Schindler Frame: Method and Substance

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CONCRETE

Concrete construction is thematic in Schindler's works of the early 1920s: "tilt-slab" for the Kings Road house and the Carlton Park residence (1925); "slab-cast" slip formed concrete for Pueblo Ribera Court in La Jolla (1923-25) and the How House in Los Angeles (1925); concrete portal frames in the Lovell Beach House in Newport Beach (1925-26); and "slab-gun" concrete for the Packard House in South Pasadena (1924), gunite sprayed against upright panel wall and stud forms. Light wood framing plays an important secondary role in each case, used for roof construction, and for perforable walls to outdoor living space. In these projects, construction method and material choice are presented as highly ideological; in Schindler's project descriptions, much of the text is devoted to detailed descriptions of the construction technique, and detailed drawings of construction process are provided[2]. With these projects, Schindler insists upon the necessity of intertwining invented construction method with new spatial possibilities; he also posits a central and controlling role for the architect in the construction process.

COMPROMISE?

The W.E. Oliver House, Los Angeles (1933-34) epitomizes a major shift in Schindler's material approach that occurred in the early 1930s. Stucco cladding over wood stud framing, which Schindler had disdained in his earlier writings, suddenly becomes the predominant means for achieving his spatial ambitions. In most versions of the story, the shift is said to result from the high costs and uneasiness of builders associated with the inventive concrete techniques; pressure was increased by the premature failure of concrete work at Pueblo Ribera due to the use of poorly washed sand from the site. Thus Schindler was forced to abandon his principles due to inadequate budgets and the conservatism of the construction industry[3]. This interpretation is grounded in the mainstream ideology of the history of modern architecture, which wants to see an inextricable link between new spatial possibilities and new methods and materials of construction. Counter to this, it is clear that after 1930, Schindler stuck with stucco and stud construction for even the most extravagant house projects. An early example is the Buck House in Los Angeles (1934), a very large house with spatially complex interiors, a highly developed landscape, and a three-car garage.

THE SCHINDLER FRAME

When Schindler come to publish his stucco and stud technique, the language is anything but apologetic, and the tone suggests the triumph of space over the limitations of convention, rather than any sort of decline or compromise.

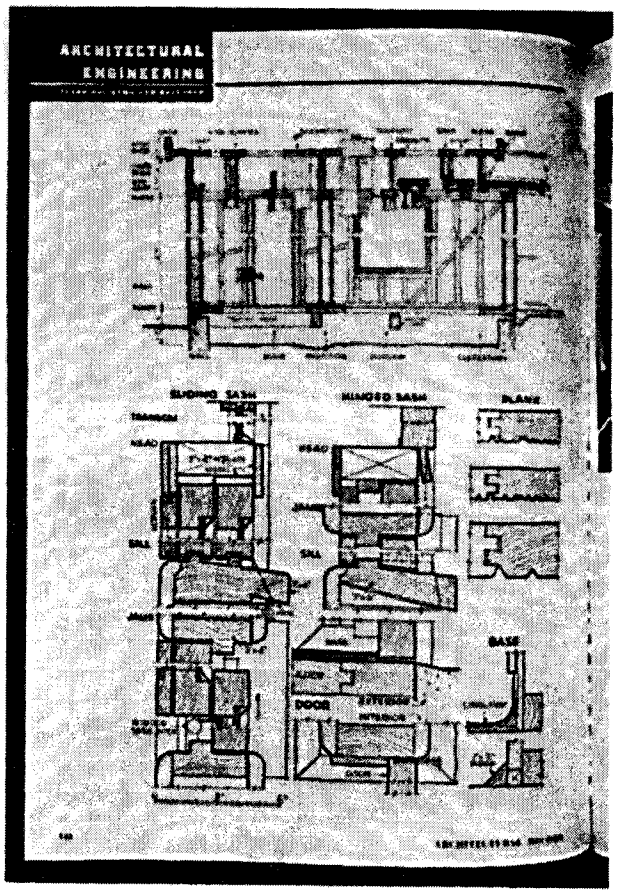

Fig. 1: Framing conditions and typical details as published by Schindler in the "The Schindler Frame," *Architectural Record*, May 1947.

