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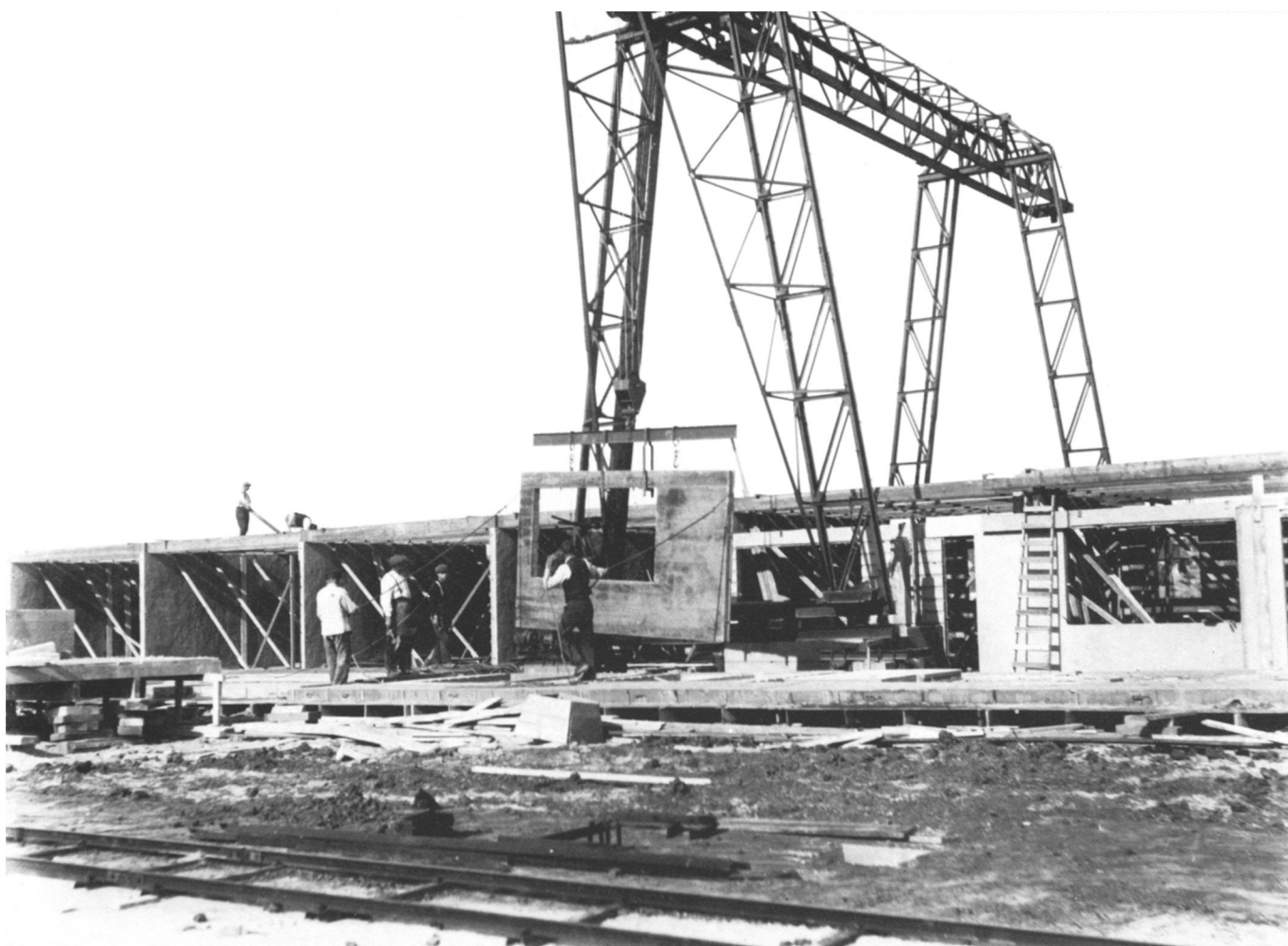
# Helen Searing

