A WINDOW OF OPPORTUNITY

A third, and Domestically focused, Modern Movement in South Africa

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ABSTRACT: The effects of climate change, resource depletion, and volatile economic circumstances require a reflection on current design approaches that can be gained through lessons from the original and mediated intentions of the Modern Movement. An important example can be found in South Africa before WW II, where the introduction of standardized building materials, particularly metal-framed windows, generated unique, mediated Modern Movement-inspired domestic interiors resulting from responses to a burgeoning industry, physical context, and functionalist attitudes to human activities.

The clarion call of the Modern Movement for an architecture of economy, efficiency, and health underlined Le Corbusier's "Cinq Points de l'Architecture Moderne" (Curtis, 1996, p. 175). This dictum was transmigrated to South Africa through the work of the zerohour Group formed in 1932. Unfortunately, the starkness of the 'foreign' architecture did not resonate with the general public, while interiors overheated and flat roofs leaked in the summer. In 1936, Iscor, a South African company, began assembling standardized metal window frames. Architects like Norman Eaton, Hellmut Stauch, and Robert Cole Bowen, sensitive to local contexts, utilized these metal window frames to create unique architectural interiors. The windows and associated modules not only provided an economical construction and structural logic through planning efficiency but generated more contextually and climatically related interiors, healthier internal environments, and fluid internal-external relationships.

This article delves into the origins and impacts of the Modern Movement in Johannesburg and Pretoria, focusing on the transformative influence of the standard metal window. Then, the bioclimatic, technological, and spatial effects of these windows on residential interiors and their lasting legacy will be highlighted.

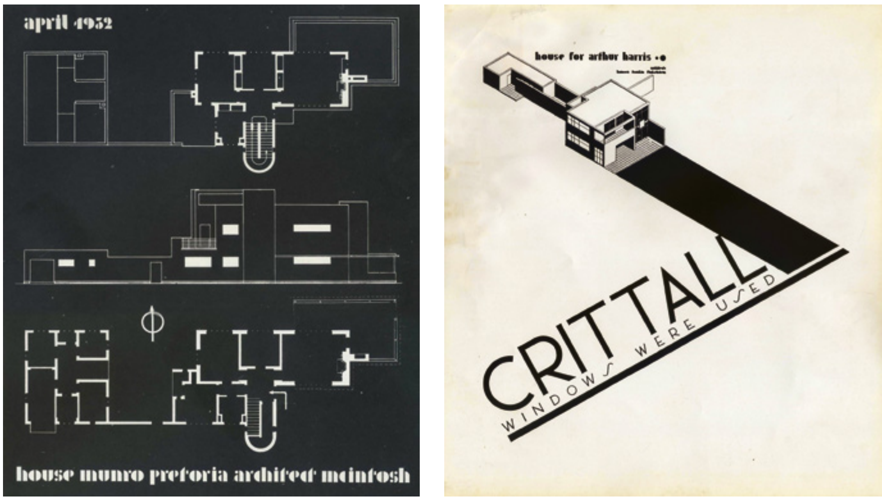
KEYWORDS: Standardization, metal windows, mediated Modern Movement, bioclimate, modern interior

INTRODUCTION: We live in testing times, enduring various impediments to the control of a secure future. The effects of climate change, resource depletion, and volatile economic circumstances resulting from, amongst other influences, the recent COVID-19 pandemic require a reflection on current design approaches. By adopting retrospective and projective attitudes, lessons can be learned from the original and mediated intentions of the Modern Movement, which grappled with similar challenges in its time. A valuable lesson can be found in South Africa, before and after WW II, with the advent of building material standardization, in particular using the metal-framed window [FIGURE 01] that facilitated the design of economic, bio-climatic, and mediated Modern Movement interiors. Through applications of the window module, opportunities presented by revised responses to industry, nature, and human activity were synergized in the design of seminal houses in Pretoria.

MODERN MOVEMENT MEDIATIONS

The first and orthodox Modern Movement (1917-1929) (Jencks, 1985, p. 31; Joedicke, 1945, p. 10), or pastoral and programmatic modernity as Heynen (1999, p. 13) has described it, called for an architecture of economy, health, and efficiency underlining Le Corbusier's (1867-1965) "Five Points for a New Architecture" (Curtis, 1996, p. 175). Le Corbusier's dicta were directly transmigrated to South Africa through the architecture and publication of the *zerohour Group* (1932) formed by Rex Martienssen (1905-1942), Gordon McIntosh (1904-1983), and

01 Metal-framed windows in the living room of Hellmut Stauch's House Kellerman, 1950, Pretoria. © Arthur Barker, 2015.



02 Houses Munro and Harris (with acknowledgment to the metal window company) published in 'zerohour,' 1933. © Architectural Archives, University of Pretoria, 009_MCI (Gordon McIntosh).

Norman Hanson (1909-1991) (Herbert, 1974, p. 95). In 1933, the band of like-minded architects drew up a manifesto for design titled 'zerohour' with the intention of creating a "living architecture in South Africa" (Herbert, 1974, p. 93) through the dissemination of the so-called International Style.

This second Modern Movement (1930-1939) (Joedicke, 1969, p. 16) extended the core principles of the first Modern Movement and found its way to non-European countries searching for a new political identity or alternatives to entrenched traditions. In 1934, Martienssen's direct encounter with Le Corbusier (Herbert, 1974, p. 100) was met with enthusiastic reception, culminating in Le Corbusier's publication of Martienssen's letter in his 1936 *Oeuvre Complète* (Herbert, 1974, p. 186). In this publication, Le Corbusier enthusiastically referred to the adherents of this movement as *Le Groupe Transvaal* [*The Transvaal Group*].

