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Framework: construction and space

in the architecture of Frank Lloyd Wright and Rudolf Schindler

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In a search for a domestic architecture that embodied contemporary culture, both Frank Lloyd Wright and Rudolf Schindler interpreted the spatial programme of modern life through the conventional construction methods of the American light timber frame. Since its invention in 1833, this American residential construction system has undergone numerous modifications and improvements, yet remains substantially unchanged. For modern architects, this standardised framing system was applauded as it met many of the criteria for industrialisation, and yet it is also remarkably adaptable. For Wright and Schindler, the flexibility of this construction assembly afforded both interpretation and innovation.

Introduction

American light-timber framing is a modular construction system developed during the late 1800s.¹ Labelled 'balloon-framing' this construction system was able to seize upon the opportunity of plentiful materials and a scarcity of skilled craftsmen. Developed primarily as an empirical system or construction in a country without a history or culture of building crafts, the American light-timber frame system consists of standardised prefabricated elements assembled in a very basic manner. The term 'frame construction', however, can be somewhat misleading. Is this clearly pragmatic form of construction a system of framework stiffened by a plywood skin nailed to its members, or is it a system of modular panels relying on vertical ribs and edge beams to prevent buckling? It can and has been both. American light-timber framing is a variable system with the opportunity to redefine its character each time the construction system is employed. Balloon-frame construction and the later developed

'platform-frame' construction systems are also extremely malleable and may be subject to alterations and modification with impunity. Incorporating a wide range of tolerances, frame construction relies upon redundant members and this structural redundancy is evident not only in the numerous vertical studs but also in the abundance of connectors. Although the nail is an extremely poor connector, in the role of a *democratic* connector that is distributed throughout the light-timber frame, the resulting structure is capable of performing monolithically despite its skimpy materials and poor quality connections.² After the development of the cut nail, American light-timber framing emerged as a fully industrialised system of contemporary construction, and is the construction type allied to the vast volume of residential building in North America (Fig. 1). The influence of wood frame construction extends beyond the scope of residential buildings to any modest span building and it has likely contributed to the model of steel framing systems for

Figure 1. Balloon Framing.
From Tom Peters, 'An
American Culture of
Construction,'
Perspecta 25, p. 145.



high-rise construction in Chicago and New York during the late twentieth-century.³

Sigfried Gideon was the first to note the profound effect of this new type of wooden construction in America. In his book *Space, Time and Architecture*, published in 1941, Gideon described the American light-timber framing system and Frank Lloyd

Wright's Prairie Houses as major contributions to the body of authentic American architecture, and to the comprehensive formulation of a modern architecture.⁴ Wright's early houses were built primarily with conventional wood frame technology and introduced not only a progressive modern spatial continuity and openness but also numerous innova-



Figure 2. Ward Willits house 1901, balloon frame construction. The Frank Lloyd Wright Foundation.

tions and interpretations of American light-timber frame construction (Fig. 2). A former employee of Frank Lloyd Wright and then later a contemporary, Rudolf Schindler was a modern architect able to take hold of the liberating spatial possibilities afforded by California's climate and progressive culture through expressive wood-frame construction. Rudolf Schindler's architecture, beginning in the 1920s with his King's Road house, sought to modify the conventional frame construction systems developing in 'frontier' California with a simplified framing configuration. Reyner Banham describes Schindler's own house 'as the most original and

ingenious domestic design of this century'.⁵ In a search for a domestic architecture that embodied contemporary culture, both Frank Lloyd Wright and Rudolf Schindler interpreted the spatial programme of modern life through unique forms of American light-timber frame construction.

Wright's modularity of construction

For Wright, the versatility of a construction system of small wooden members lent itself to great design differentiation and articulation. The modularity of a building's constructional assembly was considered a constituent element within the 'fabric' of space

Figure 3.
Transformation of
the 'Box' related
to the Ho-o-den
Temple.

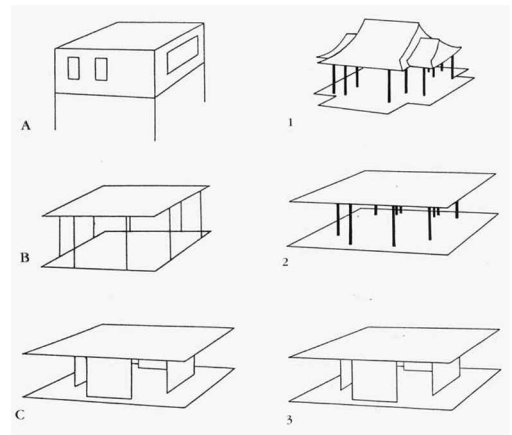
From Kevin Nute,
*Frank Lloyd Wright
and Japan*, p. 63.

and form and as such was inflected in response to Wright's compositional principles. Wright explains:

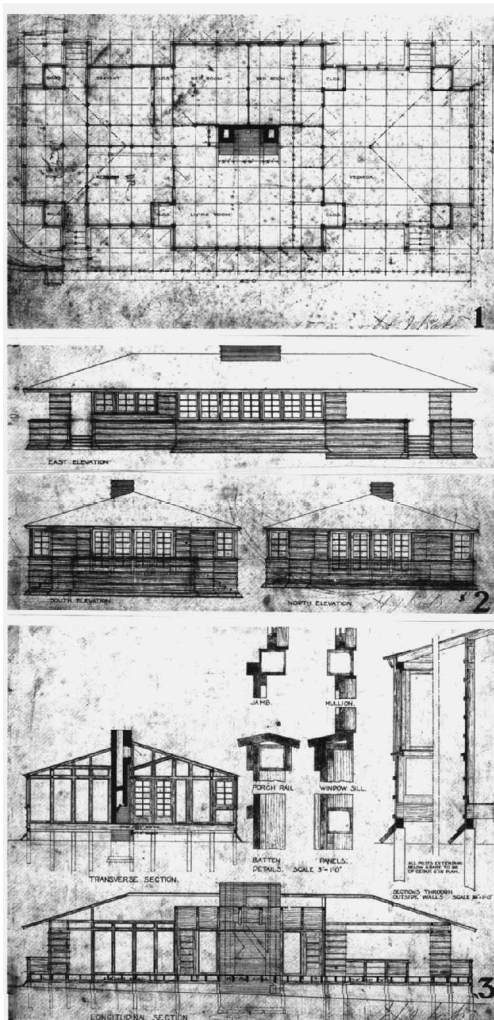
All the buildings I have ever built, large and small, are fabricated upon a unit system – as the pile of a rug is stitched into the warp. Thus each structure is an ordered fabric. Rhythm, consistent scale of parts, and an economy of construction are greatly facilitated by this simple expedient – a mechanical one absorbed in the final result to which it has given a more consistent texture, a more tenuous quality as a whole.⁶