> [The Schindler Frame] allows such freedom in the use of the more *important features* of space architecture that it should prove a boon in developing it, and might well give to contemporary houses what the past called "style."[4]

The "Schindler Frame" frees space from the limitations of conventional construction, and frees the "space architect" from the burden of re-inventing construction in order to achieve spatial freedom. It is a rediscovery (conscious or not) of the position declared in his 1912 student manifesto: "Structure has been solved.

Space remains the problem."[5] Construction and material became non-ideological, the transparent means of achieving spatial ends. In sharp contrast to the concrete projects, with the Schindler Frame it is sufficient for the architect to concentrate on the manipulation of space.

"The Schindler Frame" text offers a highly poetic invocation of spatial possibility, mingled with detailed description of construction method (figure 1). The poetics of Schindler's description obscure the simplicity and directness of the construction technique. The Schindler Frame accepts the basic module of balloon framing as its point of departure: three stud spaces of sixteen inches make four feet. The inventions are largely in the realm of dimension and placement:

1. Studs are cut to door height, rather than ceiling height, providing the continuous double top plate at 6 feet 9 inches above the floor. This is above all the crucial invention, as it frees the walls from a fixed structural relationship with the roof and ceiling zone, without compromising the lateral integrity of the framing.

2. All openings run up to the underside of the upper top plate. The usual fussiness of lintels and stud framing above openings is eliminated, simplifying framing; at the same time, the elimination of the lower top plate above window or door openings allows a great spatial continuity across walls.

3. Roof framing is based on 1-5/8 inch thick tongue-and-groove wood decking, with a span capacity of up to 10 feet. The use of decking frees the roof structure from the staccato 16 inch member spacing of the wall, allowing a contrasting legato at the soffit with member spacing at 6 feet, or 6 feet 8 inches.

Cantilevers, shifts in structural alignment in plan, shifts in structural planes in section, are all freely achieved. In traditional stick framing the eave is the locus of a set of structurally crucial connections; the Schindler Frame creates a structurally unencumbered zone between wall and soffit, available to the architect for free spatial manipulation. Schindler's text points out that the manipulation of ceiling and roof planes, the creation of cantilevers, and the like, involve significant extra effort in a balloon frame. Not mentioned, but clear from study of the Schindler Frame in use, is that a simple box is now more effort to achieve than a shifting, complex play of volumes.[6]

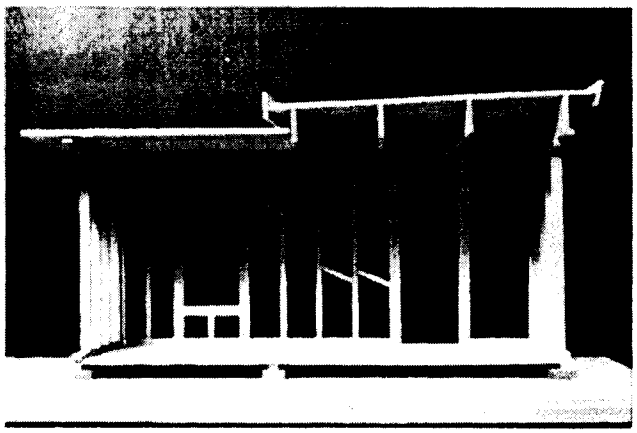

Fig.2. Schindler Frame sampler model, scale 1"=1'-0", constructed by DalTech students July 1998.

THE SAMPLER

The framing detail accompanying Schindler's text is as densely packed as a needlepoint sampler, containing a frenzy of almost every imaginable framing condition. The ambition of the design lab was to unpack these details, to look at how they might play out in specific spatial situations. We first modeled this drawing at a scale of 1 inch to the foot, to try and elucidate the spatial implications of the frame sampler (figure 2). The wall was modeled back four feet in depth, and a variety of soffit and ceiling framing possibilities were tested. This sample of the Frame remained spatially incomplete, really a two and a half dimensional entity rather than a fully three dimensional one, and begged questions of extent, duration, rhythm, and repetition. Certain issues of the relation between components of the frame were revealed by this model, but more than anything it served to underscore the fact that the Schindler Frame presumes a vision of spatial order and composition.

