enclosure achieved thorough research into the nature of materials. The rainscreen cladding system expresses the duality of the shell: an exterior skin, made of baked clay units floating in an aluminum frame relates to the Parisian landscape, while the seamless metal weatherproofing membrane wraps interior activities. Initial design relied mostly on model making, until production phase. Piano used constructive logic as the conceptual departure point, as did his mentor Jean Prouve. Figure 5 shows how detail elaboration encompasses sequences of assemblies. CDs were drawn with consults of contractors, who gained a sense of ownership and became committed to the process. "If the work is fascinating, the contractor will do it, and do it well. It saves spending time on stupid drawings" states Vincent. The French *Ordre des Architectes* establishes a system for architectural services that defines specific scopes of services called the *missions* and associated fees. A *mission* M1 entails complete architectural services, while M2 indicates that the architect performs only partial construction documents. Piano prefers the latter, M2, where the contractor complete CD. In the case of the IRCAM, the split was 50-50%. The architect could then focus on objectives, performance, and intended results. Subcontractors participated in the design, yet Piano's workshop acted as general contractor. Thus drawings were *open* to the contractor's input. Contractors and design professionals worked as a team to find creative ways to achieve desired results until the end of construction.

This level of sophistication and innovation relies the architect's control over construction. Innovation with materials requires creative thinking throughout the process. Research into detailing demands commitment to ultimate quality. Piano's practice is making a case for *open* drawings, as a modern heritage of the Masterbuilders.

Case study #2: Line and Space's ASDM Restaurant, obeying similar principles, illustrates the complete control of the architect over design, production, and construction/execution. Les Wallach, principal, is directly involved in all aspects of the work. He trains his staff himself, most of whom have worked with the firm for many years. This model is closest to that of traditional craftsmen, relying on trust and staff continuity. The project design spanned 3-5 months; an experienced architect developed a comprehensive set of construction documents (9-12 months), that Wallach would review daily. Wallach attended all meetings and maintained hands-on throughout. Construction spanned over 16 months.

The suspended canopy was designed as a spine that would lead visitors to the cafeteria main entrance and conceal the ductwork running above it. Painted purple, it contrasts with

adjacent stones and pale stucco work. Several design options were investigated, including a shaded walkway with a stretched yellow canvas at the top (see Fig. 9). The budget of $20,000 appeared to cover the cost of the skeleton only, made out of 12 gage steel leaves, tapered to fit the configuration, and fastened together with tubular pipes (see Fig. 10). The supporting channels were to be connected to the wall with a column, tapered and turned to the desired diameter, anchored to the stone with a steel plate (see Fig. 11). CDs show the location of the spine, and specifications called for its quality. Wallach believes in *overdrawing* rather than *underdrawing* (within the limits of effectiveness), even though some new solutions may be developed on site, and new drawings generated then. He feels detail resolution cannot be left to chance. Construction documents are developed with the assumption that it might be built by someone else, and maintain the same degree of completeness required for bid. As a general contractor, Wallach suggests that comprehensive documents give subcontractors a better definition of the work, who in turn quote better prices; the effort is therefore not wasted.

While the drawings appear to be *closed* at the time of bid, the architect's knowledge of construction lets him build in them flexibility to make changes during construction. When the construction and the design team are one, the exchange between drawing and construction is permanent, allowing ingenious detailing that makes economic sense.

I.b- Split between production and design: Case #3

Antoine Predock[7] emphasizes the Art and the gesture in his process. Having thoroughly digested the project program, he sculpts a clay model in-situ that serves as base for all remaining phases. Design was developed at Predock's studio, and handed to BWH for CD. Minimal contact was maintained between the two offices during CD's elaboration, which the project architect regretted[8].

A circular dome, the *desert kaleidoscope*, was designed to cover the Reading Success room, an annex to the main library. Located under a public courtyard at the heart of the school, in what Predock calls the "subterranean world," its only source of natural light comes through the ceiling. Allusions to the riparian habitat were meant to be seen in this *kaleidoscope*. From below, one would have seen their silhouette, and from the top one could have walked to examine closely all these creatures.