A familiar tartan or simple quadratic-planning grid is present in most of Frank Lloyd Wright's architecture. The modular dimensions of this grid vary, ranging from a basic two-way three-foot grid of the mid-western or 'Forest Period,' to the sixteen-inch square module of the California 'textile block' houses.⁷ Wright's three-foot tartan grid of the prairie-style DD Martin House in Buffalo orders the composition of interior spatial volumes, the building structure, and the placement and size of window openings and modulates the expanding landscape of terraces, arbour and plantings surrounding the house. Although the specific modularity and resulting matrix varied with each local circumstance, Wright's grid was a logical companion to the rising practices of industrialisation and mechanisation of North America. For Wright, the grid was as much an economic and democratic labour-saving device as it was a framework for architectural form and space.

Wright's pragmatic thinking encompassed both geometry and construction, space and material assembly, and was rooted in the aesthetic sensibility of traditional Japanese art and architecture.



Kevin Nute's study, *Frank Lloyd Wright and Japan*, draws attention to the influence of Japanese architecture through Wright's proposed familiarity with Edward Morse's 1886 publication *Japanese Homes* and the remarkable re-construction of the Ho-o-den Temple for the 1893 World Exposition held in Chicago.⁸ Wright could hardly have escaped noticing this impressive collection of Japanese buildings in Chicago, either while they were under construction and through the extensive coverage in newspapers and journals or during the subsequent five decades that this impressive temple stood on its prominent site. The spatial as well as construction traditions of Japanese culture are evident in Wright's early houses. One of Wright's significant innovations for the Prairie House was a spatial fluidity he described as the 'destruction of the box'. Wright's departure from conventional residential forms and construction represented by the box, are described in a diagrammatic transformation (Fig. 3).



The transformation addresses a primary concern for supporting the roof with structural efficiency. Perimeter walls become piers or columns that migrate inward and later are incorporated into freestanding screens that bear a strong resemblance to the 1893 Ho-o-den pavilion. Wright seems to have recognised the potential of a completely new form of domestic building and new mode of construction that could be related to both the method of framing and the articulation of space.

Coincident with the Chicago Exposition, Wright completed several all timber frame cottages including the Walter Gerts Cottage in Birch Brook, Illinois completed in 1902 (Fig. 4). In this building, a formal and structural tension is developed between the one-storey wood frame of vertical posts that are spaced at three-foot intervals and the exterior cladding of horizontal wood boards that are one foot in width. The framing condition is exposed on the interior between plastered panels and although obscured by the horizontal exterior cladding, the frame is conveyed on the facade between the windows that run under the roof.

Exterior cladding and the vertical module

In the Romeo and Juliet Tower of Spring Green, Wisconsin (1898) Wright conveys the presence of wood studding through the expressive character of the horizontal exterior cladding. Kenneth Frampton describes this cladding as a 'plaited fabric' and it is composed with alternating modules of timber shingles and wood battens. The banded cladding presents a remarkable horizontal stratification and Wright pursued and developed this horizontal modulation through a number of 'board and

Figure 4. Walter Gerts Cottage 1902. From *Frank Lloyd Wright Monograph* vol. 3. The Frank Lloyd Wright Foundation.

Figure 5. Ross House
1906.

From *Frank Lloyd
Wright: Early Work*.



batten' cottages that Henry Russell Hitchcock characterised as an adaptation of the American Shingle Style and referred to as Wright's 'Forest Period'.

Wright explored the panelised nature of timber frame construction and enabled conventional windows to become a continuous strip by the expressed absence of panels of cladding. For the Ross House of 1909, horizontal band-like volumes expand from the house and the strip of window that hugged the eave is a prominent element of the facade (Fig. 5). Wright's window is an articulation of the rules of assembly and latent character of a panel system of construction. The window is not conceived as a hole in the surface of the facade, promoting the reading of window as figure, but rather, the window is made through the elimination of panels. Characterising the wall as horizontal panels had important consequences. Just as Wright's architectural vocabulary of form and space emerged from the internal grid of the plan, the horizontal metering and modular character of the facade construction accommodates the expression of volumetric bands, such as parapets, porches and balconies, that are read as extensions of an intrinsic structure.

Oddly, the development of an elevation module was not Wright's primary concern at the time. Instead his focus remained on the essential character of the plan. In his 1928 publication entitled, 'The Logic of the Plan,' Wright declares the plan as the prophetic soul of the building – A building that can live only because of the prophecy that is the plan. . . . In itself it will have the rhythms, masses and proportions of a good decoration. . . . for an organic building with individual style – consistent with materials . . . The several factors most important in the making of plans – after general purpose or scheme or project are, 2nd–Materials, 3rd–building methods, 4th–Scale . . .