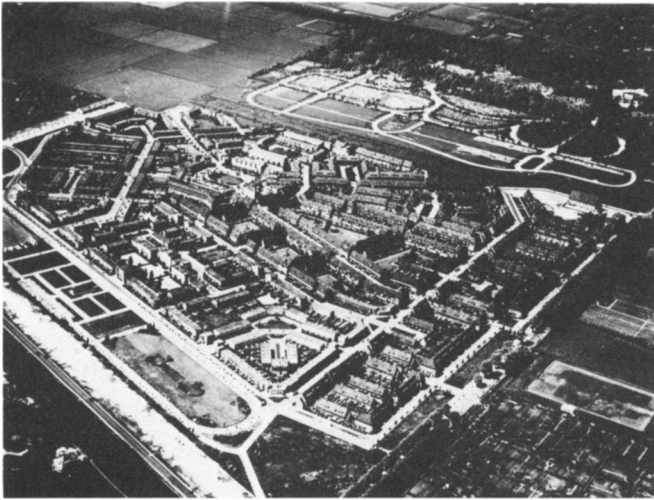
## Betondorp: Amsterdam's Concrete Garden Suburb

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Betondorp, conceived in 1922 and executed, for the most part, between 1923 and 1927,<sup>1</sup> embodies in its concrete structures a remarkable assemblage of complementary social, technological, political, and architectural ideas and innovations. In the first place, it is a vivid representative of the aggressive housing policy pursued by the municipality of Amsterdam during the second and third decades of the twentieth century, utilizing to the maximum degree the financial provisions of the famed *Woningwet* (Housing Act).<sup>2</sup> In particular, it fulfills the Social Democratic goal of offering the workers an alternative to the densely populated inner city, in the form of low-rise housing in an open landscape where they could share the middle-class idyll of living close to nature.<sup>3</sup> But as Betondorp was not the first garden suburb in Amsterdam, its major significance lies in those factors that distinguish it from its slightly older sisters. The most obvious factor is technological, for Betondorp provided a testing ground for nine different methods of construction in concrete, a material relatively untested in the Netherlands.<sup>4</sup> Although most immediately prompted by the need for more economical building methods, the employment of concrete was also, in turn, intimately related to fierce party struggles taking place within the complex political scene in the Netherlands. The final, and perhaps most significant, factor is architectural, for the experiment had reverberations in the profession at a time of confrontations between disparate rival movements. And if Betondorp ultimately fell short of the manifold goals of its originators, it adumbrated better-known housing experi-

1 (frontispiece). Dick Greiner, dwellings under construction using the Bron system of prefabricated concrete, Betondorp, 1922

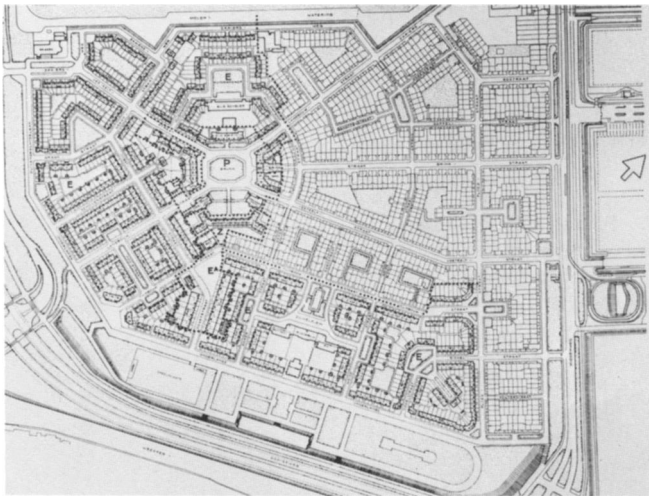




2. Garden suburb Watergraafsmeer, aerial view



3. Map of Amsterdam, showing Tuindorp Watergraafsmeer at lower right



4. Betondorp Watergraafsmeer, plan

ments elsewhere,<sup>5</sup> and, despite its shortcomings, became a sought-after place to live in Amsterdam.<sup>6</sup>

Betondorp occupies half of the garden suburb of Watergraafsmeer, which lies southeast of Amsterdam's historical center, less than thirty minutes by tram from the inner core.<sup>7</sup> Tuindorp Watergraafsmeer is laid out in a pattern of diagonal streets extending from the central *Brink* (village green). The northeastern section consists of 1,058 dwellings belonging to *Eigen Haard* and the *Algemene Woningbouw Vereniging (AWV)*, two of the workers' housing societies created under the *Woningwet*.<sup>8</sup> Their traditional brick and tile-roofed buildings form a marked contrast to the flat-roofed, concrete architecture in the southwestern section, which contains a library, a club house, shops, and more than nine hundred dwellings owned and operated by the municipality. This portion, including two brick schools, and housing for the elderly executed in the 1930s, bears the affectionate name of Betondorp, or concrete village.