REFERENCE FRAMES IN SPACE

Schindler published another key article, "Reference Frames in Space," in the April 1946 *Architect and Engineer.*[7] Again the description of an instrumental construction technique, here a system of reference grids on construction drawings, is mingled with a vision of spatial method. Both the "reference frame" and the spatial possibilities it is meant to allow are based on the same four foot module, intended to free the architect from fussing over dimensional calculations and the builder from the burden of converting those dimensions back into physical extents.

> [The architect] wants to be relieved of hours of measuring, figuring and checking. He needs a unit of dimension which is large enough to give his building scale rhythm and cohesion. And last, but most important for the "space architect," it must be a unit which he can carry palpably in his mind in order to be able to deal with space forms freely but accurately in his imagination.[8]

The four-foot module operates both in plan and in section, and is subject to a limited set of permutations. Basic divisions are one-half module (2 feet) and one-third module (16 inches); with one-quarter module (12 inches) possible if used sparingly. Multiples are one and one-half modules (6 feet), one and two-thirds modules (6 feet 8 inches), and two modules (8 feet). The module and its allowable multiples and fractions are set in relation to comprehensible bodily scale: stud spacing; human height; door height; typical room height.

To implement the Reference Frames system on site, the contractor first erects a set of batten boards at the building perimeter, each marked with the reference number or letter. Thus the grid traced on the architect's drawing is reconstituted at full scale on the site, and the builder locates material in relation to the grid, rather than in relation to the nearest piece of completed work. The improvement in accuracy and the reduction for potential accumulated errors in such a system is obvious when reference grids are used on almost all buildings of medium scale. Schindler points out a more significant advantage for space architecture of the system. Reference to the grid, rather than to the walls below, is essential for the accurate layout of a spatially rich, shifting complex of soffits and roof planes.

HOUSES AND FRAMING MODELS

For the design lab, two of Schindler's houses from the 1940's were selected to undergo re-enactment, a reverse design process aimed at uncovering the specific interplay of proportion, spatial order, and construction technique in each project.

The Harris House in Los Angeles of 1942-44 (figure 3) is a very modest enclosed volume attached to an extensive pergola perched on top of a massive granite rock. Quite simple in plan, the house is developed in section through a stack of flat roof planes framed with exposed, close-spaced joists. The stacking and cantilevers of these roof planes in combination with the fully glazed living room wall create a sense of spatial interplay between outside and inside that is clearly related to the spirit of Schindler's early concrete. This project was the sentimental favorite of the group, very easy to appreciate from the late twentieth century and its "neo-modern" impulses.[9]

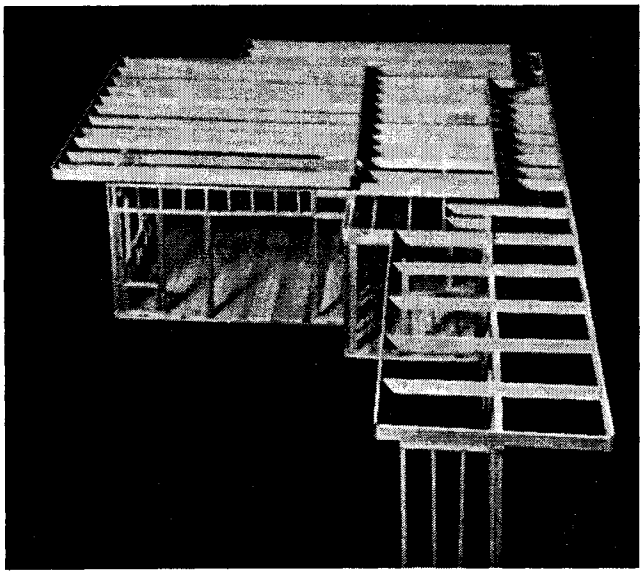

Fig.3. R.M. Schindler, Mrs. George Harris House, Los Angeles 1942-44. Framing model, scale 1'=1'-0", constructed by DalTech students July 1998.