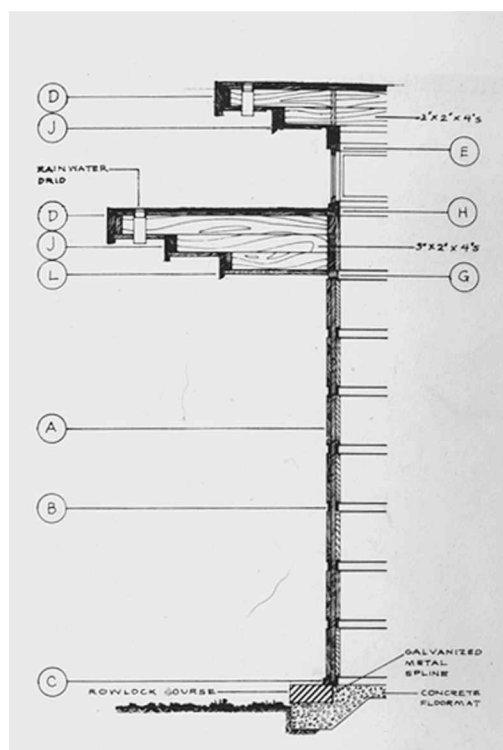
As Wright continues in this essay on the plan, he does connect a building's scale with both the logical norm of a human dimension and a unit-measure based on construction methods and materials.

The only sure way to hold all to scale is to adopt a unit system, unit lines crossing the paper both ways. . . . A certain standardization is established here at the beginning, like the warp in the oriental rug and it has other economic values in construction.

Wright continues,

Experience is necessary to fix upon the proper size of the unit . . . trained imagination is necessary to differentiate or syncopate or emphasize, to weave or play upon it consistently.

Wright clearly recognised a relationship between material character, modular dimension and volumetric possibilities when he writes, 'Sticks of wood will have their own natural volume and spacing



determined by standards of use and manufacture and the nature of both.' However, the development of a relationship between construction methods, and an unique modular spatiality promoted through a plan/section reciprocity would not occur for another ten years.

Horizontal and vertical measure: defining spatial fields and boundaries

The development of a planning grid with a complementary, vertical measure for spatial boundaries

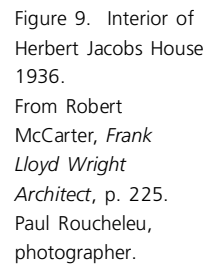
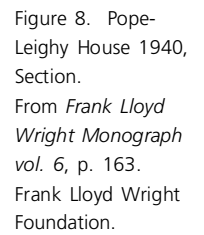
and the facade is a fundamental character of Wright's Usonian Houses. The Usonian House was conceived through a three-dimensional gridded cage in which the 2-foot by 4-foot or 4-foot by 4-foot planning module is interwoven with a vertical module. The horizontal module governed the plan and this grid appeared on the architect's drawings, as well as on the concrete floor of the building itself, thus enabling the builder to locate walls and glazing units with ease. A 13-inch module expressed through the horizontal cladding of the exterior facade meters the vertical dimension and is the module that organized interior recesses, window transoms, door heights, decks for concealed lighting, shelving and built-in furniture (Fig. 6). At a time with a building's perimeter consisted of complex interior and exterior surfaces and was elaborately dimensioned in the traditional manner of string dimensions and notations, Usonian walls and openings were simply centered on, or aligned with, or related to, subdivisions of the grid⁹ (Fig. 7). Wright's skill lay in the deployment and coordination of horizontal and vertical systems to manipulate the character of every part of the house. Wright's concern for modern and plastic spatial character is borne out by his provision for three separate plan cuts: one at floor level, another at doorhead/clerestory and a third at roof level. These plans do not necessarily coincide and thereby present the unique volumetric spatial layering of Usonian architecture (Figs 8 and 9).

The Herbert Jacob's House of 1936 is typical of the early Usonian Houses. In this house, the frame roof is supported by a hybrid wall system that includes brick piers and solid load-bearing wood

Figure 6. The Usonian Wall Section.
From John Sargeant,
Frank Lloyd Wright Usonian Houses,
p. 110.

[illegible]

crete floor with its embedded grid module, then laying the courses of brick masonry for the workplace core and outlying piers. In the tradition of Japanese construction, the frame roof was then constructed



on these supports and this structure provided cover to shelter a workplace to fabricate the wall panels Wright developed for his Usonian architecture.¹⁰ These panels were constructed of a plywood core with a board siding on both sides. The siding materials are both structure and finish and are exposed inside and out. Recessed boards rather than the projecting battens of the forest-style work articulate the module of cladding, the expressed relationship between panels. In the Jacob's House the panels are pine and in later Usonian Houses the panels are cypress. Diagrammatically, the Usonian House illustrates Wright's trajectory of transformation from the conventional American house as box, through the form, space and construction of the framed Ho-o-den temple to the Usonian architecture of panels and screens that are supporting the roof (Fig. 3). For Wright, the Usonian Houses reflected an economical and informal way of living for a growing middle-America and he recognised the financial and social need for many people to build their own houses with an optimised construction process and the standardisation of many details. Over the span of more than forty years, Wright interpreted and transformed the syntax of American frame-construction. The unique panel system construction of the Usonian House completed his spatial intention for his claimed 'destruction of the box'. Looking back at what he has accomplished at the end of his life, Wright summarised his design process:

Kindergarten training as I have shown, proved an unforeseen asset: for one thing, because all my planning was devised on a properly proportional unit system. I found this would

keep all to scale, ensure consistent proportion through the edifice, large or small, which thus became – like tapestry – a consistent fabric woven of interdependent, related units, however various. So from the very first, this system of 'fabrication' was applied to planning even in minor buildings. Later I found technological advantages when this system was applied to heights. In elevation, therefore, soon came the vertical module as experience might dictate. All this was very much like laying warp on the loom. The woof (substance) was practically the same as if stretched upon this pre-determined warp. This basic practice has proved indispensable and good machine technique must yield its advantages. Invariably it appears in organic architecture as visible features in the fabric of design – insuring unity of proportion. The harmony of texture is thus, with the scale of all parts within the complete ensemble.¹¹

Wright's concept of coherence between spatial composition and structural construction did not require the literal exposure of structure: 'Why should you always expose structure? I call it indecent exposure' (*An American Architecture*, p. 54). The modularity and rhythm of spatial composition was not only carried off by the building's structural members, Wright continually experimented with different building systems and materials, searching for those that would respond plastically to his spatial ideas. Structure and construction are fundamental aspects of Wright's architecture, however in his earliest buildings there is an emphasis on spatial relationships rather than on a novel expression of structural form that would mark some of his later

commissions, such as the Johnson Wax building and Fallingwater. Wright's early architectural commissions, most of which are houses, convey the importance of an intrinsic relationship between structure and construction that extends beyond solving questions of function.