A THIRD MODERN MOVEMENT

During the 1920s and 1930s, a limited number of more aesthetically inspired than principally or functionally informed Modern Movement houses were designed and built in Johannesburg and Pretoria, including House Martienssen (1926) (Haig, 1986, p. 59), House Munro (1932) (Herbert, 1974, p. 70) [FIGURE 02], House Harris (1933) (Herbert, 1974, p. 86) [FIGURE 02], and House Stern (1934) (Herbert, 1974, p. 122). The designs were a reaction to imported Dutch and British domestic architectures (Herbert, 1974, p. 28) but represented a resistance to moving away from traditional cellular layouts. Unfortunately, the intentions of Modern Movement efficiency and a new interior domesticity mainly resulted in compact circulation layouts. The starkness of the imported architecture did not resonate with the public, while the interiors overheated in summer and flat roofs leaked (Howie, 1945, p. 141; Connell, 1945, p. 164; Chipkin, 1993, p. 166). Martienssen's rejection of an offer from the CIAM to establish a South African arm of the organization in 1937 (Herbert, 1976, p. 187) and his untimely death in Pretoria on August 26, 1942 (Herbert, 1974, p. 245), added impetus to the demise of a second Modern Movement in single residential dwellings.[1]

After 1940 and until around 1960, a third, and regionally inspired, Modern Movement began to see the light of day (Curtis, 1996, p. 567; Prinsloo, 2000, p. 96; Ghirardo, 1996, p. 10). The major shift occurred in work outside Europe, particularly in developing countries in South America and Africa (Curtis, 1996, pp. 491, 635). In South Africa, the formal orthodoxy of the limited second Modern Movement was tempered by a more focused "counter-pastoral" (Heynen, 1999, pp. 11-14) direction through a recognition of the technical and climatic failures of buildings from the 1930s (Cooke, 1998, p. 232), place, building materials, and local 'Afrikaner'[2] culture, particularly in Pretoria. Notably, in the 1950s, there was a reevaluation of gender roles in middle-class households, with women transitioning from mere oversight to actively managing household tasks, a shift reinforced by the adoption of open-plan kitchen and dining room layouts (Jackson, 1998, p. 88) and made easier through newly available equipment and hard-wearing, cleanable, surfaces (Cole Bowen. n.d., p. 45).

During and directly after WW II, in South Africa, limited imports of building materials (Muller, 1984, pp. 447-448) led to scarcity, paradoxically prompting innovation and efficiencies in construction and space planning. By 1940, local resources allowed for the construction of concrete, metal, and brick buildings, while timber and window glass remained imported products (Hartdegen, 1988, p. 207). The housing needs of returning soldiers (Cooke, 1998, p. 233), rural migration to the cities, and the restrictions of building controls (Peters, 1998, p. 177) forced architects to focus on "more modest and therefore more realistic needs" (Hanson, 1958, p. 20). Hanson further argued that there should be a focus on the use of logical, efficient, dimensionally coordinated structural systems supportive of the local building industry (Cooke, 1998, p. 234).

DERIVATION: MATERIAL STANDARDIZATION

The emphasis on efficiency in construction through the potential of mass production, standardization, and the use of repetitive modules was initiated during the Industrial Revolution in buildings such as the Crystal Palace (1851) (Frampton, 1992, p. 34) and later, in the 1926 Bauhaus

03 Crittall metal-framed window advertisements in the December 1928 and April 1932 South African Architectural Record journal. © Architectural Archives, University of Pretoria, 000_GEN (General Collection).

building with its 1′10″ (560 mm) metal-framed window module.[3] Consequently, the use of industrialized products associated with the Case Study House program (1945-1966) in California, United States, became equally influential (Smith et al., 2009, p. 8).

For many Modern Movement architects, the value of standardization offered a way to streamline the manufacture and use of building components to limit wastage and enhance adaptability while providing the possibility of seamless additions and alterations and ensuring aesthetic continuity and control. Initially, in South Africa, modular metal products such as corrugated iron sheets were imported (Fisher, 1998, p. 31), but after 1934, metal-framed windows from England were assembled and, later, manufactured by the newly established Iscor metalworks to the West of Pretoria (Hartdegen, 1988, pp. 118, 173).

INITIATION: THE MODULAR METAL WINDOW

The use of proportion systems during the Modern Movement was a key part of the education of architectural students, not least through Le Corbusier's *Modulor*. Hambidge's 1926 publication "Dynamic Symmetry" (De Bruyn, 2018, p. 155) formed the impetus for the development of the *Modulor* in the Department of Architecture at the University of Pretoria in 1943 (Steenkamp, 2003, p. 7) through the use of proportional design grids. In addition, a more rationalist approach developed from an understanding of locally available and standardized building materials (Steenkamp, 2003, p. 8).