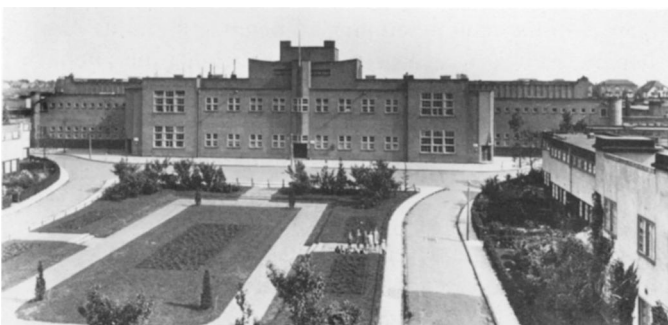
A brief history and description of Betondorp and its Amsterdam context is in order before examining the interlocking innovations that made this project so controversial. In 1915 the Amsterdam authorities — mayor, aldermen, and city council — had committed the municipality to constructing and operating dwellings for the lower-income workers who could not afford to belong to the housing societies.<sup>9</sup> Concurrently, a municipal housing service was established to execute this commitment; at its head was placed the dedicated and outspoken Social Democrat Ary



5. Jan Gratama and G. Versteeg, *Eigen Haard* and Algemene Woningbouw Vereeniging (AWV), Watergraafsmeer, Amsterdam, 1924



6. Garden suburb Watergraafsmeer, showing in the left foreground dwellings by J. B. van Loghem; middle ground, dwellings by Jan Gratama; background, AWV dwellings by Gratama and Versteeg



7. Garden suburb Watergraafsmeer, view from Tuinbouwstraat at Karnstraat, showing public school and youth and community center by the Department of Public Works, Amsterdam; in the right foreground, dwellings by Gratama; and, in the middle ground, dwellings by van Loghem

Kepler.<sup>10</sup> Supported by F. M. Wibaut — a fellow member of the Social Democratic Workers Party (SDAP) and at that time the energetic alderman for housing<sup>11</sup> — Kepler moved rapidly to implement the municipal housing plan. Three sites in different areas of Amsterdam were selected. The two closest to the center were to be provided with the four-story perimeter blocks that had become standard in many Dutch cities;<sup>12</sup> while the third, north of the IJ Estuary, was to be developed with low-rise dwellings. The Social Democrats were particularly avid proponents of the garden suburb ideal and had, in 1912, established a building code for Amsterdam North limiting heights to two-and-a-half stories. The first municipal dwellings in this semi-rural area, then accessible only by ferry,<sup>13</sup> were ready for occupancy in 1919. They were designed by J. C. van der Pek, one of the first Dutch architects to accept the challenge of low-cost workers' housing.<sup>14</sup> The solution here was characteristic of his approach. The dwellings are solid in construction and traditional in silhouette and materials. The detailing is necessarily simple and straightforward — *zakelijk*, to use a word popular at the time. But through the picturesque grouping of the units, van der Pek has achieved with modest means an attractive working-class quarter (*buurt*), which now bears his name, the van der Pekbuurt.

After fulfilling the initial objective of three thousand municipal dwellings, the administration pressed ahead with further programs.<sup>15</sup> Armed with the *Woningwet*'s mandate for an orderly expansion,<sup>16</sup> Amsterdam cast a greedy eye on her neighbors; as early as 1905 the mayor and aldermen had proposed the annexation of Watergraafsmeer, which had the advantages of proximity and good connections to Amsterdam's center. Nothing came of the initial proposal, but in 1912 further attempts were made to incorporate an unwilling Watergraafsmeer. Not until 1921 did Amsterdam receive approval for annexation from the higher authorities.

In anticipation of such approval, the administration had begun to purchase land in Watergraafsmeer with the intention of leasing it to the housing societies; the site on which Eigen Haard and the AWV would establish their housing estates was bought in 1917. The following year the adjoin-

ing parcel came under consideration for municipal dwellings, in accordance with the administration's preference for blending the two types of workers' housing to create a population of varied income levels, sharing shops and schools as well as the green spaces of the garden suburb.

Perhaps to forestall engulfment by its powerful neighbor, the municipality of Watergraafsmeer had commissioned an ambitious extension plan of its own in 1906. At the time little had been developed within its boundaries, and a large cemetery, the extant Nieuwe Ooster Begraafplaats, occupied substantial acreage. The well-to-do citizens of Watergraafsmeer recognized that the plan would have to provide for workers' housing, in accordance with the aims of the *Woningwet*; most of the housing was to be in the form of low, closed blocks (*aaneengeslotenbebouwing*) lining the streets and enclosing interior gardens.<sup>17</sup> To counter the closely spaced housing development, green spaces, in the form of parks and gardens, were distributed throughout the plan. Nor was this intended as a mere dormitory suburb for Amsterdam. Cultural institutions (a theater, concert hall, library, and museum), a hospital, churches, and several schools and hotels were projected, as well as factories and municipal services. The industrial terrain, with its adjoining workers' village, was located in the plan's northeasternmost part, separated from the remainder of the municipality by the railroad running between Amsterdam and Hilversum.