Predock forwarded schematic sketches to the production team (see Fig. 13): a concrete dome pierced by holes housing skeleton of insects and small animals poured in a plastic resin, as a sky gallery of desert remnants. Sketches had few indications of materials nor of the quality of transparency. The liaison between Robin Shambach, BWH's Project Architect, and Predock's office occurred through junior members of the staff, who needed to wait for directions from Predock to solve details. "So, you're always dealing with sort of a second string" Determined to do the best possible job, Shambach felt the rupture or absence of communication impaired her ability to interpret some design intentions. A worldwide zoo builder, Larson Company, was consulted during design. Their construction processes are highly specialized, some techniques patented, making specification writing difficult. In addition, construction techniques depend on who would perform the concrete work, the number of trades involved. None of these conditions could be determined during design phase, since the project was to be publicly bid. By law, specific contractors cannot be called for either. Detail resolution had to be postponed to construction phase. Only an allowance of $28,000 could be determined. The drawings merely indicated generic location and shape of the dome (Fig. 14.)

Where the CD team is distinct from the design team, the project success and coherence depend on the production team motivation and respect for the architectural "parti". The risk of imbalance between the making and the design of the building is only offset by "ideas" strong enough to carry a project. Yet, limiting the input of the production team members on a repeated basis erodes their interest. Dana Cuff points out the discrepancy between the *ethos* of the profession and its practice[9]. Innovation is thus formal and symbolic in nature and does not rely on constructive logic.

Production, significant to both Piano and Wallach, is handled by the firm's principals rather than junior staff. These "hands-on" operations limit the size or quantity of work produced. Wallach performs only one major construction a year. While Piano handles large projects worldwide, Vincent notes that the 50-person-firm operation in Genoa is more difficult than that of the 30-person-firm in Paris, suggesting that there might be an ideal maximum size of operation. Architects who seek congruence between detailing and architectural parti favor *open* drawings, subject to change during construction. While Wallach develops seemingly *closed* drawings for bidding purposes, they in fact are open, subject to change when he builds the project. Piano avoids lengthy drawings altogether, by involving the contractor in their production. The resulting buildings demonstrate care for materials and techniques.

On the other hand, Predock is not involved in production, and the project relies on the power of the initial concept. Architects for whom form is essential may opt for closed drawings. This "hand-off" practice enables the architect to produce more projects and to design from a distance. Resulting buildings tend to look like blown up models. Intricacy and richness are mostly formal.

II. LINK FROM DRAWINGS TO CONSTRUCTION

While ties between design and production have delayed, indirect, and often intangible consequences, the relationship between construction documents and construction methodology is direct and reciprocal.

II.a- Collaboration: Case #1

Vincent defends architect's control of the construction process vehemently: "Architects who let go of their control over construction and abandon the object they drew, destroy the profession; they eliminate quality control, which is no longer anyone's responsibility[4]." During construction, documents were completely re-drawn, and cladding details refined (see Fig. 6 & 7), leading to a product that is not only elegant, innovative, but functional (Fig. 8.) However, the success of the IRCAM did not entirely rely on the contractor's motivation nor participation in CD. Contracts calling for "separate packages" (*lots separes*) gave power to the architect during construction. Main subcontractors were hired directly by the architect, who was responsible for work coordination. Logistics were kept simple by having only two main subcontractors for the shell (*Clos couvert* or *Boite etanche*); one was responsible for concrete, metal structure and weatherproofing, and the other for glazing and cladding, ensuring simple coordination for the main enclosure; interior trades followed. All work was thus under the quality control of the architect. Vincent was particularly indebted to the two contracting firms of the IRCAM who, motivated by the challenge, worked patiently with the architects towards innovative solutions.

Bidding is as common in Europe as in the USA. Clients prefer to hire a single source of responsibility that a general contracting firm offers. But Vincent thinks that it is critical that the architect selects the contracting firm. Bidding situations where the low bidder is selected, are "very dangerous, the worst scenario" he says, because many contractors refuse to comply with specifications (*cahiers d'etudes*), and are interested in seeking the cheapest way of construction. Construction documents must be tight, and written with no ambiguity, particularly from a legal perspective. To the "low bidder" (*moins-disant*) model, he proposes the "best bidder" (*mieux-disant*), which ensures a greater level of integrity during construction. Vincent suggests that a high degree of motivation matters much more than a high budget. Of course, contractors have a special incentive in performing well on prestigious projects that bear Piano's name. The success of the IRCAM rested on contracts that gave the architect power of coordination during construction.