The Presburger House in Studio City of 1945-47 (figure 4) is one of the projects used to illustrate "The Schindler Frame" article in Architectural Record. Much larger than the Harris House, and set on a much more mundane site, the house has a sprawling plan beneath a series of flat roofs and overhangs around the perimeter of an asymmetrical pitched roof space. Roofs in the Presburger house are framed with long-span decking. The pitched roof has expressed scissors rafters creating a continuous clerestory, lifting the roof zone as an independent volume above the various and sculpted low partitions below.[10]

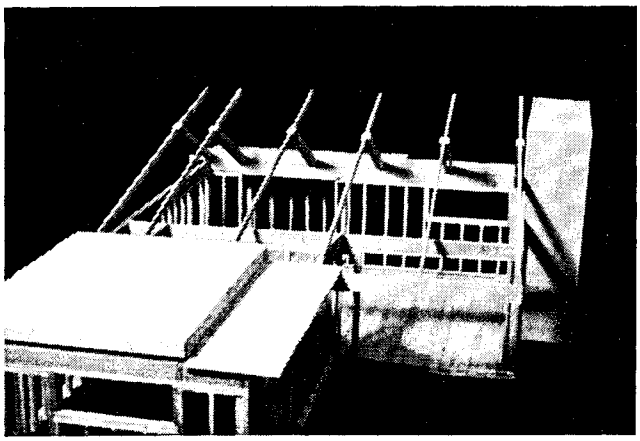

Fig.4. R.M. Schindler, Felix Presburger House, Studio City 1945-47. Framing model, scale 1"=1'-0", constructed by DalTech students July 1998.

This pair of houses illustrates the highly variable expressive possibilities of the Schindler Frame/ Reference Frames system. Operating inside the same system of spatial and constructional order, the folded planes of wood decking of the Presburger house lift the soffit zone above the walls with apparent effortlessness, creating a kind of floating roof volume; the stacked waffles of joist framing of the Harris House also float free of the walls, but here the sense is more of levitation, and the stacked planes seem only barely suspended, as if prone to drop back down at any moment.

Archival plans and sections[11] were redrawn in relation to the Reference Frames grid and its possible permutations. Adjustments and changes to the drawn project became evident in photographs of the finished work; these were reconciled back to the Reference Frames with relative directness. The Reference Frames also allowed straightforward decisions about those aspects of the designs which were obscure or not fully described by the drawings, through a bit of trial and error. The analysis of both projects began with an attempt to draw the ground plan, but this quickly shifted to focus on the roof plan first, along with the sections; once the roof plans were reconciled to the Reference Frames, the ground plan was a simple matter of adding partitions and built-in furniture elements. This was an unconscious echo of Schindler's own practice: in the 1940s, Schindler "...'looked for the roof' as he drew the floor plan."[12]

The structural integrity afforded the wall by the Schindler Frame, and the resulting integrity of each component of the roof and soffit, allows a considerable degree of improvisation on site. Not all decisions need be fixed ahead, and this potential for improvised decision making on site seems to have been fundamental to Schindler's practice. In the case of the Harris house, the drawings indicate clerestory strips between successive layers of roof plane, but the finished house stacks the planes directly upon one another.[13] Elimination of the clerestories appears to be a site-based decision, capturing space as it appears, fleetingly, in the frame.