Interestingly, not only is the intention of this plan reminiscent of Ebenezer Howard's Garden City, but the striking sequence of radial and curved streets could almost be read as the realization of his diagrams, first published in 1898. Vorkink and Wormser,<sup>18</sup> the designers of the extension, were probably influenced as well by Camillo Sitte, whose urban aesthetics were known in the Netherlands by this time.<sup>19</sup> The strongly geometric character of the Watergraafsmeer plan, however, is peculiarly Dutch, and reflects the practice then current in the Netherlands of designing according to proportional systems.<sup>20</sup>

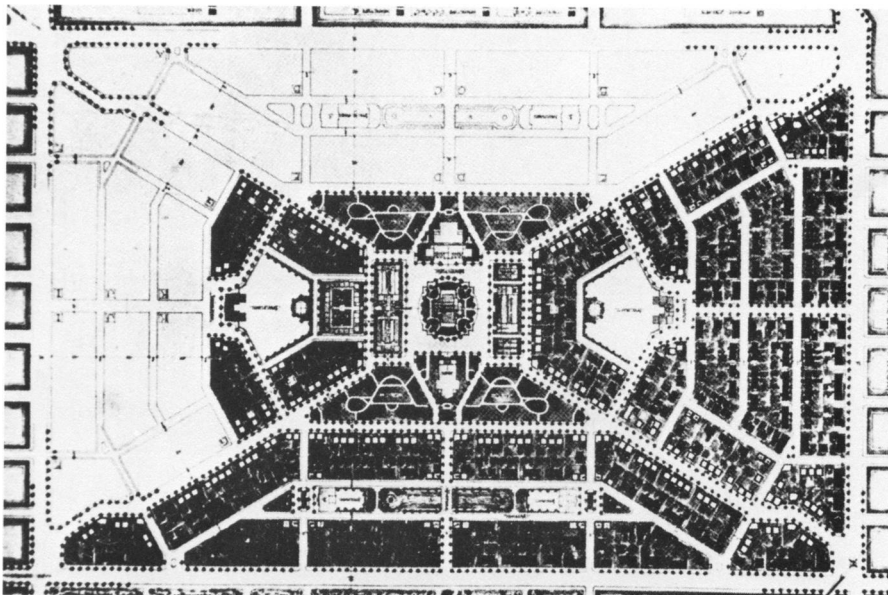
A project that shows similar formal properties was the prize winner in a competition of 1915 for a Garden City Neighborhood sponsored by the Social Technical Union of



8. J. C. van der Pek, municipal dwellings, Buiksloterham (today, Van der Pekbuurt), Amsterdam North, 1917–19



9. Pieter Vorkink and J. Ph. Wormser, extension plan for Watergraafsmeer, 1906–7. Existing buildings are indicated in solid black.



10. J. F. Repko, competition entry for a Garden City Neighborhood, 1915

Democratic Engineers and Architects. This plan had been incorporated by H. P. Berlage into the final plan for Amsterdam South, though it was never executed. The dynamic baroque motif common to all these projects was ultimately realized in Tuindorp Watergraafsmeer, which maintains in the southernmost portion a great deal of the street pattern of Vorkink and Wormser's original scheme (compare figures 4 and 9).<sup>21</sup> The "X" created by the streets converging on the *Brink* is no longer echoed across the Middenweg, the major road leading to Amsterdam that bisects Watergraafsmeer; but the strategy survives of displacing commercial activities from this artery to endow the garden suburb with its own distinct core.