The impact of Wright's thinking spread through Europe through the 1910 Wasmuth Portfolio exhibition of his Prairie Houses that included documentation of many interior spaces. Many young European architects were affected by Frank Lloyd Wright's work and the prospect of America. Rudolf Schindler, a student of the Viennese architect Otto Wagner, was undoubtedly familiar with Wright's Prairie Architecture. Schindler's and Wright's ideas correspond closely on several points. Schindler's regard for space and the necessary ancillary role of structure as the primary force in modern architecture is closely allied to Wright's thinking. Both Schindler and Wright embraced the role of the machine and of construction in the formulation of modern architecture.¹² Both architects saw the machine as the power that had transformed the traditional attitudes of the world and architecture. Both saw that construction methods would henceforth be the variable rather than a constant in the progress of architecture because technology had given the architect new freedoms.

Schindler: geometry, space and construction

The creation of space was a primary concern for Rudolf Schindler and he proposed space and ultimately architecture to exist through a system of construction that integrates spatial requirements, building methods and geometry. In a 1946 publica-

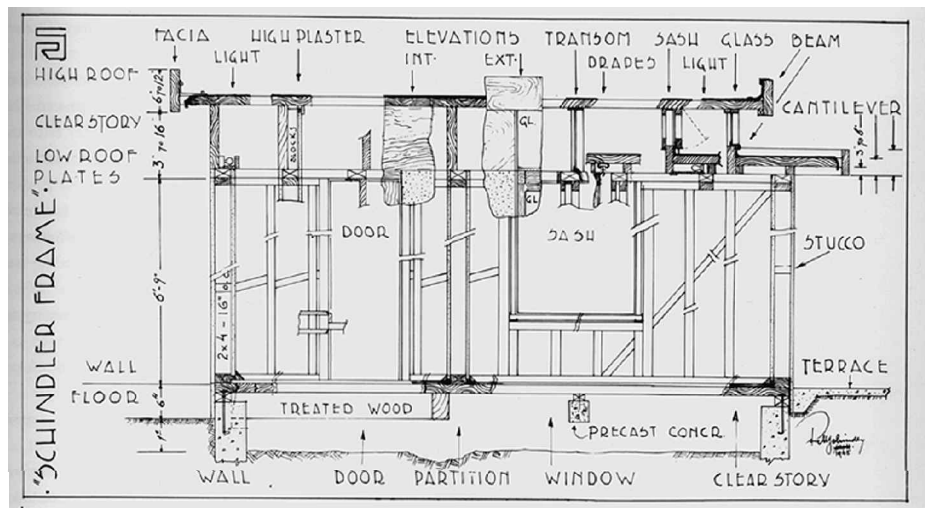
tion, Schindler described the unitary spatial system he used for twenty-six years:

To the space architect, however, a proper unit system is essential. He must establish a unit system which he can easily carry in his mind and which will give him the size values of his forms. . . . In order to be useful, the unit must have a simple relation to human stature and must be large enough to keep the necessary number of units required to size the average room small enough for easy grasp. It must be small enough to fill all needs for detail sizes by sub-dividing into simple fractions which can be easily pictured $1/2$, $1/3$, $1/4$ at the most.¹³

Schindler's space reference system is both analytic and intuitive, and is a fundamental aspect of this process of design and construction. It is a proportional system that provides, as Schindler would describe it, a 'rhythmic key', and 'space relationship' for architecture and coincidentally incorporated an American pragmatism for standard material dimensions and conventional construction methods.

Schindler had witnessed that the most predictable and effective architectural form for conventional balloon-frame construction was a box. In contrast, the spatial diversity of contemporary California architecture was often dependent upon an articulated and shifting roof plane that when executed through the local balloon-frame construction methods, resulted in difficult details, compromised structural integrity and wasted materials. Through an adaptation of existing conventional construction methods and materials, Schindler proposed changes

Figure 10. The Schindler Frame.
Architectural Record,
1947.

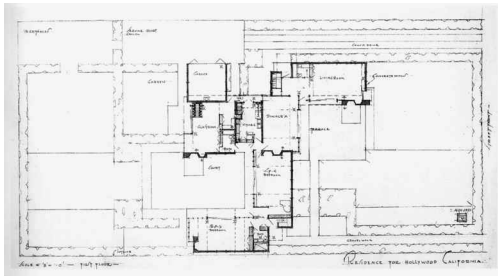


to the conventional construction system of light-timber framing in accordance with his modern spatial characteristics (Fig. 10). Schindler described the primary tenets of his adapted frame construction:

The space architect thinks in terms of articulated space forms. Large openings reduce walls to a minimum. Ceiling heights vary without disturbing the rambling low-to-the-ground and open-to-the-sky character of the building. Careful orientation of rooms makes clerestory windows and large shady overhangs mandatory. My struggles with tradition-bound carpenters finally developed the 'Schindler Frame', which eliminated a multitude of structural makeshift details which the balloon frame forces on the contemporary building ... Although the Schindler Frame unavoidably repeats certain characteristic details, it allows

such freedom in the use of more important features of space. . . .¹⁴

For Schindler, architecture grew from the articulated room conceived as a balanced harmonious aesthetic that binds surface and structure, space and furniture, light and climate in the making of a 'space architecture.' Schindler's system of construction endeavoured to simplify contemporary homebuilding by cutting all of the wall studs to a standard door height thereby providing a continuous belt of plates and spatial datum at this height. On top of this belt rests a clerestory course of timbers and glass modulating the ceiling to the required height. Schindler also proposed to eliminate the multi-layered roof assembly in favour of tongue and groove plank in order to reduce labour costs, provide greater spanning and to eliminate the need for additional interior finishes. And so, a metered



structural framework characterised the interior ceiling surface. Schindler evolved conventional frame technology to create architectural space that could set the stage for the rapidly developing modern cultural life of Los Angeles. Schindler believed that: 'Standardization is only possible for products of our civilization . . . The richness of culture lies in the variations of its theme.'¹⁵