Schindler managed the construction of all his projects, and spent much time on site:

> The seats had been removed from the back of his car to make room for building materials and a bed for [Schindler's dog] Prince. The door of the trunk was usually propped open by a load of lumber with a red flag on the end; there was often a sheet of plywood or two on top. In the back were sheet metal parts, cans of paint, and caulking compound and a complete set of tools. The tools were used to try out something on the job and to make repairs at Schindler's home and for friends. On the steering post hung a clip of scratch paper on which he wrote memos.[14]

Framing up the models revealed that the Reference Frames is not an absolute system of invariable proportional relationships; rather it is a means to govern the emergence of relationships between parts in an ongoing and iterative process of design and execution. Unlike grid-based composition systems, the crossing points of the reference frames have no privileged status, requiring affirmation by placement of physical elements at the crossings. The Reference Frame is absolutely not a structural grid. In the Presburger house, the scissors rafters are spaced at one and two-thirds modules; in the Harris house, joists on the module lines are no different than the joists placed at 16-inch centres in between. Design drawings conform to the modular system, but in ways that vary, subtly or radically, from the way that the working drawings conform to the module; and the built project varies again from the working drawings, but conforms to the spatial module. The Reference Frames provide a means to allow for the inevitable flux of the design and construction process, without compromising the spatial system. In the case of the Harris house, certain of the drawings caused the students a good deal of confusion in preparing the framing model, until it was realized that they showed a later set of alterations to the house, extending the bedroom, adjusting the entry, adding a breakfast room and altering the garage.[15] None of these alterations is particularly obvious, however, as Schindler has simply reworked the pre-existing system in its own terms to accommodate different ends.

Schindler's description of the Reference Frames system is explicit about the value of flux and improvisation in its application.

> Proportion is an alive and expressive tool in the hands of the modern architect who uses its variations freely to give each building its own individual feeling...It is not necessary that the designer be completely enslaved by the grid. I have found

that occasionally a space-form may be improved by slightly deviating from the unit. This does not invalidate the system as a whole but merely reveals the limits inherent in all mechanical schemes.[16]

In Schindler's work, the exception to the module is always to be found, often in the placement of one of a set of limiting edges - the line of a soffit, or of a paved surface - demonstrating through a momentary dissonance the harmony of the system.

In undertaking the framing at 1 inch to the foot, the lessons of the Schindler Frame are absorbed through the hands of the student, providing a kind of "simulated experience" of construction. The rhythm of the stud work in relation to the spatial model can be felt, and the relation between panels of stud wall, the binding top plate, and the spatially malleable eave zone can be experienced. Above all, the proportional operations of the modular system are experienced through their effects in controlling the placement of architectural substance, as opposed to being studied, drawn and experienced as an object in itself.

RUDY'S CABANA

The test of the simulated experience of the framing models occurred in Rudy's Cabana. A short excursion into cabana culture, through the study of "The Flamingo Kid" and beach resort projects from the 1950's, emphasized continuity between indoor and outdoor space. The cabana, free from the highly specific problems of bedroom and kitchen, allowed concentration on social issues of dwelling and their celebration in space. Spring Garden Road became the beach, and the School of Architecture, the city behind. Quick individual sketch studies of possible cabanas were prepared, followed by a chalkboard seminar where the group attempted to "channel" Schindler. Over the course of an hour, the design of Rudy's Cabana emerged. Working within the Schindler Frame/ Reference Frames system, twelve individuals were able to design with one mind (figure 5).

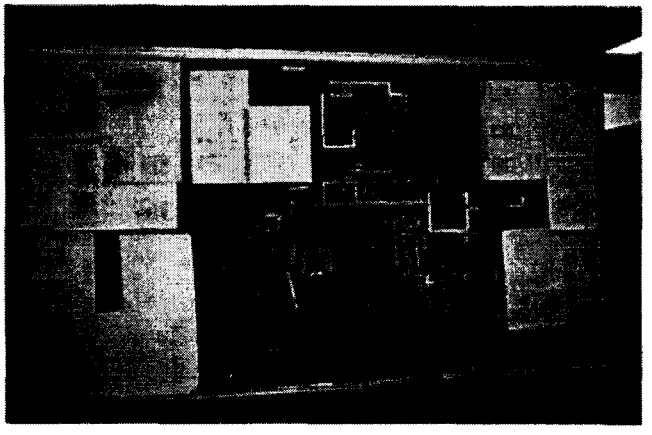

Fig.5. Rudy's Cabana design seminar, DalTech, July 1998.