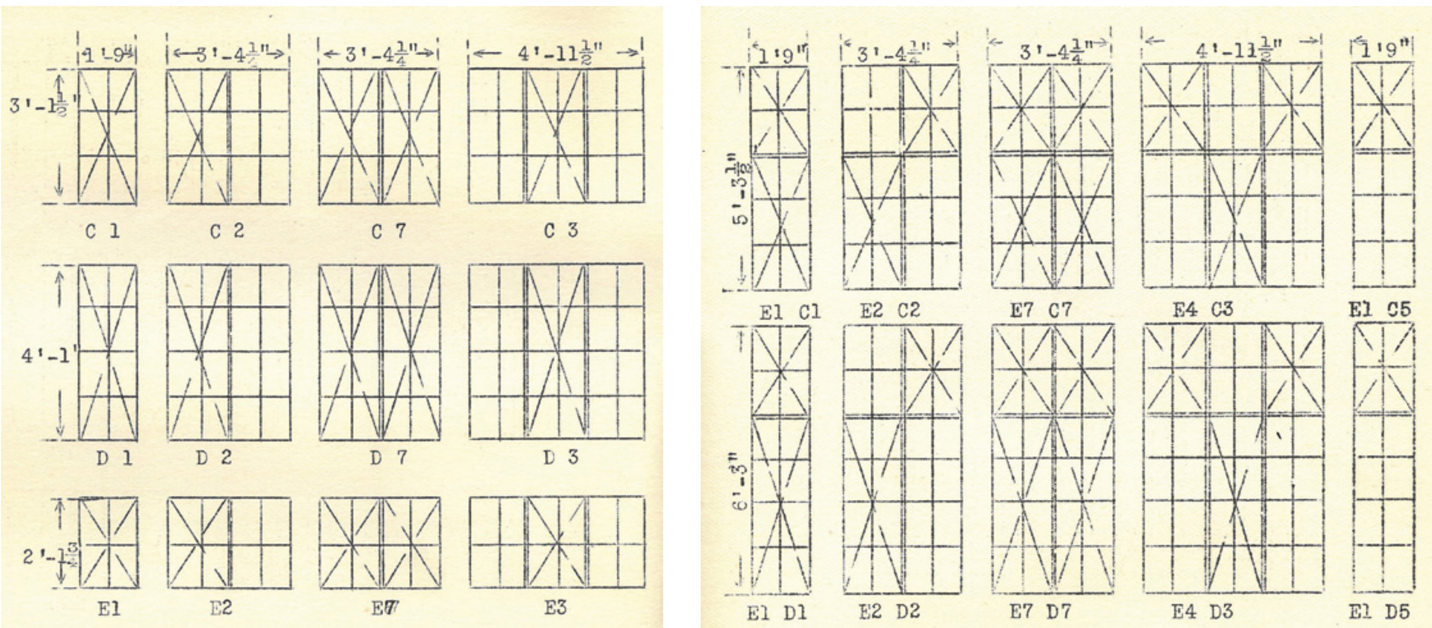
In the late 1920s, a significant advancement in construction technology arrived in South Africa with the introduction of imported metal-framed windows. After receiving a patent license on September 16, 1935 (Anon, 2023) from the United Kingdom-based Crittall Manufacturing Company Limited, Iscor began assembling standard metal window frames in 1936 for the Crittall Manufacturing Co. (S.A.) Ltd. [FIGURE 03], including 1′9″ (533 mm) wide (C1, D1, E1 range) and 3′4½″ (1029 mm) wide (C2, D2, E2 range) modules [FIGURE 04] imported from the parent country (Peters, 1998, p. 176).[4]

The adoption of metal-framed window modules had a profound impact on the evolution of residential interiors, particularly in Pretoria houses designed by architects such as Norman Eaton (1902-1966), Robert Cole Bowen (1904-1976), and Hellmut Stauch (1910-1970). The window modules provided structural and construction efficiency, the opportunity to create more climatically comfortable internal environments, and enhance planning efficiency while fostering contextually relevant internal-external relationships.