King's Road House: a genesis

Schindler was part of a generation of European architects drawn to America both through Adolph Loos' writings and Wright's Wasmuth Portfolio. His move from Vienna to America in 1914 and his employment with Wright in 1917 led him to California while he supervised the construction of Wright's Hollyhock House for Aline Barnsdall. Schindler decided not to return to Chicago and he and his wife Pauline became actively involved in a heady Los Angeles social circle. Rudolf and Pauline Schindler's commitment toward actively shaping their society was an inseparable force in Schindler's architectural ideology. Schindler's design of their own house revealed an unique European emphasis on social housing. The King's Road House

was designed during 1921–22 as a cooperative-dwelling for three households with five adults and no children. In this new form of domesticity, each adult was allocated a large studio space for living and working that provided a direct connection to a shared outdoor terrace. The house design gave privacy from the street and neighbours through an expanding reciprocity of landscape form and architectural space that effectively utilised every portion of the 100-foot × 200-foot building (Fig. 11). Schindler's vision of new domestic forms was a prophetic one, his formal and spatial composition preceded the courtyard housing of Mies van der Rohe by several decades. The plan of the Schindler Chase House is a pin-wheel of L figures. A profoundly modern configuration that would appear again in the work of Mies van der Rohe's Concrete

Figure 11. King's Road House 1921–22. From *The Architectural Drawings of R. M. Schindler*, ed. Richard Gebhardt.

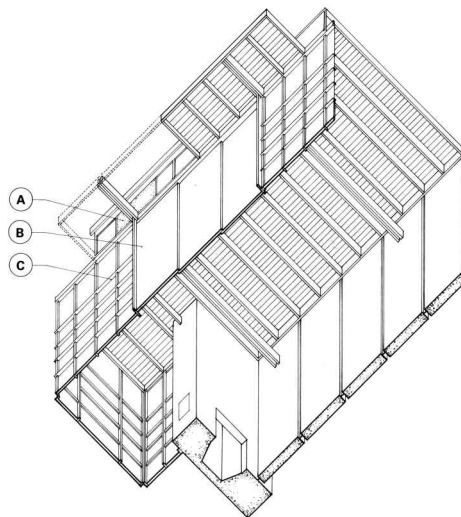
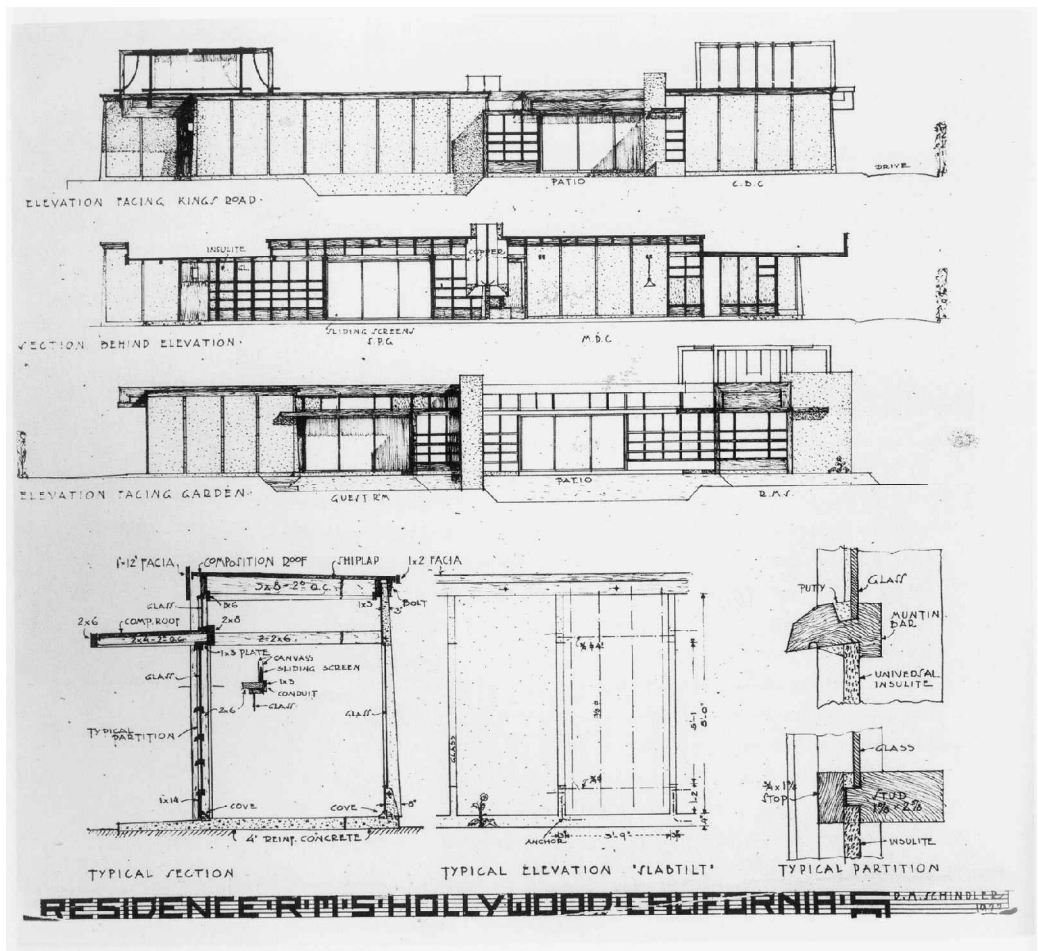


Figure 12. Framing of the King's Road House 1921–22. From Edward Ford, *Details of Modern Architecture*, vol. 1, p. 291.

Figure 13. King's
Road House
1921–22.
*The Architectural
Drawings of R. M.
Schindler*, ed. Richard
Gebhardt.