A hurried set of drawings was prepared, just sufficiently detailed to estimate materials and permit a framing model to be built. The framing model was worked out at 1 inch to the foot, with careful attention to the sequence of erection (figure 6). Finally, framing was begun at full scale. Construction of the platform occupied one day; the balance of the framing and cladding work was completed in four days. The understanding of the Reference Frame and the possible permutations of the module allowed many detail decisions to be easily resolved as they were encountered in the course of framing. Many conditions which the modeling suggested would be quite tricky to sort out, were in fact non-events on site. For example, the conjunction of column, low soffit and high clerestory beside the

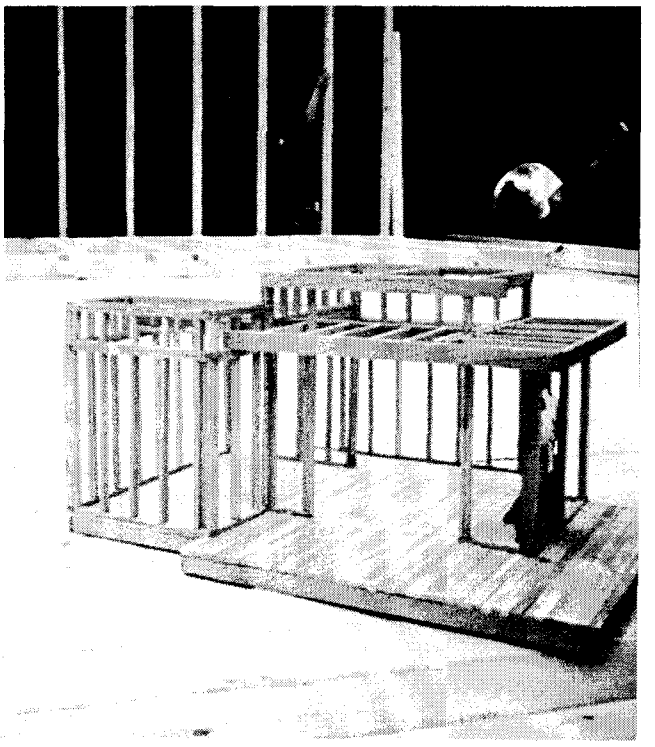

Fig.6. Rudy's Cabana framing model, scale 1"=1'-0", constructed by DalTech students July 1998, on site with cabana framing in progress.

large sliding panel was framed and re-framed several times in the cabana model, but on site the double joist flanking the column took care of tricky alignments while acting as scaffolding for the next stage of framing. The Schindler Frame uses relatively small scale wall panels, and once the top plate was installed, the walls provided a stable platform for the roof framing. The various roof panels were independent and easily handled, with the completed elements of the roof providing a platform for the work of the next part. All elements of the frame were easily handled by one or two people, with minimal falsework beyond some temporary diagonal bracing (figure 7).

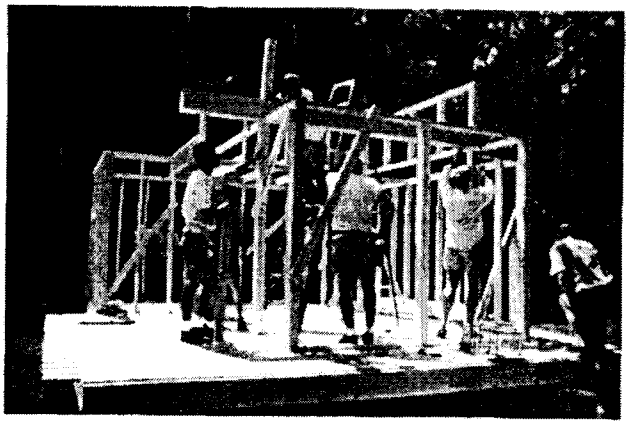

Fig.7. Rudy's Cabana, framing of the cabana in progress, July 1998.

