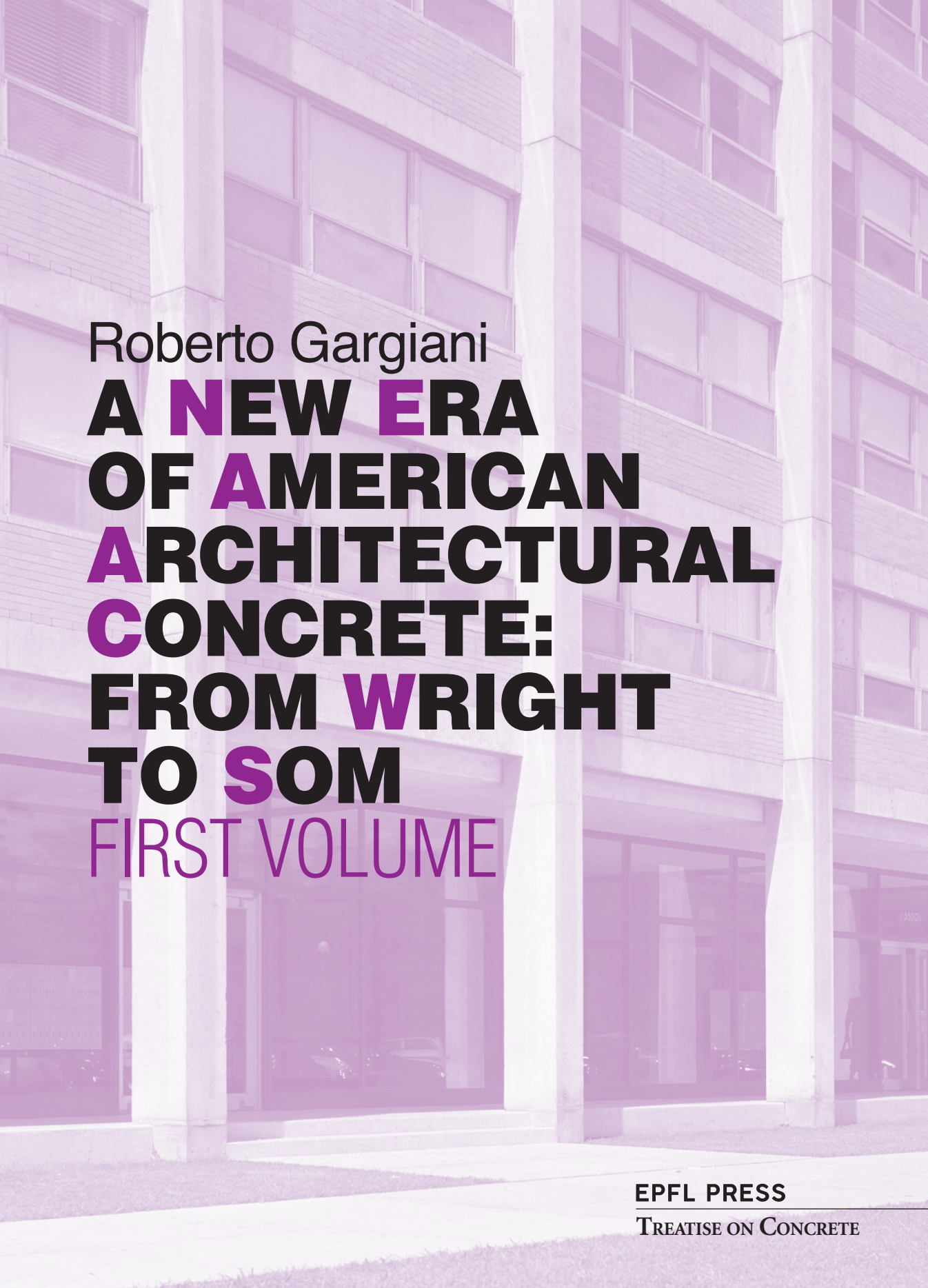

Roberto Gargiani

A NEW ERA OF AMERICAN ARCHITECTURAL CONCRETE: FROM WRIGHT TO SOM

FIRST VOLUME

EPFL PRESS

TREATISE ON CONCRETE

Treatise on Concrete
Directed by Roberto Gargiani

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Treatise on Concrete

Directed by Roberto Gargiani

The volumes of the *Treatise on Concrete* intend to offer a new and documented vision of the evolution of construction techniques and of the creative potential and formal expressions of concrete, from antiquity to the present time. Each book in the series will be based on specific archival research; the analysis of scientific, technical, and iconographic original sources; and the investigation into documents made available by companies, engineers, architects, and artists.
The full spectrum of the use of concrete will be covered, including the building of foundations, ports, moles, bridges, vaults, domes, fortresses, bunkers, houses, and monuments, as well as the manufacture of artificial stones and sculptures. In addition, the volumes will address the theoretical issues of *béton brut*, Brutalism, and the true nature of matter.
All volumes focus on the techniques and materials for the manufacture of formwork, from wood to fabric; on the meaning of the imprint; on the surface processing of concrete by hand or with machine; and on the composition of the mixture.
The series of books aims to provide the scientific community with a unique and updated reference on the historical and contemporary uses of concrete, which will open a new chapter in the knowledge of this crucial material for architectural construction, as well as for masterpieces of engineering and art.

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Louis I. Kahn, Exposed Concrete and Hollow Stones, 1949–1959
Louis I. Kahn, Towards the Zero Degree of Concrete, 1960–1974
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Contemporary Ornament in Concrete
Bared Concrete of Natural and Artificial Pozzolanas, 1780–1817
Formless: Beyond Formwork
The Concrete of Perret and Pupils

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NORRIS
1936

prologue

Surface Finishes by the Book: The Accomplishments of Architectural Concrete

A new era for concrete begins to unfold from the early 1940s onward as a result of wartime construction, post-war economic restrictions, experimentation on the part of certain architects, and the inventions of engineers, technicians, and builders. The decision to leave materials exposed, the most distinctive and widespread characteristic of the era, gives rise to a series of technical and artistic investigations into the specific textures and symbolic values of concrete. Multiple solutions are devised reflecting wide-ranging differences in building practices and cultures: from the local and national concrete manufacturing traditions that emerged during