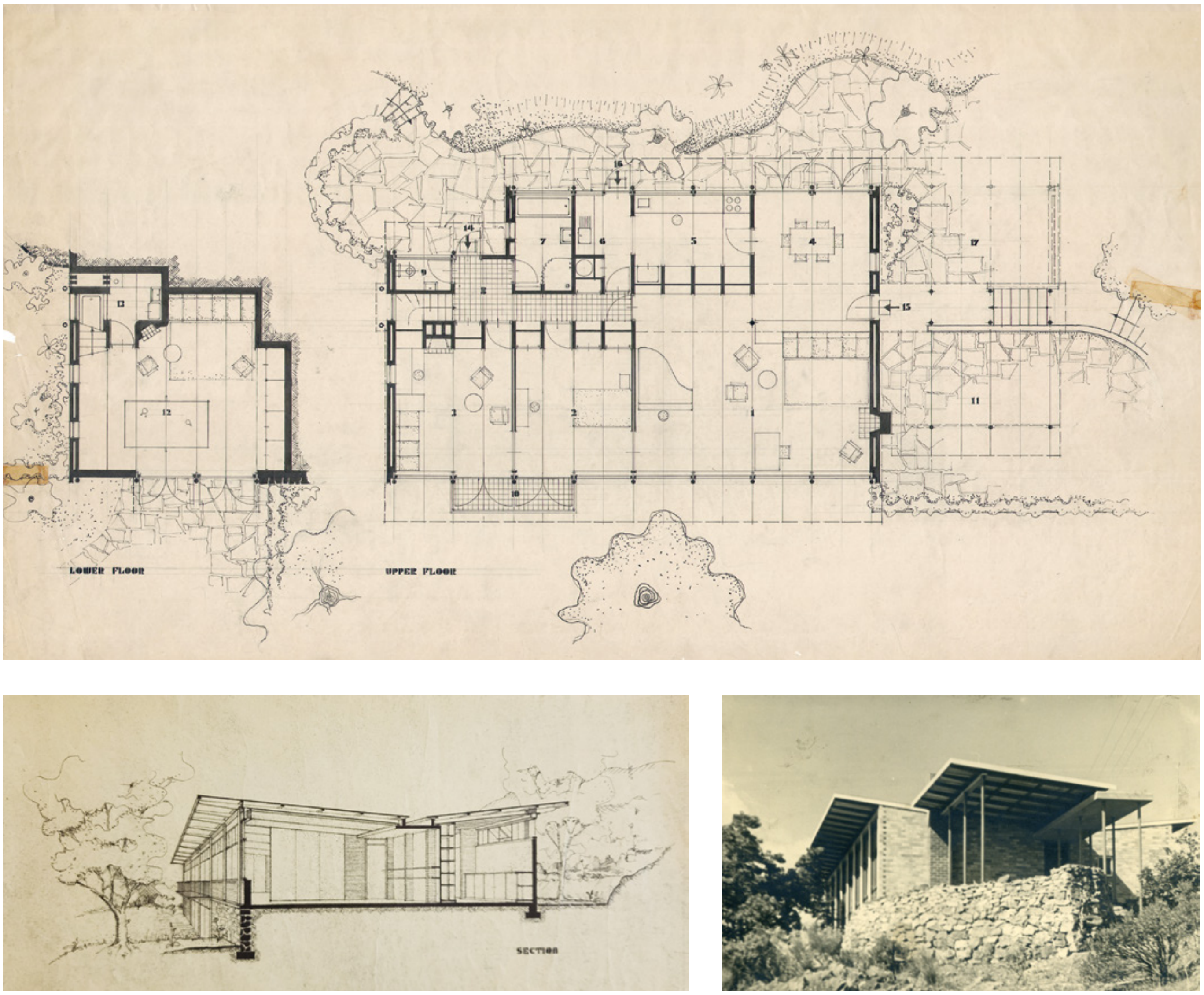
GENERATOR: WINDOW TECHNOLOGY

The use of the metal-framed window module, following European precedents, was instrumental in fostering not only a reconsideration of structural systems but also a technological revolution that shifted architecture in Pretoria from its vernacular stereotomic origins to a tectonic system.

Stauch, who arrived in South Africa in 1935 after training at the Ittenschule in Berlin from 1926 to 1929 and at the Technische Hochschule (Nation, 2014, p. 10) had already, as early as in the 1930s while working for Wilhelm Peters (Peters, 1987, p. 3), used modules of 800 mm and 1100 mm in the Kleinhaus [*small house*] designs made with metal structures and asbestos cement cladding. Stauch, a yacht designer and racer (Peters, 1998,



04 Crittall (UK) cottage-pane metal-framed windows catalog for South Africa 1930s. In South Africa, the smaller panes were largely omitted. © Braintree Museum Collection, Object Nr BRNTM:2012.571).



05 Plan, section, and photograph of Stauch's House Winckley, Pretoria, 1944, showing the metal-framed window-inspired lateral planning grid. © Architectural Archives, University of Pretoria, 011_STA (Hellmut Stauch), undated.

p. 177), also produced a 'Study for the Development of Standardised Building Elements' in 1941 (Stauch, 1941) and would have been familiar with the German metric Fenestra Crittall AG system (Lohmann, 2018, p. 104).

In Pretoria, Stauch used a lateral modular grid on the north-south axis at 3'3" (990 mm), nearing 1 m, following the German metric system (Peters, 1998, p. 185) and later adapted to suit the locally available window modules. Stauch also integrated metal column supports with metal-framed windows for the spacing of roof rafters to create a constructional whole (Peters, 1998, p. 184), for example, in House Winckley, 1944 [FIGURE 05].

Cole Bowen, a graduate of the University of the Witwatersrand (Wits), not only used a 3'4¼" (1022 mm) window module for rafter spacings [FIGURE 06] but advocated for a three-dimensional grid system, emphasizing the mathematical coordination of materials and equipment to elevate architectural theory into applied art (Cole Bowen, n.d. pp. 106, 127). He criticized the limitations of a singular 1'9" (533 mm) wide metal-framed window but argued that a doubling or trebling of the module was more efficient for roof construction (Cole Bowen. n.d., p. 10).

06 Cole Bowen's Vincent House, Pretoria (ca. 1953) with window module grid that generated bay widths and structural layouts. © Cole Bowen, Architectural Archives, University of Pretoria, 043_COL (Cole-Bowen), undated.