Country House of 1923, and Gropius' Bauhaus in Dessau of 1925–26. Schindler's innovative domesticity not only modified the con-ventional domestic programme with individual live-work rooms, he also

replaced the family kitchen with a 'utility room' and proposed cooking as a social catalyst. 'The basic idea was to give each person his own room,' Schindler wrote in 1921, 'and to do most of the cooking right

on the table – making it more a social campfire affair rather than a disagreeable burden to one member of the family'.¹⁶

Construction began on the Schindler Chase House in June of 1922, and Schindler moved in to finish the work himself. In the studio rooms, a 4-foot module is demonstrated through the detailing of the connection between the 4-foot tilt-up concrete panels that are joined with a 3-inch glass insert articulating the module and construction process. The redwood framework of the house further divides the 4-foot module in half with the spacing of roof joists and vertical members. A vertical module is developed with 12-inch segments of horizontal framing for a window wall. Paired beams articulate a lowered ceiling datum and spatially suggest subdivisions to the large room into three areas that can be further defined by hanging screens and through furniture arrangements (Figs 12 and 13). Schindler's exposed frame construction of ribs and lines is the genesis of his system of spatial geometry that he would articulate in about twenty years. The formal composition of Schindler's pinwheel plan composition is structured by interlocking L-figures and is a compositional device that is evident in both space and material relationships. An L-figure of two rooms wrapping around an exterior patio is echoed in the L-shaped concrete wall in each large studio room, a shape that is also configured for structural stability. Another L-figure is formed by the comparatively lightweight redwood timber frame of roof and walls completing Schindler's consistent attention to the relationship of geometry and material assemblies with an end toward modulating space, climate, light and mood.

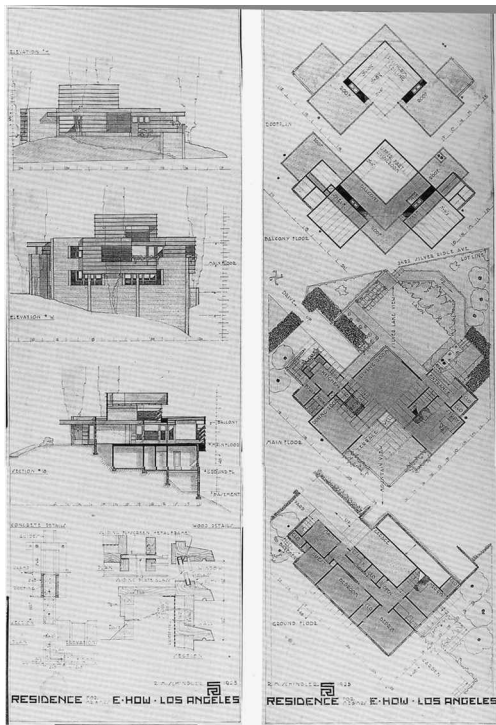


Figure 14. Frame construction in Pauline Schindler's studio. Photograph by Grant Mumford.

Construction and space: the Schindler frame and the space reference system

What Schindler would claim as his 'space reference system' is in a very primitive form in the King's Road House. The horizontal datum of the frame is not yet at 6'-8", yielding Schindler's prescribed one and two-thirds module. The overall room height is 8'-8" and the horizontal datum is at only 6'-3". Additionally, the horizontal divisions of the framed window wall are at 12-inches, not the required 16-inches for a one-third module (Fig. 14). However, these dimensional discrepancies are summarised and codified in Schindler's later project for the How House that was completed in 1925. Schindler, through his explanation of the Schindler Frame construction, set out seven points which lead to qualities of space that are tied to his innovations in conventional wood framing. The seven points are as follows: 1) Large openings in Walls, 2) Varying Ceiling Heights, 3) Low Horizontal Datum, 4) Clerestory Windows,

Figure 15. How House 1925.
The Architectural Drawings of R. M. Schindler, ed. Richard Gebhardt.



5) Large Overhangs, 6) Interior Floor close to exterior ground, 7) Continuity between adjoining 'space units.' Schindler's focus on the frame as a material assembly with a structural role allows Schindler to consider the frame as a space-making device with his simple innovation for a continuous belt of plates. The opportunity for Schindler's seven points unfolds from this construction modification.

The How House was commissioned as a modest home for a small family and included individual studies for Dr and Mrs How. The site for the house

is in Los Angeles on a steeply sloping site with a growth of old eucalyptus trees. Compositionally, Schindler employed diagonal bi-lateral symmetry of overlapping L-figures resulting in a square plan. The wings of both provide roofed outdoor terraces. And at the elbow of the L-figure, there is the living-room and a complementary outdoor terrace that stand in a diagonal relationship to each other. At this formal juncture, an open shaft of space and light penetrates between the multiple levels of the house, emphasising spatial continuity. The How House is set on a 4-foot modular square grid, and this grid is numbered from one through to twenty-five and lettered A through to W on Schindler's construction drawings (Fig. 15). A provocative essay by Lionel March entitled 'Dr How's Musical Box,' describes the recapitulation of classical themes and musical proportioning systems that Schindler responds to and incorporates in the How House. In most cases, Schindler responds to the classical models through a negation of opposition. For example, in response to formal composition and symmetry, Schindler employs the diagonal as opposed to the classically axial and orthogonal compositions. Similarly, Frank Lloyd Wright emphatically employed the diagonal in his Usonian Houses, but not until eleven years later at the Jacob's House of 1936. In the How House, there is a drop of twenty feet across the plan and a vertical module of sixteen inches is shown in Schindler's section and elevation drawings with the only vertical dimensions given in feet above sea level. The sixteen-inch vertical module is directly tied to Schindler's space reference system of planning and to the construction of the exterior cladding and in this manner

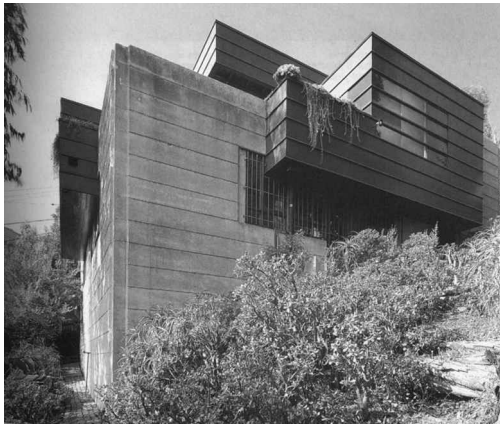


Figure 16. Exterior view of How House 1925.