the early decades of the twentieth century to the direct influence of contemporary art movements, the craftsmanship of construction workers and builders, and lastly, technical evolutions in the building materials industry in terms of both concrete mixes and formwork fabrication. It is during this period that concrete reveals itself to be the most suitable material for expressing the contemporary crisis of the universal values propagandized in the name of the International Style. Concrete demonstrates the impossibility of establishing fixed aesthetic canons. It is workable in endless ways—even becoming the means to a baffling eclecticism—and can give substance to any form and to any structure that can be modeled not only according to the orthogonal geometries of the frame but also to those of ruled surfaces.

From the 1940s onward, architects from Le Corbusier to Louis I. Kahn, from Kenzo Tange to Giovanni Michelucci, from Eero Saarinen to Paul Rudolph, Ieoh Ming Pei, and Marcel Breuer, begin a systematic exploration of concrete production in search of its true nature. Before then, those who have dared to leave concrete exposed, including Frank Lloyd Wright and Jože Plečnik, have been unable to create a significant artistic orientation, with the exception of Auguste and Gustave Perret, who have gained a certain following since the 1940s.

With its increasingly sophisticated choice of compound ingredients and production techniques, exposed concrete affirmed itself as an architectural

material in particular for its ability to produce an economical artificial stone with characteristics similar to those of natural stones. In American construction culture, this approach to concrete treatment resulted in the definition of "architectural concrete." Coined in the early 1920s to describe the work of John J. Earley (1881–1945), architectural concrete will become a fundamental benchmark for concrete research after the World War II.[1]

Technical and formal refinements in architectural concrete are documented in a popular book written by Francis S. Onderdonk, Jr., *The Ferro-Concrete Style: Reinforced Concrete in Modern Architecture*, published in 1928.[2] Masterworks such as those by Auguste and Gustave Perret, Max Berg, Dominikus Böhm, Karl Pinno & Peter Grund, Julius Maria Luthmann, Karl Moser, Rudolf Steiner, Antonin Raymond, Allison & Allison, and Harbin Hunter, erected with a reckless desire to leave the defects of imperfect formwork exposed, constitute isolated exceptions, the explosive force of which will not be fully grasped except by a handful of critics after World War II. In regard to the board imprints left visible in Perret's works, "probably for the sake of economy," Onderdonk emphasizes their contradiction with the "monolithic cube" of the "concrete structure," in that they call attention to "the limited pieces that make the molds for unlimited concrete."[3]