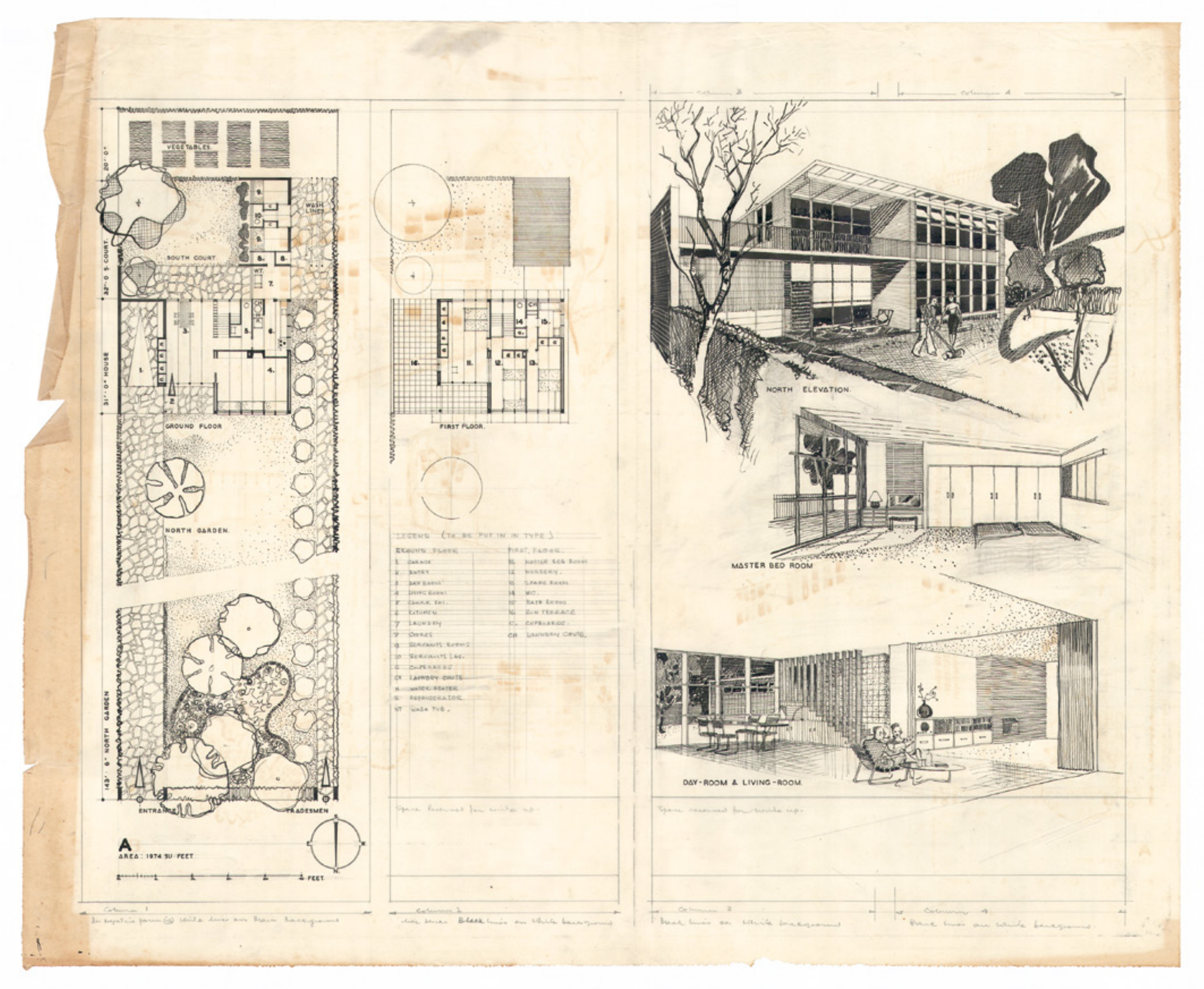
Norman Eaton, another South African Wits graduate, had already experimented with a continuous band of metal-framed glazing as early as 1933 in House Boyes in Brooklyn, Pretoria (Harrop-Allin, 1975, p. 27). However, it was not until 1948 that he began employing this approach as a modular grid in projects like House Greenwood (1949-51) in Pretoria (Harrop-Allin, 1975, pp. 72-77). Eaton's travels to the Americas, including to Los Angeles in 1945, where he met Richard Neutra (1892-1970) (Pienaar, 2013, p. 198), heightened his awareness of standard building elements like the earlier 3'3½" (1003mm) system used in the Lovell Health House (1927-29) (Fisher, 2009, p. 403) and later the American Truscon metal-framed window system, available in 1'8" (508 mm) and 3'4" (1016 mm) modules, as used in the Eames House of 1949 (Eames Foundation, 2024).

FACILITATOR: ECONOMY OF THE WINDOW

Post-WW II South African economic challenges and material shortages, compounded by war-related manufacturing constraints, significantly impacted the availability of building products (Peters, 1998, p. 177). This, together with a constrained economy and architects being better educated to deal with new functionalist attitudes, fostered the design of efficiently organized space and the economical use of materials.

Teeger (1965, p. 7) described Cole Bowen as adept at creating economical homes within tight budgets, while Stauch focused on minimizing waste both spatially and materially, a mindset cultivated during work with Fred Forbat (1897-1972) and Peters Bau in Berlin (Nation, 2008, p. 28). Eaton, on the other hand, utilized cost-effective materials like peeled cypress poles for modular column and roof construction, along with locally sourced stone and bagged brickwork (Harrop-Allin, 1975, p. 79-80), effectively managing restricted budgets, all lessons so valuable in our current environmental and economic crises.

The dimensional coordination provided by the metal-framed window module facilitated the accurate spacing and sizing of elements such as columns, roof rafters, and purlins so that they could be used without physical or structural wastage while ensuring an economic and structural logic (Cole Bowen, n.d., p. 106). For Cole Bowen, the 1'8'' (508 mm) module dictated cupboard and counter depths while the 3'4¼" (1022mm) module [FIGURE 07] was ideal for circulation spaces and door widths. The 4'11½" (1511 mm) module suited the length of a "centre-based



07 One of the twelve alternative designs for the Average House by Cole Bowen showing the lateral window-inspired planning grid at 3'4¼" (1022 mm). © Cole Bowen, Architectural Archives, University of Pretoria, 043_COL (Cole-Bowen), undated.

sink and drain, double compartment wash tub, two-place settee, a babies' cot or an ironing table … while the quadruple module accommodated the length of a bed or bath and dining room table" (Cole Bowen, n.d., p. 109).