From 1918 — three years before annexation — to 1922, Keppler struggled with municipal housing schemes for Watergraafsmeer, faced with the persistent problem of keeping down costs while providing an attractive and viable neighborhood. In March 1920 he presented a project consisting entirely of four-story structures, which ran counter to reserving outlying areas for garden suburbs. Although four-story tenements purportedly could shelter more families on a given site, Wibaut rejected their use because he believed it would result in higher land prices in that quarter, which ultimately would lead to greater expense for the administration should Amsterdam continue to construct *Woningwet* projects in the soon-to-be annexed neighboring municipalities.<sup>22</sup> In May Keppler agreed to consider only low-rise proposals and produced three different schemes: Each consisted of brick structures of a vernacular character; one design even flaunted the stepped gables of traditional Dutch houses. His most economical solution was to repeat the type designed by van der Pek for Amsterdam North, and this alternative was provisionally selected for execution.<sup>23</sup>

Construction was delayed, however, because of spiralling costs. During 1920, while Keppler was preparing his alternatives, building costs climbed to more than three hundred fifty percent of prewar levels. Throughout 1921 Keppler pondered the dilemma; building costs had begun to fall that year but were still two hundred seventy-five percent of 1914 prices.<sup>24</sup> When the proposal for municipal housing in Watergraafsmeer finally came before the city council on 3

March 1922, it included a daring new concept: the construction of six hundred one-family units in a material relatively unfamiliar in Amsterdam — concrete.

Keppler's proposal elicited strong opposition from a number of the councillors, and petitions and protests from brick manufacturers and bricklayers' unions, usually adversaries but united on this occasion. As was characteristic of the debates in the Amsterdam city council, aesthetic issues were an important component of the discussion. Several councillors contended that in terms of beauty no less than solidity brick was the only suitable material, and that the estimated savings were insufficient to justify the employment of a substance they found unpleasant as well as foreign. A Social Democratic councillor hastened to reassure his colleagues on this point, explaining that he had seen concrete dwellings recently erected in Berlin and Paris in a suburban setting, as was proposed here, and that they did not in any way deface the townscape.<sup>25</sup>

During the long debate, an apparent anomaly was exposed. Although the material suggested might be cheaper, the one-family units — maisonettes arranged as rowhouses — were unnecessarily luxurious, and therefore too costly, for municipal dwellings, which more customarily consisted of flats. Keppler was instructed to revise the plan so that it comprised exclusively two-family dwellings (each family to occupy an upper or lower floor) and to continue to explore the possibility of using brick.

On 20 July 1922 the council accepted a new and definitive proposal. As a compromise between the council's wishes and those of the administration, the number of dwellings was set at nine hundred, with three hundred one-family and an equal number of two-family units. But Keppler had not changed his mind about the material. Citing success with a modest experiment in concrete construction that the municipality had essayed in 1920 in Amsterdam North,<sup>26</sup> the administration insisted on testing the material on a much larger scale in Watergraafsmeer. The state approved a *Woningwet* loan of over three-and-a-half million guilders to cover acquisition and construction costs, and by 1925 the major part of Betondorp was completed.

Discussion of concrete usually centers around its structural properties. However, in the small two-story buildings of Betondorp no daring spans were required, nor did walls need to support crushing loads. Indeed, when concrete was considered in Amsterdam in 1922, the potential disadvantages of its use were far more in evidence and far more relevant than its dazzling structural possibilities. Problems of permeability, condensation, and cracking were of particular concern in the damp and sometimes freezing climate of the Netherlands. The reasons for employing this material were not structural but economic and, as will be shown, political.

Not only was brick intrinsically a more expensive material, but as well its use necessitated the costly labor of experienced masons. In 1914 wages had accounted for one-quarter of the costs of the average building; by 1922 this proportion had risen to one-half, so that labor-saving methods began to attract great interest.<sup>27</sup> With concrete, a greater degree of mechanization could be introduced and low-cost industrial wastes utilized in its composition. But even more significant, unskilled workers could be employed to erect the formwork and to make and assemble prefabricated parts. This meant not only a saving on wages, but also an easing of some of the unemployment that existed in other trades. Most important of all, in the Amsterdam of the immediate postwar period, it offered the possibility of hiring men whose political orientation differed from that held by many of the available construction workers.

Whether because of, or despite, its small size and, in the years before the Second World War, its apparent ethnic homogeneity, the Netherlands has a population sharply divided along religious and political lines. Schools, newspapers, radio stations, housing, and social and professional activities are remarkably sectarian. The trade unions are similarly denominational, and workers in any given trade must decide among Protestant, Catholic, or nonconfessional organizations. For left-leaning workers in the early 1920s, there had been since 1900 two choices. One was the “modern” union movement, whose members came from the ranks of the SDAP and supported parliamentary means to socialism. The other was the “independent”

union movement, associated with the doctrines of anarcho-syndicalism and, after 1917, represented by the Communist party.<sup>28</sup> The independent movement was particularly powerful among skilled workers in the building trades — masons, carpenters, painters, and plasterers. It was highly militant and did not scruple to disrupt the construction of workers’ housing by slowdowns and strikes in order to obtain higher wages. The syndicalists believed that any sacrifice of their own potential gains in favor of the larger needs of fellow proletarians was a capitulation to capitalism. The demands of the independent unions escalated after the First World War and threatened to make housing costs almost prohibitive. Consequently, tremendous friction existed in the Amsterdam city council between the members of the SDAP and the tiny but vocal Communist faction that supported the syndicalist construction unions.