II. b- Integration: Case Study #2

Line and Space offers clients the option of building projects themselves during CD phase. Both parties assess the level of their mutual trust, which is essential to a successful construction phase. Line and Space built ASDM. Wallach visited the site every morning, catching problems as they occur. Building allows him to make decisions that can save money for the client, avoid costly mistakes, prevent delays, focus skilled labor where needed, and control the execution.

TACAID, metal fabricator, sent a bid of $37,500 for the suspended canopy made of 14 gage metal. Flanges would cost an extra $3,000, and a 12 gage steel would add $2,000. Les realized that if the fins were made of two pieces welded together at the center, they could be cut out of a 16 gage by ten feet by three feet standard sheet size; if the pipes were purchased directly, the canopy would fit the budget. Being both contractor and architect, he had the freedom to make these changes without compromising the design (see Fig. 12). In this instance, comprehensive documents only serve to obtain better prices from subcontractors. While CDs resolve thoroughly and accurately the main technical features of the design, a complementary set of construction drawings is developed on site. Sketches, perspectives, full size details, exact ceramic tile layout, railing, fountains, etc. were pined up on site. The design clearly continued during construction, fed by the reality of materials and volumes as they were erected. That knowledge can not be acquired at the drafting board.

In traditional schema, architects can only control cost and quality globally. Some research is superfluous during design phases because market conditions fluctuate in just a few months. Control over execution permits continuous investigation, and allows drawings to remain *open*. This type of practice relies on clients' trust and cooperation. Wallach always includes a clause of "no maximum price guaranty," even though he claims that he never exceeded the initial quotation. Wallach (concurring with Vincent) stresses that this is probably the most significant aspect of a contract, because "it works both ways." Thorough knowledge of construction combined with design skills allows changes that do not compromise quality.

II. c- Separation: Case Study #3

Case Study #3 is a public project, bid for low bidder selection. The school construction was supervised by an independent *Construction Manager*, a fourth separate entity. Roles and responsibility became more complex, boundaries between liability and responsibility more sensitive.

The $28,000 allowance for the kaleidoscope covered design and construction cost. A preliminary set of correspondence determined that the structural engineer of record, in conjunction with Larson company, were the best qualified team. Ensued another series of faxes, details, and correspondence on the structure for the dome. In the mean time, the School Board found the idea of dead bodies offensive, and replaced insects with elegant fragments of Indian potteries. Ironic transfer from native fauna to politically correct artifacts! Nonetheless, chemical properties of clay differ from those of insects, and design proceeded on new grounds.

In public bids, contingencies and allowances are the only means of introducing flexibility during CA, and to inform design decision, as in the example of the kaleidoscope. They do require extensive paperwork. As is typical of bid situations, many contracts were involved. An excessive climate of accountability creates controversial relationships between intervening parties. It restricts flexibility in a process which is by nature one of change. Construction Administra-

tion thus consists in verifying that the conditions specified in CD are met within budget and schedule. The process precludes technical innovation.

CONCLUSION: CONNECTION FROM BUILDING TO CONSTRUCTION

All three buildings offer strong materiality. Intended results (ranging from high precision to rustic abstraction) require different processes (from rigor to gesture). Sophisticated enclosures demand a high level of mastery over techniques and close collaboration between architect and builder, while simple buildings that rely on proven construction techniques enable architects to be detached from construction. The sophistication of the IRCAM tower, making use of innovation, is a testimony to the paradox of high technologies that require high-skilled of craftsmanship. The ASDM Restaurant, more earthy in nature, delights by the richness of textures, colors, and surprising craft, demonstrating ingenuity. Ventana Vista Elementary School presents strong and powerful volumes and emulates spatial richness at a macroscale, relying on ideas rather than detailing.