Eaton designed economic structural and spatial organizations by using the 3′4½″ (1029mm) window grid module in two directions, as evidenced in the pencil grid underlying his floor plan design for House Heystek (1957) (Pienaar, 2013, p. 113). In Stauch's designs, the vertical module facilitated the varying heights necessary for butterfly-shaped roof sections, ensuring adequate light, solar gain (and protection), and purposeful ventilation while opting for a monopitch roof without a ceiling, maximized usable roof space (Peters, 1998, p. 178).

The functional requirements of homes, combined with the window module, significantly enhanced planning by creating efficient circulation spaces. Moreover, the adoption of metal-framed windows alleviated the constraints imposed by traditional cellular plans (De Bruyn, 2018, p. 153), leading to improvements in interior comfort through control of the local climate.

MEDIATOR: THE BIOCLIMATIC WINDOW

The application of a pastoral modernity (Heynen, 1999, p. 13) by the zerohour Group had neglected the effects of local climate in Pretoria and Johannesburg. However, those architects educated in a more functionalist and scientific manner (Peters, 1998, p. 182) in Europe in the 1920s and in South Africa in the 1940s and 1950s (Steenkamp, 2003, p. 4) designed buildings in a bioclimatic manner to provide interior spatial comfort. A northerly orientation was favored, with a large equatorial window[5] for winter solar gain in living and sleeping areas and pitched roof overhangs for climatic control. These design strategies were further supported by architectural-climatic diagrams, such as those by the Olgyay brothers in the 1950s (Olgyay, 1962), and the establishment of institutions like the South African Council for Scientific and Industrial Research in 1945, including its arm known as the National Building Research Institute (CSIR, 2024). The latter entity provided detailed research on climate and building design from around 1950.

However, before leaving Germany, Stauch had already embarked on solar studies (Nation, 2008, p. 26), exhibited in his initial work in Namibia as early as 1929 (Nation, 2008, p. 28). Stauch designed dwellings with openings facing east and west to avoid the extremely hot northern aspect, while sheltered outdoor living was created through a recessed veranda (Peters, 1987, p. 24). These approaches were developed in later residential buildings in Pretoria and through publications depicting appropriate sun angles for building sections emphasizing northerly orientation (Stauch, 1945, p. 207).

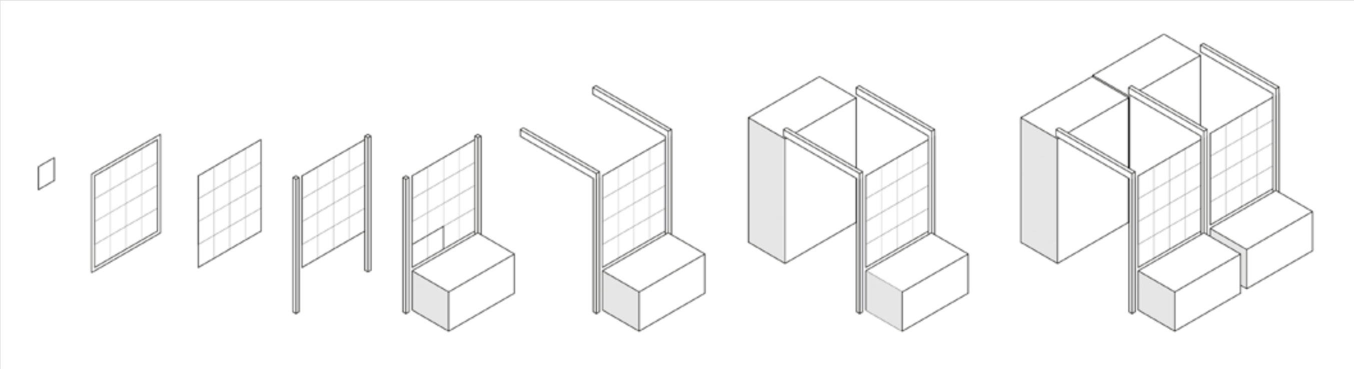
Stauch further refined his understanding of climate-responsive architecture through practice and part-time teaching at the University of Pretoria from 1943 to 1948, significantly influencing students (Steenkamp, 2003, p. 7). His use of metal-framed windows extending from the floor to the underside of roof rafters, butterfly-shaped roof configurations, and extended eaves not only enhanced solar control but also facilitated efficient night ventilation while optimizing the use of ceiling space. Stauch also incorporated clerestory windows (Peters, 1998, p. 182) to allow for adequate ventilation at the center of a deep plan while appropriate window heights provided adequate light and sun. Window locations, such as between kitchen counter and overhead cupboard, provided comfortable working conditions with a framed view of the outdoors.

Cole Bowen embraced a similar approach to Stauch's by designing double-banked residential buildings on narrow sites. This provided expansive north-facing glazing that extended seamlessly from floor levels or low windowsills to the ceiling plane. Cole Bowen (n.d., p. 65) asserted that the design of fenestration for a house had evolved into a science [FIGURE 08] and that the organization location of windows must consider lighting, prospect, privacy, sun control, solar heating, and ventilation. This complexity required an infinite variation in window opening adjustments and coordination and a roof design to limit stale air pockets.

Cole Bowen advocated for both fixed and adaptable window systems, such as louvers (Cole Bowen, n.d., p. 68), where air movement could be directed by changing the angle of the window blades to create comfortable indoor conditions. He also referenced the opaque louvers of the Brazilian Ministry of Education and Health building in Rio de Janeiro (Cole Bowen, n.d., p. 68) that would later serve as the precedent for sun shading in Stauch's 1952 Meat Board Building in Pretoria (Gerneke, 1998, pp. 216, 224). Eaton, in his later works, reinforced the use of extensive north-facing modular screens, complemented by attenuated design layouts that facilitated effective cross ventilation (Pienaar, 2013, p. 45) while optimizing spatial organization.