Keppler conceived two ways to circumvent the independent unions. One was to establish new trade organizations modelled after the German *Baugilde* (called “productive associations” in the Netherlands). The workers in these associations contracted for the job directly, without a middleman, to the mutual end of lowering costs and raising some wages. Only those workers who believed in cooperation rather than confrontation would be likely to join such a group; indeed, the productive associations accused the syndicalist unions in the building trades of plotting their destruction.<sup>29</sup> Keppler’s other idea was to introduce methods of concrete construction that would permit the employment of workers not belonging to the militant independent unions — those who were generally unskilled but also those from other trades untrained in construction work.

An article published in the syndicalist newspaper *Het Bouwvak*, shortly after the July decision of the city council was made known, is pertinent here:

The principal differences between the modern and the independent unions are in regard to the question of whether workers should help restore capitalism as a system of production and distribution by their acceptance of wage cuts desired by employers. We have issued a manifesto against experiments in concrete construction which have as their purpose the lowering of our wages. The other unions don’t know any better than to offer to work in

masonry for less, thus playing into the hands of the SDAP alderman [Wibaut] who aims at lowering wages in the building trades under the guise of furthering the construction of dwellings. This is all a logical consequence of the standpoint of the modern union movement and their SDAP, whose policy is not directed to the destruction of capitalism at all.<sup>30</sup>

Despite opposition from all sides of the political spectrum, Keppler realized both of his strategies at Tuindorp Watergraafsmeer.<sup>31</sup> The productive associations built the dwellings of the AWW and Eigen Haard. Risky technological experiments were deemed inappropriate to the means and goals of the housing societies, and therefore brick was used; but savings were nevertheless accomplished by eliminating the private contractor, and, as a pleasant bonus, the quality of the workmanship was outstanding.<sup>32</sup> Keppler's other idea also appealed on several fronts. Reducing costs through the use of concrete construction would make it easier to pry loose from the central government a *Woningwet* loan, and would answer the complaints of conservative critics about the extravagance of the Social Democratic housing program. The possibility of combatting unemployment was also attractive: it was estimated (too optimistically, it turned out) that with concrete systems, seventy percent of construction workers could be inexperienced in the field. In addition to the ever-present pool of unskilled labor, a large number of diamond workers and cigar makers, the elite of the modern union movement, were out of work in 1922, and could at Betondorp be shifted into the construction trades. Even more significant for Keppler, they could replace the intractable members of the independent unions.<sup>33</sup>