Patterns can be derived from the three models presented here (see Fig. 4). In case studies #1 and #2, architects' control over project execution builds in the construction process a flexibility that allows reality to inform design and vice versa. It is the prerequisite for technical innovation or ingenuity. Where constructive ideas initiate form, craftsmanship and concept must be integrated throughout the process, involving constant creativity. Where form is at the origin of a concept yet remains flexible and open to the reality of construction, craftsmanship and concept enrich one another. During execution, practical circumstances modify detailing. Case study #3 presents how architects circumscribe the inflexibility of the conventional bid processes that separate design, production, and construction. Where form does not significantly rely on constructive resolutions, drawings predetermine construction conditions. Instead of enriching the design, the execution complies with it. This means that 70% of the design/ construction process (using AIA recommended percentages of services) is deprived of real creative input. Innovation thus is limited to formal manipulation. Art and technique are divorced, unless contracts make room for some decisions during construction. The models proposed in case 1 and 2 may not be transposed "as is" from the private sector to the public realm, nor perhaps from smaller projects to large ones, yet they offer concepts worth borrowing, because they reclaim the marriage of Art and Technique in Architecture.

Open drawings enable the design process to evolve continuously. The resulting architecture appeals to our senses, because textures and materials are imbued with care and thought. Details, such as a clay mask sculpted by Wallach's son cast in the midst of a stone wall, attract smiles that only craftsmanship incites. The human intervention is present and reflected in spatial surprises and discoveries.

Closed drawings designed to prevent lawsuit, prepared to avoid risk taking and without the benefit of contractor's input require levels of competence on the architect's part that often exceed realistic capabilities. In bid work, more energy is spent documenting and recording the conditions of the work than the work itself. Emphasis is shifted towards legal concerns. Risk taking is dangerous and potentially costly; therefore technical innovation is discouraged. This is the beginning of the banalization of the built environment. When there is no room for error, there is little room for success. When change is the enemy, the creative process stops to make room for bureaucratic exercises.

ACKNOWLEDGMENTS

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NOTES

[1] Thomas Fisher, "Can the Profession be saved?", *P/A*, (Cleveland,OH: Penton, 2/94) 45

[2] Andrea Palladio, *The Four Books of Architecture* (New York: Dover, 1965) First Book, Chapter I

[3] Welde Coxe & Mary Hayden, *Trends in Private practice* (New Jersey: UIA Project Work Group, Dec 1992)

[4] Structured/formal interviews of architects, Principals, Project Architects, Designers, and Construction Administrators, serve as primary means of collecting data. Additional discussions with staff were conducted to offset excessive self-promotion. Analysis of sketches, CDs (where made available) and/or correspondence, comparison with buildings , and readings of articles supplemented findings from interviews.

[5] per Jean-Marc Weil, ex-worker in Piano's office

[6] Vincent's quotes were collected by author during interview held in July 93

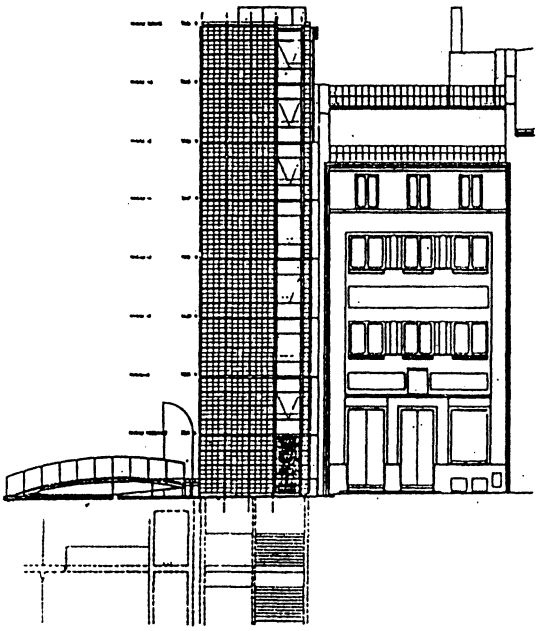
[7] Predock's quotes were collected by author during interview held in July 94

[8] no debriefing of the design occurred, except for one public presentation to the Board made by Predock in March 93.