ORGANISER AND CONNECTOR: AN OPPORTUNE WINDOW

By the late 1950s, the metal-framed window module had resulted in a design grid that guided not only room widths but also roof rafter spacings, structural support positions, and the organization of internal fittings and equipment. As a response to functionalist ideals, the module became a plan and sectional controlling device providing a wholeness of design through its three-dimensional spatial



08 Isometric drawing showing the development of the three-dimensional module from its origins as a windowpane, inserted into a timber frame, then metal, and finally the repetitive module informing structure, space, and fittings. © Arthur Barker, 2023.

organization.

The metal-framed window grid facilitated vertical organization of space based on the available heights of modules like 2′1¾″ (654 mm) (E), 3′1½″ (953 mm) (C) and 4′1″ (1244 mm) (D). Combining modules C and D created a 7′2½″ (2197 mm) high module, equivalent to a standard metal-framed door height of 7′0″ (2134 mm). Substituting a C-height module at the ground floor level with a built-in fitting allowed for appropriate worktop heights in bathrooms and kitchens.

Stauch (1945, p. 207) emphasized the importance of generating and linking building sections from repetitive basic domestic elements. This sentiment echoed that of Cole Bowen (n.d., p. 24), who suggested designing the interior first and then working outwards so that there was surety in the process (through an understanding of the various internal activities) and product (through the application of an appropriate module generated from accurate measurements of equipment and utensils).

In line with Cole Bowen's ideas of designing with furniture in mind, Eaton often integrated furnishings such as seating with walls, as in House Scully (1962), where the kitchen, bathroom, and fireplace acted as a piece of furniture that defined spatial zones (Pienaar, 2013, p. 120).

The window afforded an improved connection between inside and outside, even when doors were not present. Bedrooms were often designed with bed-height exterior walls and windows above. This condition not only provided a sense of security and privacy but a seamless visual connection to the outside. In living areas, floor-to-ceiling windows and external doors heightened the indoor-outdoor experience. The placement of openings also paid homage to a South African tradition, the *stoep*[6], that served as a vital space for shielding buildings from excessive summer solar heat while facilitating comfortable outdoor living.

CONCLUSION: A WINDOW REFLECTION

An influential, local, domestic architecture and associated interior emerged in Pretoria after WW II, prompted by reactions to the failed, formalistic orthodoxy of second Modern Movement experiments. This third, or regional, Modern Movement approach synthesized industry, nature, and human activity through the use of the metal-framed window. The associated module-initiated changes in the use of structure and technology and was instrumental in forging a new contemporary and tectonic architectural identity that improved familial relationships through fluid spatial connections and practical efficiency for the homeowners. Concomitantly, a new type of interior condition provided more comfortable indoor environments and more fluid indoor-outdoor relationships.

Pretoria architects Stauch, Cole Bowen, and Eaton contributed to the evolution of comfortable, efficient, and economically viable interiors through their design explorations. Despite their diverse educational backgrounds and experiences, they shared a common focus in designing spatial and material solutions that harmonized with new lifestyles within a specific climatic context and the socio-cultural and economic setting of Pretoria society.

The value of these endeavors in a time of climate change, resource depletion, and volatile economic circumstances highlights the importance of a contextual understanding, rooted in a philosophical approach suited to the times, with an appreciation of the economic, spatial, and physical possibilities of available technologies and changing ways of living.

The timeless quality of the interiors of many of the houses that still exist in Pretoria serves as a testament to thoughtful and principled design approaches, originating from the early Modern Movement but refined in the hands of well-educated, creative, and forward-thinking individuals. These lessons retain relevance today, urging us to reflect and contemplate on and further develop as a clearer window to a sustainable and secure future.

REFERENCES

ANON. (2023). Crittall Metal Windows. http://archive.org/download/CrittallMetalWindows.No50Feb1929/Cca18838CrittalMfg.Co.Ltd..pdf/ Accessed Sept. 23, 2023.

CHIPKIN, C. M. (1993). *Johannesburg Style: Architecture and Society 1880s – 1960s*. Cape Town: David Philip.

COLE BOWEN, R. E. (n.d.). The Average House [Unpublished manuscript]. Architectural Archives, University of Pretoria, Pretoria, South Africa.

COLE BOWEN, R.E. (1953, April). Three Pretoria houses. *Architect and Builder*, pp. 36-49.

CONNELL, P. (1945). A review of 'The Architectural Review, October 1944. Special Number devoted to South Africa'. *South African Architectural Record*, *30*, 162-165.

COOKE, J. (1998). Revisions of the Modern: The End of the International Style in the Transvaal. In R.C. Fisher, S.W. Le Roux & E. Maré (Eds.), *Architecture of the Transvaal* (pp. 231-251). University of South Africa.

CSIR. (2024). *CSIR through the years.* Retrieved April 5, 2024, from https://www.csir.co.za/our-history/.

CURTIS. W. (1996). *Modern Architecture since 1900*. London: Phaidon.

DE BRUYN, D. (2018). *Construing free inhabitation in the domestic architecture of the Silent Subversives (1950s to 1960s)* [Unpublished Doctoral Dissertation]. University of Pretoria, Pretoria, South Africa.

EAMES FOUNDATION. (2024). *The Materials of the Eames House.* Retrieved April 5, 2024, https://eamesfoundation.org/news/the-materials-of-the-eames-house/

FRAMPTON, K. (1992). *Modern Architecture – A critical history*. London: Thames & Hudson.