Rudy's Cabana (figures 8, 9) recapitulates the spatial motifs of Schindler's earliest houses. The basic spatial schema of Schindler's studio in the Kings Road house sets the plan, with its interlocking slipped 'L's of solid wall and glazed wall, and the large sliding canvas panel below a low soffit and clerestory, opening the interior to the apron of deck outside. The sleeping basket and its canopy are

based on Kings Road. The cladding of plywood panels with projecting spruce trim above is set out on one-third modules, and recalls the striated surfaces of Pueblo Ribera and the How House. The gaps between cladding panels relate to the vertical gaps between the tilt-slabs at the Kings Road house, here set horizontal. In both instances, the gaps have the paradoxical effect of lending the wall a disproportionate sense of substance and enclosure. The low ceiling zone over the bench is modeled on the How house, and was fitted with a reproduction of Schindler's 1920's track light fixture. The built-in bench itself is modeled on space-furniture elements that appear in almost all of Schindler's later houses.

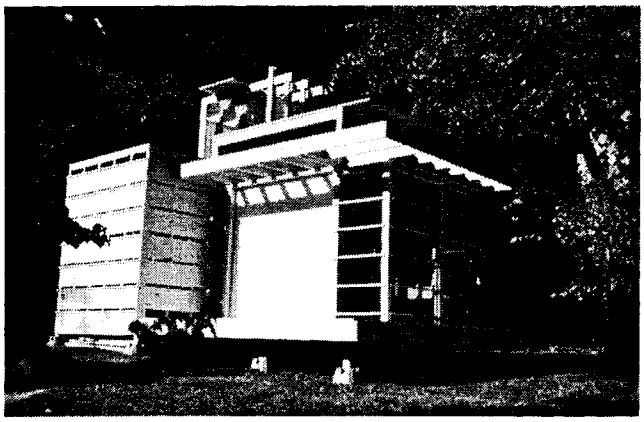

Fig.8. Rudy's Cabana, overall view from the northeast, July 1998.

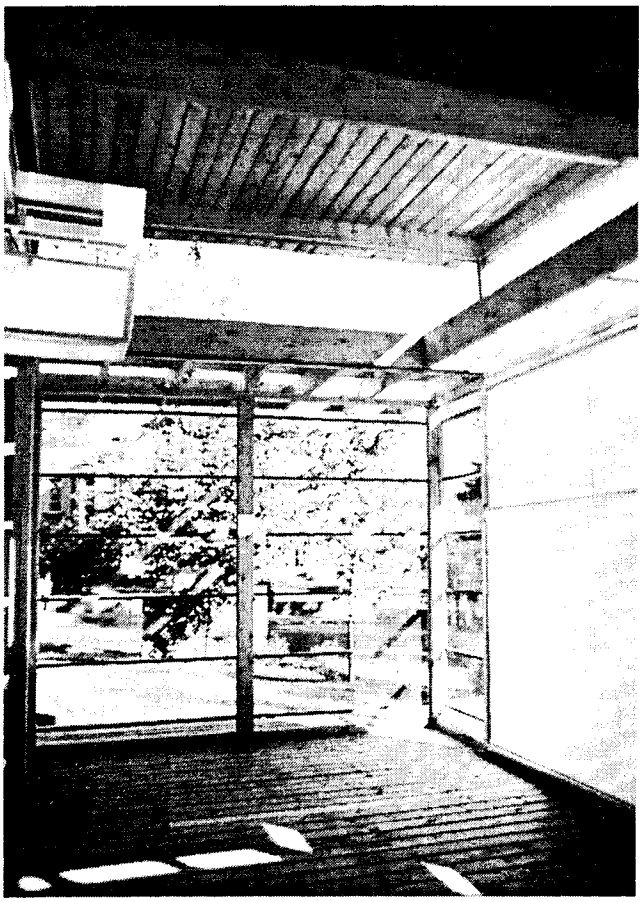

Fig.9. Rudy's Cabana, interior view from entry towards screened room and sliding canvas door, July 1998.