And yet, the practice of leaving exposed concrete untouched after stripping, and thus tattooed by the imprints of the formwork, was already taking place well before its extraordinary occurrence on the building site of Le Corbusier's Unité d'Habitation in Marseille. Booklets and manuals devoted to concrete, issued between the 1920s and 1930s by such institutions as the American Portland Cement Association in Chicago, and by publishers like Concrete Publications Limited in London,[4] promoted technical knowledge regarding the composition and implementation of a material capable of replacing every kind of stone and coating. These publications had already registered a broader interest in concrete textures obtainable directly by means of form imprints. The cases discussed were almost never the works of Perret or Moser, celebrated by international journals or essays on architecture, but those of lesser-known

1. John J. Earley, ceiling, Department of Justice Building, 950 Pennsylvania Avenue, Constitution Avenue, Washington, D.C., by Clarence C. Zantzinger & Charles Louis Borie Jr., 1931–35. ("Architectural Forum," vol. 72, February 1940, No. 2.)

[1] Earley greatly contributes to the spread of the concept, still prevalent and influential after World War II, of "architectural concrete," (John J. Earley, *Architectural Concrete*, in "Journal Proceedings of the American Concrete Institute," vol. 20, 1924, p. 157). See Frederick W. Cron, *The Man Who Made Concrete Beautiful. A Biography of John Joseph Earley*, Ft. Collins, 1977. See also *Disintegrated Cut Stone in State Capitol Replaced by Architectural Concrete*, in "Concrete," vol. 51, February 1943, No. 2, pp. 4, 9. For some general guidelines on concrete developments in the early 1940s, see John W. Shaver, *Improved Concrete Technology Will Aid Postwar Designer and Builder*, in "Concrete," vol. 53, February 1945, No. 2, pp. 5–8.

[2] Francis S. Onderdonk, Jr., *The Ferro-Concrete Style: Reinforced Concrete in Modern Architecture*, New York, Architectural Book Publishing Co., Inc., 1928.

architects, authors of ordinary works, thereby indicating a progressive generalization of a certain taste for exposed concrete left untouched after stripping.

While over the course of the 1940s the stated purpose of the authors of the various manuals continues to be the elimination of "imperfections in the concrete wall surfaces,"[5] as this was the orientation of the principal and most advanced technical research in the early decades of the twentieth century, in the late 1930s and the 1940s these same manuals begin to document a growing taste for rough surfaces obtained by means of visible wood grain imprints. One can only make assumptions on the reasons for this emerging taste. The textured surfaces of wood imprints are discussed in the context of a more general explanation of ways to treat concrete to make it smooth or similar to stone. This fact should not be overlooked in an attempt to understand how the transfer of wood grain—a transmutation of concrete into wood—asserts itself as a new method for decorating the principal material of contemporary construction directly by means of its fabrication process. This low-cost type of ornamentation begins to enjoy a certain popularity that precedes the cultural and social effects of the war, even though these effects will later be considered the direct origin of béton brut. In the 1950s, British and American construction manuals will consistently be the predominant sources of practical solutions for concrete implementation; their sporadic discussion of the graphic effects of concrete surface imperfections will gradually increase in the wake of the international success of béton brut.

The poetics of *béton brut* is announced by the widespread diffusion, already in the 1930s, especially in the United States, of exposed concrete surfaces marked with various types of formwork imprints. In this period, these surfaces generally appear alongside concrete patterned by means of geometric moldings that are often derived from ancient ornaments stylized according to the rules of Art Deco. Significantly, a handbook published in 1929 by the Portland Cement Association discusses the "practice of leaving the concrete exterior just as it comes from the forms," with "artistic results" that "a few years ago would have been thought quite impossible."[6]

The practice of casting concrete with exposed surfaces inaugurates a quest for perfection in the implementation of formwork. Indeed, it is not uncommon for manuals and other publications to discuss the perception and acceptability of defects. The deflection of the formwork components is of particular concern because it causes recesses and protrusions on the concrete surfaces. This is considered acceptable only when wood boards are used rather than plywood panels, and above all only in the case of building surfaces hidden from close view.[7] In the second half of the 1930s, attitudes towards defects evolve to the point that they even begin to modify the parameters of architectural concrete as defined by the processes proposed by Earley. These are the types of technical details that will give rise to the most original expression of American concrete of the 1960s, that created by Kahn.