FISHER, M. (2009). Prefabrication and the Postwar House: The California Manifesto. In P. Crisman & M. Gillem (Eds.), *The value of design: design is at the core of what we teach and practice* (pp. 402-409). Washington, D.C.: ACSA Press: Distributed by Assoc. of Collegiate Schools of Architecture.

FISHER, R.C. (1998). The Third vernacular. Pretoria Regionalism - aspects of an emergence. In R.C. Fisher, S.W. Le Roux & E. Maré (Eds.), *Architecture of the Transvaal* (pp. 123-147). Pretoria: University of South Africa.

GHIRARDO, D. (1996). *Architecture after Modernism*. Thames & Hudson.

HAIG, B. (Ed). (1985). *UIA International Architect: Southern Africa (Issue 8)*. London: International Architect.

HANSON, N. (1958). Technical Aspects of Architecture in South Africa. *South African Architectural Record*, *43*(1), 19-21.

HARROP-ALLIN. (1975). *Norman Eaton: Architect.* A study of the work of the South African architect Norman Eaton 1902-1966. Cape Town and Johannesburg: C. Struik Publishers.

HARTDEGEN, P. (1988). *Our Building Heritage. An Illustrated History*. Johannesburg: Hartdegen Press.

HERBERT, G. (1974). *Martienssen and the International Style. The modern Movement in South African architecture*. Cape Town: A.A. Balkema.

HEYNEN. (1999). *Architecture and Modernity*. Cambridge: MIT Press.

HOWIE, D. (1945). Whither Architecture? *South African Architectural Record, 30*, 40-45.

JACKSON, L. (1998). *'contemporary': architecture and interiors of the 1950s*. London: Phaidon.

JOEDICKE, J. (1969). *Architecture since 1945*. London: Pall Mall.

LOHMANN, D. (2018). *Stahlfenster von Fenestra-Crittall in den Bauten der Verseidag Krefeld. Bedeutung und Erhalt.* In Pufke, K. Fenster im Baudenkmal: Wert – Pflege - Reparatur https://www.academia.edu/36700236/Stahlfenster_von_Fenestra_Crittall_in_den_Bauten_der_Verseidag_Krefeld_Bedeutung_und_Erhalt/ Accessed Apr. 5, 2024.

MULLER, C.J.F. (1984). *Five Hundred Years - A history of South Africa*. Pretoria, Cape Town: Academica.

NATION, S. (2008). *The background, architectural philosophy and work of Hellmut Wilhelm Ernst Stauch* [Unpublished master's dissertation]. University of Pretoria. Pretoria.

NATION, S. (2014). *Hellmut Stauch Leading Architect.* Johannesburg: Kyosti bookbinders.

OLGYAY, V. (1962). *Design with Climate: Bioclimatic Approach to Architectural Regionalism*. Princeton, U.S.A.

PETERS, W. (1987). The importance of the '30s in the Domestic Architecture of Hellmut Stauch. *Architecture South Africa*, January/February, pp. 23-29.

PETERS, W. (1998). Houses for Pretoria. In R.C. Fisher, S.W. Le Roux & E. Maré (Eds.), *Architecture of the Transvaal* (pp. 174-195). University of South Africa.

PIENAAR, M. (2013). *The Norman Eaton legacy: A Critical Architectural Appraisal of the Documentation of his Domestic Oeuvre* [Unpublished master's dissertation]. University of Pretoria, Pretoria, South Africa.

PRINSLOO, I. (ed.). (2000). *Architecture 2000: A review of South African Architecture.* Johannesburg: Picasso Headline.

SMITH, E.A.T., Schulman, J., & Gössel, P. (2009). *Case Study Houses [the Complete Csh Program 1945 - 1966].* Hong Kong: Taschen.

STAUCH, H. (1941, February). Study for the Development of Standardised Building-Elements. *South African Architectural Record*, pp. 62-73.

STAUCH, H. (1945). THE DOUBLE LEAN-TO ROOF OR HOUSE PLANNING FROM A DIFFERENT ANGLE: AN ECONOMICAL STRUCTURAL SYSTEM WHICH ALLOWS FOR FREE PLANNING. *South African Architectural Record, 30*, 207-213.

STEENKAMP, A. (2003). Reminiscences - The Pretoria School as remembered by early graduates 1943-1953. *Image & Text 10*, 3-10.

TEEGER, E. (1965, April). Domestic Architecture in South Africa from 1930-1965. In Supplement to the *South African Architectural Record, 5*-8.

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ENDNOTES

1 The second Modern Movement had a greater and more long-lasting impact on multi-story residential designs in South Africa, including the still extant Hotpoint House (1934) by Norman Hanson (1909-1991), Samuel Tomkin (1908-2012), and Nathan Finkelstein (1909-1964) and Aiton Court (1937) by Bernhard Cooke (1910-2011), both in Johannesburg (Herbert, 1975: 138 &142).

2 The term 'Afrikaner' describes a cultural and social grouping typically among white South Africans of Dutch origin.

3 Measured by the author on a visit to the Bauhaus in June 2023.

4 The *Crittall* metal windows catalog of the time also included an L Series with 1′8″- and 3′3¼″-wide options.

5 The windows stretched from floor to underside of the roof, providing a glazed screen rather than individually placed windows in a stereotomic framework and were combinations of 2′1¾″ (E)-, 3′1½″ (C)- and 4′11″ (D)-high modules.

6 In the South African and Afrikaans language, this means outdoor undercover terrace.