Figure 17. Geometry, Construction and Materials, How House 1925.

the existence of a vertical module is remarkable similar to Wright's Usonian houses. However, where Wright implies that construction is in service of spatial volumes, Schindler clearly articulates a reciprocity between a proportional spatial system and the assembly of light-frame construction.

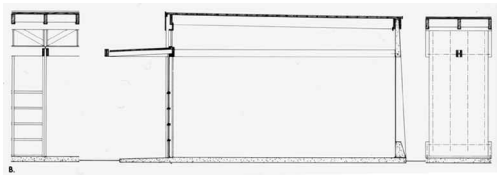
The upper portion of the How House is conventional wood-frame construction with modifications to incorporate Schindler's framing system and the

lower portion of the building that is set into the hillside is cast concrete. The wood exterior cladding develops the sixteen-inch module through the horizontal boards that are joined by projecting, applied moulded drip strips. This detail allows the wood to expand and contract beneath this water-shedding moulding. The sixteen-inch module is carried into the construction of the cast concrete through the board shuttering that is used to form a day's pour and then moved upward for the next pour. The planks for the formwork are beveled to aid in their stripping and articulate the extent of each pour (Fig. 16). In addition, the unavoidable subtle shifts in colour in each concrete batch punctuate the horizontal layering.¹⁷ Schindler weaves together these two systems of construction through the geometry of material assembly and his system of spatial proportions. Schindler proposes the role of the window as another material change within the fabric of the panelised cladding (Fig. 17). A glass panel replaces redwood board siding in a one-to-one exchange. The geometric module serves visually to tie together three materials: concrete, redwood and glass. The horizontal lines articulate actual construction joints between separate concrete casts, between individual pieces of siding and between panes of glass. Here, geometry, construction process and material quality are skillfully synthesised.

Conclusion

Both Schindler and Wright were excluded from the 1932 International Style Exhibit at the Museum of Modern Art in New York and subsequently dismissed by the architectural establishment as not serious modern architects.¹⁸ As a significant contributor

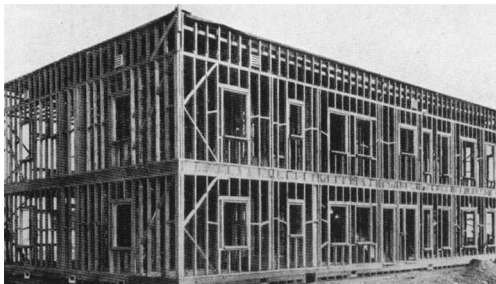
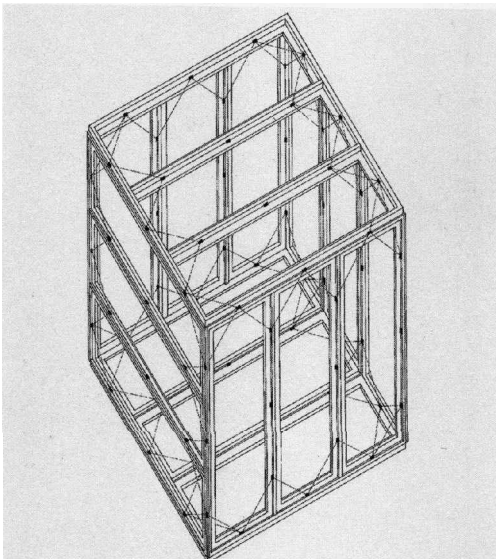
Figure 18. King's
Road Building,
Section.
From *RM Schindler*,
ed. Lionel March and
Judith Scheine.



to the development of early modern architecture, Wright's work soon reflected his interest in pre-industrial Japan and man's relationship to nature. He saw the machine not as a future symbol of man, but rather as a way to produce an architecture that embodied man's primordial existence and this put Wright at odds with the European architectural intelligentsia. The curators of the famous exhibition, Henry Russell Hitchcock and Philip Johnson, presented a contemporary style of architecture that was structured by a skeleton frame and conveying a weightless volume of space that was enclosed by a tautly stretched seamless skin devoid of decoration. 'Good modern design expresses in its design this characteristic orderliness of structure and this similarity of parts by an aesthetic ordering which emphasizes the underlying regularity.'¹⁹ Both Wright's and Schindler's designs incorporated most of these principles, but not within the orthodoxy Hitchcock and Johnson demanded. The images of the catalogue are of buildings that exude a machine-like air with taut volumes and crisp seamless skins. A quick survey of both Schindler's and Wright's wall sections reveals their distance from the International style (Fig. 18). There is no machine aesthetic, no flush finish, and no desire for abstraction or weightlessness.

Schindler described with some disdain the practice of frame-construction wherein the structural

frame is covered with material finishes and skins as the 'Petticoat method' – where the structure of the building is carefully clothed with layer after layer, 'transforming buildings into starched sheets of oil paint endlessly recoated'. In opposition to the International Style architecture Schindler and Wright posited an architecture that embraced the construction processes and significantly reconsidered frame-construction within the economic and cultural forces of modern life. Schindler accomplished this through the revelation of structural forces in exposed building framework and further through an adaptation of construction conventions that were allied to a system of spatial proportioning and a social agenda for programmatic invention. Rudolf Schindler's architectural constructions were always proposed to be in the service of defining and conditioning space for human occupation. His commitment to scale, proportion and geometry provided the armature for progressively modern spatial constructions as a foil for contemporary life. The intellectual and formal ordering, presence of material conditions and intrinsic detailing of Frank Lloyd Wright's architecture defined his work as a synthesis of space, construction and landscape dedicated to the creation of a framework for the ethical life of man.²⁰ Wright considered the horizontal extension of space toward the landscape, so typical of his Usonian houses, as emblematic of the most basic American ideals: 'I see this extended horizontal line as the true earth line of human life, indicative of freedom. Always.'²¹ Wright's adaptation and transformation of conventional frame construction is reflective of the freedoms inherent in this truly American form of construction.