[9] Dana Cuff, *Architecture: The Story of Practice*, Cambridge, Mass: MIT Press, 1991

[10] Illustrations of the IRCAM are taken from Peter Buchanam, *Renzo Piano Building Workshop, Complete Works*, Volume one (London: Phaidon, 1993) 210-211; and Luciana Motto, *Renzo Piano* (Paris: Editions du Centre Pompidou, 1987)

List of Illustrations



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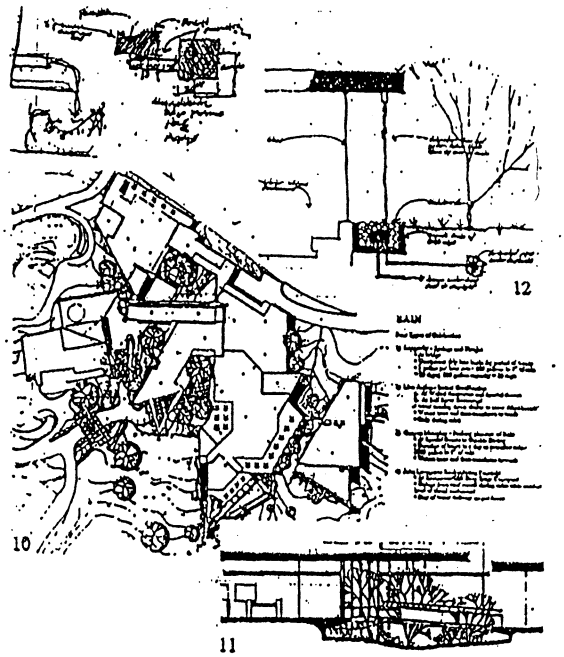

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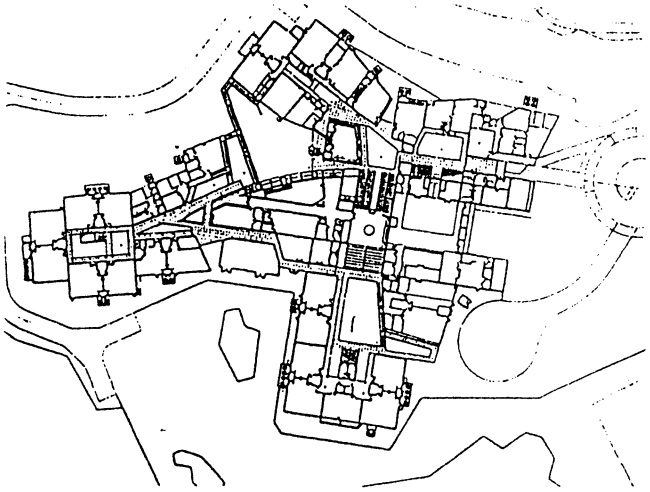

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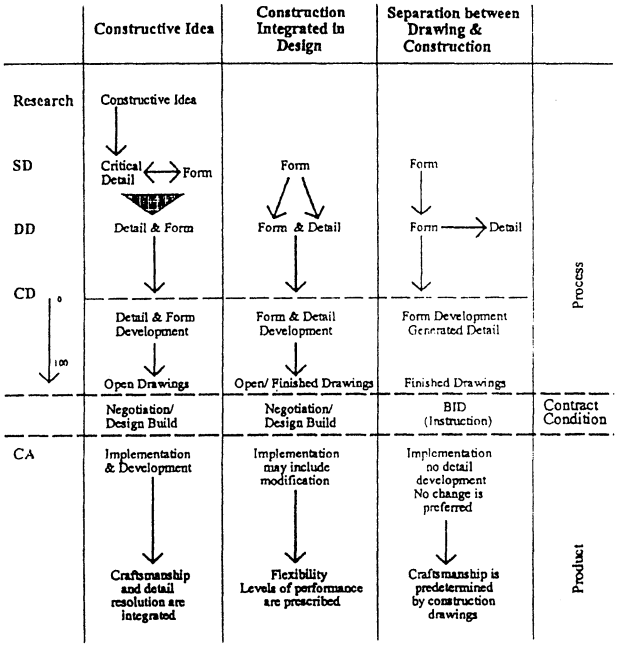