The thesis of Rudy's Cabana is that the stick-built Schindler Frame does not constitute a break with the spatial ambitions of the early concrete projects, but rather provides a means to achieve those same spatial effects free of the difficulties of an overt ideological use of materials. In the cabana, materials are utterly commonplace, spruce studs, joists and decking and spruce sheathing plywood. The prosaic materials are effectively transparent, allowing unencumbered appreciation of the spatial effects. One of the most evident characteristics of the cabana is the power of the ceiling, the play of levels and shifts in material and structural order, to create a high degree of spatial richness in a building with a dead-simple plan.

FINIS

Rudy's Cabana confirms the intuition of recent publications on Schindler's work that the Schindler Frame and Reference Frame texts of the mid 1940's have relevance to an appreciation of the earliest works of Schindler's career.[17] Schindler's post-1930 projects exhibit a much broader range of spatial types, roof and soffit forms, lighting effects, and surface conditions, a testament to the liberty afforded by the frame. Armed with the Schindler Frame and the Reference Frames, the space architect was free to devote his entire energies to spatial strategy, as the vernacular of construction could now take care of the tactics.

ACKNOWLEDGMENTS:

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Heroic editorial work was performed by Laureen van Lierop - as always, thank you.

NOTES:

[1] R.M. Schindler, "The Schindler Frame," *Architectural Record* 5 (1947): 143-146.

[2] On the ideological use of materials, see Judith Sheine, "Construction and the Schindler Frame," in *R.M. Schindler: Composition and Construction,* ed. Lionel March and Judith Sheine (London: Academy Editions, 1995), 229-251; for an overview of the concrete construction techniques employed by Schindler in the 1920's, see Esther McCoy, *Five California Architects,* 2nd. ed. (New York: Praeger, 1975), 157, 163-168; see also Schindler's project descriptions of the period, e.g. "A Co-operative Dwelling" in *T-square* 2 (1932): 20-21, describes the tilt-slab method of the Kings Road house (reprinted in August Sarnitz, *R.M. Schindler, Architect, 1887-1953* (New York: Rizzoli, 1988), 49.

[3] David Gebhard, *Schindler* (London: Thames and Hudson, 1971), 69-72, 88-90; Sarnitz, *R.M. Schindler Architect,* 19; Lionel March and Judith Sheine, "Foreword", in March and Sheine, *R.M. Schindler,* 9.

[4] Schindler, "The Schindler Frame", 147.

[5] R.M. Schindler, "A Manifesto", 1912 (unpublished; reproduced in Gebhard, *Schindler,* 191); this paraphrase is an amended version of that in Sheine, "Construction and the Schindler Frame", 245.

[6] Sheine, "Construction and the Schindler Frame", characterizes the spatial and material effects of the Schindler Frame in related but somewhat different terms.

[7] R.M. Schindler, "Reference Frames in Space", *Architect and Engineer* 4 (1946): 10, 40, 42-43.

[8] Schindler, "Reference Frames", 10.

[9] Harris House description and photos: Sarnitz; *R.M. Schindler,*

Architect, 151.

[10] Presburger House description and photos: Sarnitz, *R.M. Schindler, Architect,* 154.

[11] For the Harris House: David Gebhard, *The Architectural Drawings of R.M. Schindler* (New York: Garland, 1993), vol. 2, 136-139; for the Presburger House: Gebhard, *Drawings,* vol. 3., 358-366.

[12] McCoy, *Five California Architects,* 180.

[13] Gebhard, *Drawings,* 138 (cat. 1222); Julius Shulman's photos in Sarnitz, *R.M. Schindler, Architect,* 40, 151.

[14] McCoy, *Five California Architects,* 151.

[15] Gebhard, *Drawings,* 138-139 (cat. 1221, 1224).

[16] Schindler, "Reference Frames", 45.

[17] Sheine, "Construction and the Schindler Frame"; James Steele, *How House,* (London: Academy Editions, 1996).