One of the most important publications regarding the new trend of treating concrete surfaces is published in Chicago in 1936 (again by the Portland Cement

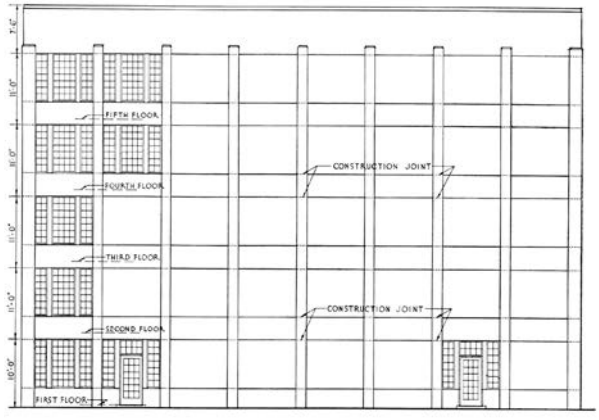
[3] Ibid., p. 55.
[4] See Edwin A. R. Trout, *Concrete Publications Ltd and its Legacy to the Concrete Industry*, in "Construction History," vol. 19, 2003, pp. 65–86.
[5] Henry Langdon Childe and William Samuel Gray, *Concrete Surface Finishes, Renderings and Terrazzo*, London, Concrete Publications Limited, 1948², p. 1. The first, 1935, edition of the manual opened with the same sentence.
[6] Portland Cement Association, *Monolithic Concrete Buildings*, Chicago, Portland Cement Association, n.d. [1929], p. 7.
[7] Portland Cement Association, *Forms for Architectural Concrete*, Chicago, Portland Cement Association, n.d. [1936], p. 8.

Association) and dedicated to the technical issue that will become crucial over the following decades: *Forms for Architectural Concrete*.[8] The experts at the Portland Cement Association note a propensity, after an initial quest for "smooth surfaces," for architects "to swing in the other direction until the opposite extreme," that is, toward the use of "unusually rough textures," albeit occasionally. They observe that architects now have available a "range of textures from those of glass-like smoothness, produced with special liners or metal molds, to those rugged textures obtained with rough-sawed lumber in which the grain has been artificially raised by soaking with water or ammonia."[9]

Formwork accessories, such as nails, bolts, and ties, together with the types of wood, are discussed according to their potential for generating defects on the surface of the concrete. It is pointed out that construction joints and cold joints should be planned for, depending on the concrete castings and the general design: "sometimes the architect designates on the drawings where the joints must be located."[10] The use of tongue and groove joints is recommended for the formwork boards. The detail of a concrete wall shows "rough-textured surfaces" obtained "by using re-sawed square-edged lumber."[11] Precise descriptions are given for formwork with plywood or pressed wood panels in order to obtain a "smooth wall surface" as well as techniques to make the wood grain obvious, so as to create "rugged textures."[12]

The Reinforced Concrete House, a handbook published around 1938 by the Portland Cement Association and devoted to examples of textured walls for

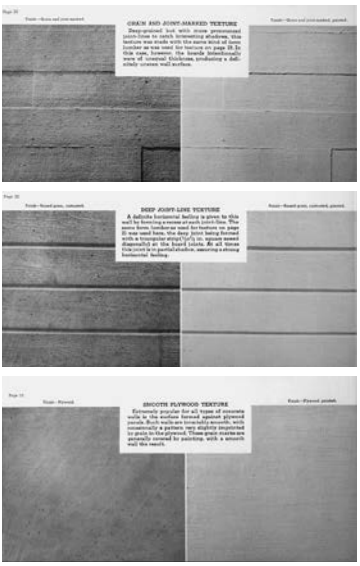
2. Albert R. Walker and Percy A. Eisen, Sunkist Building (California Fruit Growers Exchange Headquarters), 705 W. Fifth Street, Los Angeles, California, under construction, 1935 (demolished, 1972). (*Forms for Architectural Concrete*, Chicago, Portland Cement Association, n.d. [1936].)