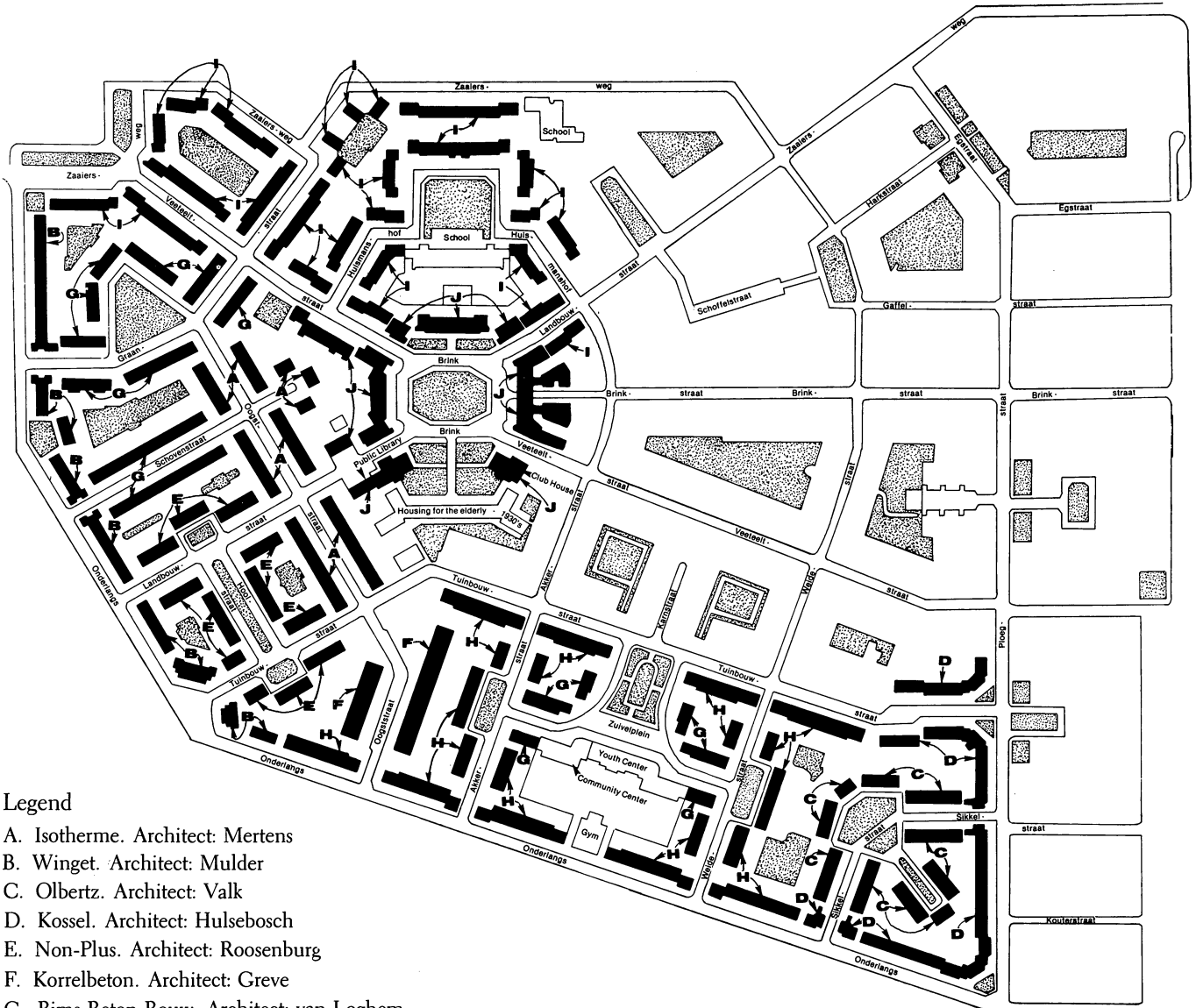
Even before receiving the council's approval in July of 1922, the irrepensible Keppler had proceeded to invite bids from firms experienced in building in concrete. In accordance with Amsterdam's known penchant for *Woningwet* construction of a high aesthetic standard, each contractor was required to work in association with an architect, who would be responsible for the design of the dwellings. More than forty firms evinced interest, eighteen were invited to submit applications, and seven contractors, representing ten different building methods, were chosen.<sup>34</sup> The average price per unit, excluding the foundation, was to be 4,000 guilders. This may be compared with the cost of the brick

van der Pek dwelling type, originally specified, which was estimated as costing 1,800 guilders before the war and 8,520 in 1920.

The Municipal Housing Service was very precise about its requirements, leaving the architects initially little scope in devising plans. It specified that all units contain a living room in front, a kitchen in the rear, and a water closet (but no shower, as was then standard in the Netherlands). To be sure, some variety was allowed among dwelling types: the number of bedrooms varied from one to three, and shops or workplaces were attached to some of the units. Six hundred families were to live in one-story units, three hundred in two-story units. Nor were room sizes standardized. Most living rooms measured from sixteen to seventeen square meters, but some were smaller. The modest size of the two-family units, chiefly intended for young couples, was in no way unprecedented. In 1920 the federal government had established a *maximum* cubic content for *Woningwet* dwellings over the strong protests of housing reformers and workers. Betondorp is representative of the European-wide search to define *die Wohnung für das Existenzminimum* that permeated the decade, culminating in 1929 at the CIAM conference at Frankfurt devoted to this topic.<sup>35</sup>

The visual diversity favored in Amsterdam in these years was served by the variety of building methods. These may be grouped according to three basic approaches: the Isotherme, Winget, and Olbertz systems used concrete blocks;<sup>36</sup> Kossel, Non-Plus, Korrelbeton, and Bims Beton Bouw (B.B.B.) were poured-concrete systems;<sup>37</sup> the Hunke-möller and Bron systems were based on prefabricated elements.<sup>38</sup> A fourth method, the British Dorlonco, survived for only a few dwellings. With its steel frame, it belonged more to the expensive category of metal construction. The exterior surfaces were concrete applied over steel mesh, and fears that the metal would rust through proved justified.