In 1941 when Sigfried Gideon published *Space, Time and Architecture*, Walter Gropius and Conrad Wachsmann introduced a new wood building system called the General Panel System in the United States (Fig. 19). This system of construction relied on the calculated and precise support of structural forces by a specialised iron joint component. Top,

bottom and side to side, the same General Panel framework is employed as most components to the system were interchangeable. Although a system of standard components, the empirical and somewhat 'vernacular' system of American light frame construction is by nature variable, redundant, and malleable (Fig. 20). The components of this system are not interchangeable, yet the definition of the character of the system is open for interpretation. This relative quality of ambiguity afforded Wright and Schindler the opportunity to manipulate the grammar and syntax of the construction assembly toward their goals of space making and inhabitation. The construction innovations made by Wright and Schindler begin as modifications or highly articulated characteristics that are intrinsic to frame construction. For example, the identity of the frame assembly as panel, with the consideration of the edges of panels, their connections and operations for penetrations. Or alternatively, the rigorous tectonic expression of the frame where the structural capacity of the frame is acknowledged and configured to absorb and express unique formal and spatial concerns. For both Frank Lloyd Wright and Rudolf Schindler, American light frame construction became a synthetic armature that was infused with the concerns of material form, spatial geometry and the cultural priorities of modern life.

Figure 19. Frame diagram of the General Panel System, 1941. From Konrad Wachsmann, *Building the Wooden House*.

Figure 20. Platform Framing. From Neutra, *Amerika*.

Notes and references

- 1 For a brief history of George W. Snow's invention of Balloon framing, see Sigfried Gideon, *Space, Time and Architecture* (Cambridge, Harvard University Press, 1941), pp. 274–276.

- 2 See Tom F. Peters, 'An American Culture of Construction, *Perspecta* 25, (New York, Rizzoli, 1989), pp. 142–161.
- 3 See Tom F. Peters, 'The Rise of the Skyscraper from the Ashes of Chicago,' *American Heritage of Invention and Technology* (Fall, 1987).
- 4 Sigfried Gideon, *Space, Time and Architecture*, *op. cit.*, pp. 269–277.
- 5 Reyner Banham, 'Rudolf Schindler, Pioneering without Tears', *Architectural Design*, December 1967, pp. 579–578.
- 6 Frank Lloyd Wright, *The life-work of an American Architect Frank Lloyd Wright* (New York, Horizon, 1965), p. 57.
- 7 Robert McCarter, 'The Integrated Ideal' *Frank Lloyd Wright a Primer of Architectural Principles* (New York, Princeton Architectural Press, 1991).
- 8 Kevin Nute *Frank Lloyd Wright and Japan* (New York, Routledge, 2000), p. 53.

'Not surprisingly, Chicago's own newspapers took a particularly keen interest in the curious activities on the Wooded Isle of Jackson Park. Even Wright's tiny local paper, The Oak Park Reporter described the Ho-o-den in considerable detail . . .' and further: 'By the time the exposition opened on May 1st 1893 the Japanese pavilion would already be familiar to many local architects, via the Inland Architect, the main Chicago-based architectural journal serving the Midwest, which had devoted two extensive articles to the Ho-o-den during the winter of 1892–93.' Other references include: 'Building the new house' in *An Autobiography* (New York, Duell, Sloan & Pierce, 1943), pp. 141–142.
- 9 Frank Lloyd Wright, *The Future of Architecture* (New York, Horizon, 1953), p. 230.
- 10 The masonry also served as wind bracing. See John Sargeant, *The Usonian House* (New York, Whitney Library of Design, 1976), p. 19.
- 11 Frank Lloyd Wright, *A Testament*, quoted by Kaufmann in *An American Architecture* (New York, 1955), pp. 306–307.
- 12 Frank Lloyd Wright, 'The Art and Craft of the Machine,' in *The Future of Architecture* (New York, Horizon, 1963), p. 96.
- 13 Rudolf Schindler, 'Reference Frames in Space' in *Architect and Engineer*, (April 1946), pp. 10, 40, 42–43.
- 14 R.M. Schindler, 'The Schindler Frame,' in *Architectural Record* (New York), vol. 101, (May 1947), pp. 143–146.
- 15 R.M. Schindler, 'Notes: Modern Architecture,' manuscript, 1944. Schindler Archive, University of California, Santa Barbara.
- 16 Kathryn Smith, *Schindler House* (New York, 2001), p. 20, quoted from a letter to Mr. and Mrs. Gibling, November 26, 1921.
- 17 This is a form of construction similar to Louis Kahn's use of concrete at the Salk Institute (1959–1965). The ornament and detailing sensibility grows from understanding of the logic of the process of assembly and is created through modifications or alterations to the method of construction.
- 18 See Robert McCarter, *Frank Lloyd Wright Architect* (London, Phaidon, 1997), p. 203. See also Kathryn Smith, *Schindler House* (New York, Abrams, 2001), p. 37–38 and her footnotes. In addition, Alfred Barr's 'Preface' *The International Style*, describes Wright's architecture, 'For even more than the great styles of the past it required restraint and discipline, the will to perfect as well as to invent. And this is in contrary to the American cult of individualism, whether genuinely romantic, as in the case of Frank Lloyd Wright . . .'
- 19 Henry Russell Hitchcock and Philip Johnson, *The International Style* (New York, Norton & Co., 1932), p. 70.
- 20 Robert McCarter, *Frank Lloyd Wright Architect*, *op. cit.*, p. 334.
- 21 Wright, *The Natural House* (New York, Horizon, 1954), p. 58.