3. Construction joints drawing. (*Forms for Architectural Concrete*, Chicago, Portland Cement Association, n.d., [1936].)

houses in exposed concrete, is another very important document, as it will be consulted in 1949 even by Kahn, the man responsible for America's greatest original interpretations of architectural concrete. The handbook explains that "smooth forms such as metal, plywood or smooth-finish lumber are used in producing smooth and even surfaces. Rough-surfaced forms produce rough textures. Often interesting effects are produced, for example, by the impression of the grain and joint lines of form boards." Detailed illustrations are provided for constructing the various types of forms.[13]

In the early 1940s, the various manuals dedicated to the enhancement of concrete surfaces tend to follow their predecessors of previous years. They are often reprints, updated with new examples and new techniques, as evidenced by the famous manual by Henry Langdon Childe (1893–?), *Concrete Surface Finishes, Renderings and Terrazzo*, written with William Samuel Gray (1889–1945) and published in 1935 by Concrete Publications Limited, with Childe as the editor. The manual is repurposed with significant variations in a second edition in 1943 and reprinted again in 1948. It is only in the manuals published in the late 1950s and early 1960s that we begin to see a radical renewal in the documentation of examples and techniques for concrete finishes. This fact bears witness to the international affirmation of an idea of concrete being shapeable in a wide range of finishes, ranging from the sophistication of architectural concrete to the artistic automatisms of béton brut.



4–6. Details of concrete surfaces. (*Reinforced Concrete House*, Chicago, Portland Cement Association, n.d., [circa 1938].)

In confirmation of the information provided by the Portland Cement Association regarding the popularity of certain rudimentary treatments of concrete surfaces, it should be noted that, in the 1948 edition of their manual, Childe and Gray indicate that, despite certain measures that can be taken to improve the surface quality of the concrete, "some architects have expressed a preference for concrete surfaces that resemble timber boards, and use rough boards with a view to emphasizing the grain of the wood on the finished concrete."[14] Childe and Gray apodictically outline the prevailing directions of formal research for the expression of concrete: "There appear to be two main trends in the textural finish of concrete, one striving to transfer to the concrete as faithfully as possible the grain of wood and the other requiring the surface to be as smooth as possible."[15] They also discuss "petrified timber boards."[16]

Childe and Gray document other types of surface finishes, some of which are destined to become fundamental forms of expression of exposed concrete in the 1950s. A certain method of assembling the boards produces a wall subdivided into compartments, each individualized by grooves and marked by alternating imprints of vertical and horizontal boards. The resulting ornamentation of the wall surface can be seen in such examples as the Water Works building in Faribault, Minnesota, by Roy Long & Louis L. Thorshov, built by C. G. Victorson and Co.[17], or the Norris Dam, built between 1933 and 1936 in Anderson County and Campbell County, Tennessee, by Roland A. Wank (1898–1970).

[8] Ibid., p. 4. The *Foreword* opens with the observation that the "use of concrete as architectural material […] is now developing rapidly."
[9] Ibid., p. 5.
[10] Ibid., p. 27.
[11] Ibid., p. 35.
[12] Ibid.
[13] Portland Cement Association, *The Reinforced Concrete House*, Chicago, Portland Cement Association, n.d. [circa 1938], p. 12.
[14] Childe and Gray, *op. cit.*, 1948[2], p. 1. The phrase does not appear in the 1935 edition.
[15] Ibid., p. 25.
[16] Ibid., p. 25.
[17] Ibid., p. 7. An advertisement for the Portland Cement Association shows a photograph of a building with this legend: "Distinctive texture in walls of architectural concrete" (Portland Cement Association, advertisement, in "Architectural Forum," vol. 74, January 1941, No. 1).

7. Louis L. Long & Roy Thorshov, Water Works Building, Seventh Street NW, Eighth Avenue NW, Faribault, Minnesota, 1933–38.

8. John Stokes Redden, John Gerard Raben, Sears Roebuck & Company Building, Wisconsin Avenue, Albemarle Street, Washington, DC, 1941.

9. Roland A. Wank, with Tennessee Valley Authority engineers, Norris Dam on the Clinch River, Anderson County and Campbell County, Tennessee, 1933–36.