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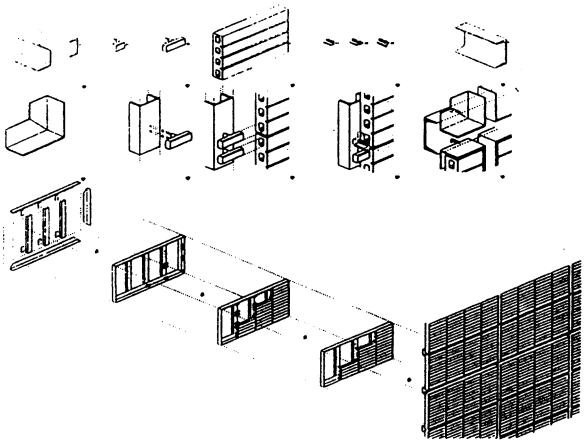
By author



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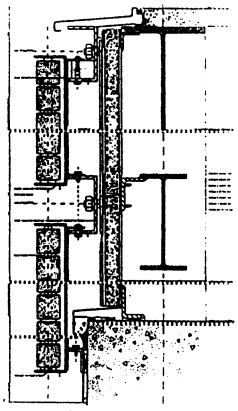

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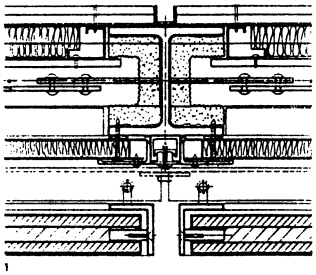

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Fig. 8: IRCAM cladding close-up photograph
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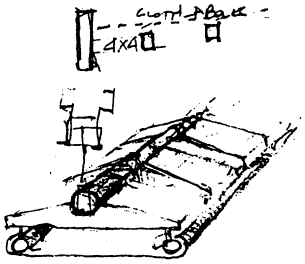

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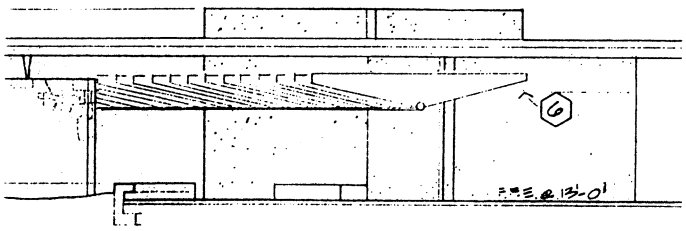
Courtesy of Les Wallach



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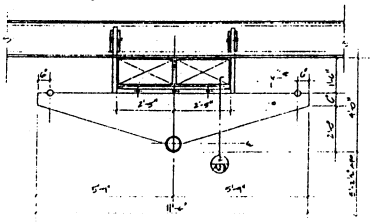

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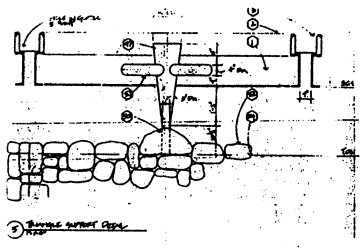

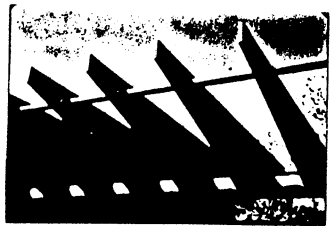

Fig. 12: ASDM canopy
photograph
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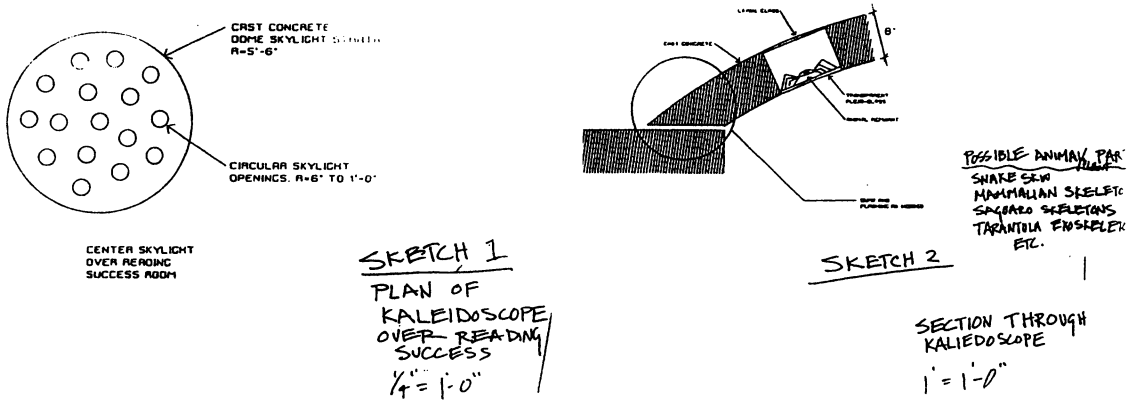
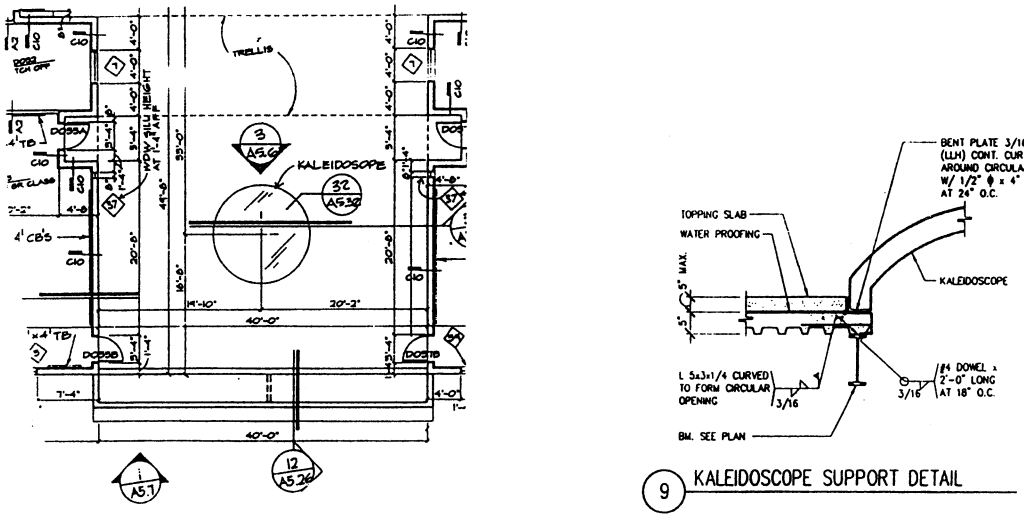


Fig 13: Ventana Vista Elementary School. Kaleidoscope plan and section: sketches by Predock
Courtesy of Burns Walt-Hopkins architects



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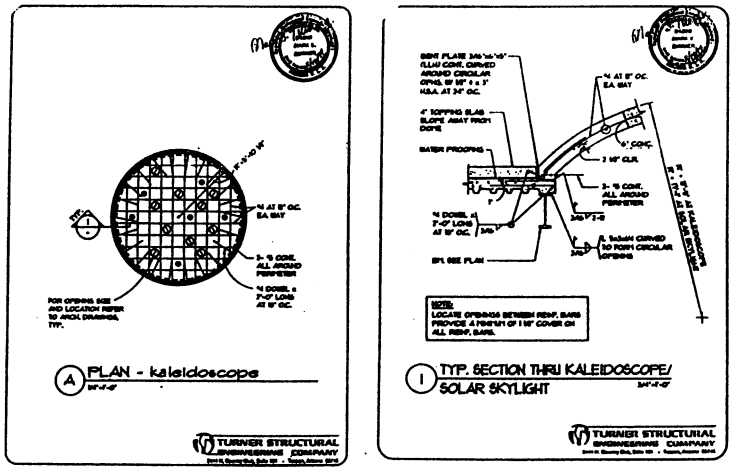

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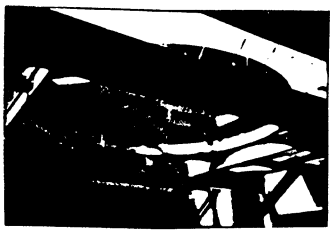

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