Other buildings with the same style of textures include the Sears Roebuck & Company Department Store, located on Wisconsin Avenue at Albemarle Street, Washington, DC, designed in 1941 by John Stokes Redden (1902–91), John Gerard Raben (1905–75), and built by the Consolidated Engineering Company, Inc., of Baltimore, Maryland, and the Community Building in Tola, Kansas.[18]

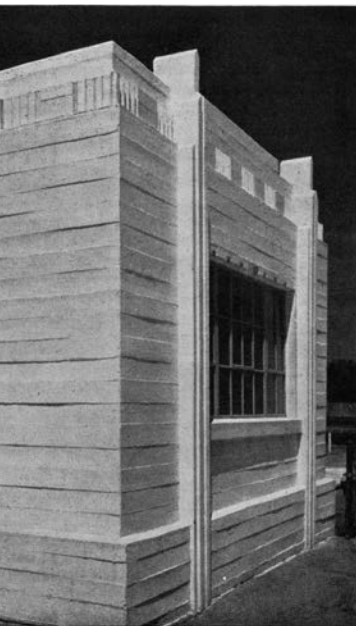
By now architectural concrete is heading toward an increasing prevalence of rough surfaces, including random placement of the form boards and even certain types of controlled defects. Exposed concrete of the type left unfinished after stripping and marked by form board imprints begins to be included in this category of concrete finishes. The Bathhouse, the Armory and Community Building, and the Municipal Stadium at Riverside Park in Iola, Kansas, all built by Garrold A. Griffin in 1937–38, become models for this type of finish. A photograph of the visible horizontal board imprints on the Armory and Community Building is used by the Portland Cement Association to demonstrate "ruggedness and vigor of texture" on "walls of architectural

[18] *Selecting the Surface Texture for Sears Architectural Concrete Building*, in "Concrete," vol. 51, February 1943, No. 2, pp. 5–6.
[19] Portland Cement Association, *Wartime Vigor in Walls of Architectural Concrete*, in, "Architectural Forum," vol. 9, September 1943, No. 3, p. 135. Griffin explains that he preferred the "rough-textured walls," because the buildings had to be erected in a park, as well as for economic reasons: "The original idea was that the lumber would be re-sawed with a band saw to produce vertical saw marks. However, the availability and price favored the use of rough lumber cut with a circle saw. This gave a slightly different texture than originally planned in that the saw marks are slightly curved. The basket weave is produced by driving small wedges between the boards and the studs. Wedges are driven behind alternate boards on the same stud and staggered on alternate studs" (Garrold A. Griffin, *Park Building for Iola, Kansas*, in "Architectural Concrete. Portland Cement Association," vol. 8, 1942, (pp. 18–21), p. 20).
[20] *Plyform*, in "Architectural Forum," vol. 70, June 1941, No. 6, p. 30. Cf. Douglas Fir Plywood Association, *Handbook of Industrial Uses for Plywood*, Tacoma, n.d. [circa 1942].
[21] See the advertisement, *Douglas Fir Plywood, Simple Solutions*, in "Engineering News-Record," vol. 146, January 18, 1951, No. 3, pp. 70–71.

concrete," and how "texture or ornamentation may be produced economically and quickly."[19]

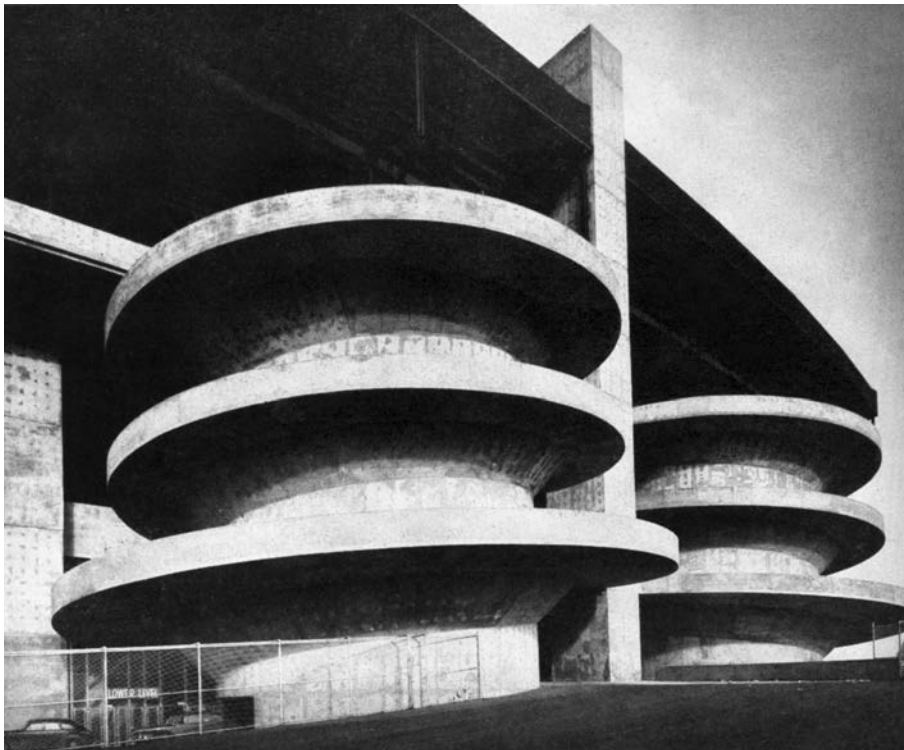
The cult of smooth surfaces, which remain the principal goal of architectural concrete, also induces formwork producers to improve the quality of their products. Plyform, for instance, produced by the Douglas Fir Plywood Association based in Tacoma, Washington, results in "smooth, flawless concrete surfaces at lower costs" for "exposed concrete." Each Plyform panel is "sanded satin-smooth, oil-treated and edge-sealed at mill," and "joints and fins are absolutely minimized" during assembly.[20] One of the expressive works of exposed concrete cast in formwork by the Douglas Fir Plywood Association is The South Stands, a covered addition of Husky Stadium at the University of Washington in Seattle, Washington, realized in 1949–50 by George Wellington Stoddard (1896–1967) & Associates with Sigmund Ivarsson (1899–1968) as the consulting engineer and Strang & Son as the general contractor. The building is exemplary of the smooth surfaces obtained by using this formwork.[21]

The technical prerequisites for a wide variety of treatments for visible concrete surfaces are already well-established from the 1940s. What is still missing is a cultural and artistic vision that can give these technical prerequisites the authority to refound the very fundamentals of architecture and to move toward a new definition of truth in materials and exposed structures, in direct opposition to camouflaging of any kind.



10–11. Garrold A. Griffin, Bathhouse, Armory, Community Building, and Municipal Stadium, Riverside Park, Iola, Kansas, 1937–38.

12. George Wellington Stoddard, with Sigmund Ivarsson, South Stands Stadium of the University of Washington, Seattle, Washington, 1949–50.




BRANDT IRON WORKS
BRANDT IRON WORKS

chapter one
the self-built construction of wright and residential fabrication systems

Wright's Desert Concrete: Toward a Constructional Primitivism

In the American culture of architectural concrete, research into form is focused on revealing the nature of materials, a concept set forth by Frank Lloyd Wright (1867–1959) and echoed in the 1942 book dedicated to his work, *In the Nature of Materials*, by Henry-Russell Hitchcock (1903–87).[1] Wright's reflections on concrete, including reinforced concrete, date back to the early 1900s, when he realized that one of its most important qualities, from both a technical and formal point of view, was its monolithic nature. These reflections are later articulated and enriched by his discovery of the material's malleability, a quality that he exploits to create ornamentation, first by means of his textile blocks and culminating in the spectacular cantilevered terraces of the Edgar J. Kaufmann House, in Mill Run, Pennsylvania, also known as Fallingwater, which take full advantage of the invisible steel "nerves" within. Nonetheless, Wright proves tireless in his exploration of concrete, pursuing its hidden potential and envisioning new spaces and techniques. For several decades, to the end of the 1950s, Wright continues to pioneer various methods of working, placing, and shaping concrete into unusual structures, using Gunite and prestressing techniques.

Wright's invention of an original mix for the construction, in the winter of 1937–38, of the low walls of Taliesin West, in the desert plains of Maricopa Mesa near Phoenix, Arizona, opens up questions about the very "nature" of concrete. The first fragment of this concrete masonry system consists in the construction of the fireplaces for Sun Trap, a temporary residence built in wood and canvas. Construction at Taliesin West continues with the Drafting Room, and is carried out during the winter months due to the desert heat. The site remains active for nearly a decade, and Wright's approach to self-building

[1] Henry-Russell Hitchcock, *In the Nature of Materials: 1887–1941. The Buildings of Frank Lloyd Wright*, New York, Duell, Sloan and Pearce, 1942.