The dwellings erected in concrete block accomplished few if any economies. Although the material itself was cheaper, the method required skilled masons; and despite the larger format of the structural unit, construction time was not

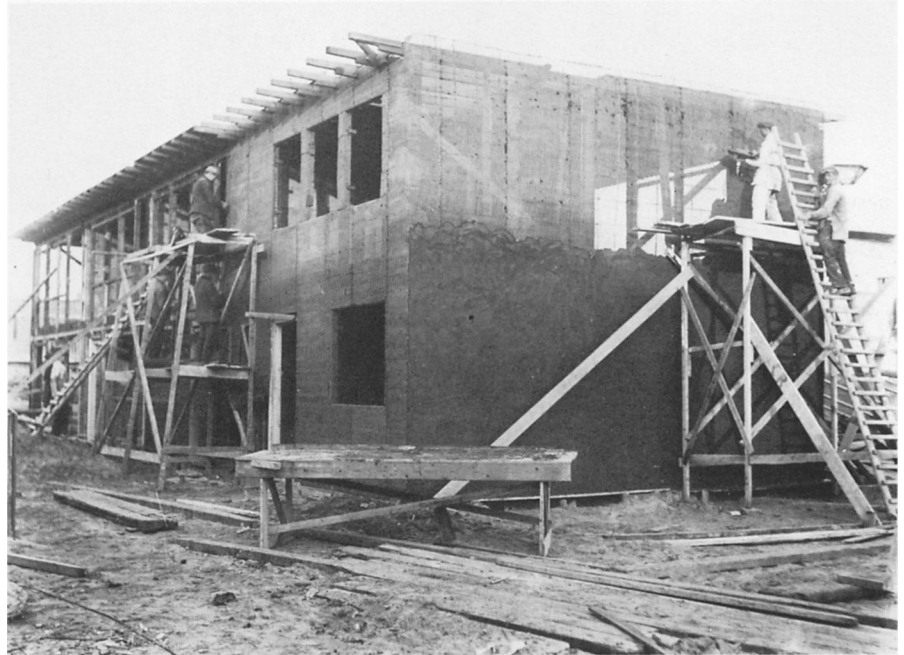


Legend

- A. Isotherme. Architect: Mertens
- B. Winget. Architect: Mulder
- C. Olbertz. Architect: Valk
- D. Kossel. Architect: Hulsebosch
- E. Non-Plus. Architect: Roosenburg
- F. Korrelbeton. Architect: Greve
- G. Bims Beton Bouw. Architect: van Loghem
- H. Hünkemoller. Architect: Gratama
- I. Bron. Architect: Greiner
- J. Korrelbeton. Architect: Greiner

11. Betondorp, plan diagram showing construction systems and architects

12. Dorlonco system under construction, 1923



appreciably reduced. Furthermore, the blocks were very vulnerable to moisture. The Isotherme dwellings had to be partially rebuilt in brick at a later date, while the housing constructed of Olbertz blocks was clad in wood shortly after completion to keep the interiors dry (see figures 17 and 23). The poured-concrete dwelling systems, on the other hand, did realize some savings in labor costs, although skilled plasterers were needed to apply the exterior coats of waterproofing material. The methods employing prefabricated parts would seem to have offered the most promise economically; but when Betondorp was expanded in 1925, after the initial 902 dwellings had been built, the poured-concrete Korrelbeton system was selected.<sup>39</sup>

Technically, the experiment in concrete construction cannot be judged a great success. In addition to the renovations already cited, the dwellings designed by W. Greve and executed in Korrelbeton had to be demolished in 1958 (see figure 25). Various interventions in the remaining dwellings have been made over the years to mitigate the pervasive problems of poor insulation and dampness, and every one damaged the architectural quality of the buildings. In 1984 the municipality embarked on a major job of insulation and restoration, but the achievement has been more practical than aesthetic. Such vicissitudes, however, have not compromised Betondorp's desirability as a neighborhood; it has been popular since its completion, a popularity perhaps due to the innovations in planning and architectural design.

The layout of Bentondorp differed from that of Amsterdam's first low-rise workers' quarters as well as from that of the majority of housing projects erected in the city. Until the 1930s, these mostly consisted of perimeter blocks disposed to create defined streets and squares of various patterns and dimensions, and to enclose interior gardens, some reserved solely for the tenants but others of a more public character.<sup>40</sup> Amsterdam South, to a great extent executed according to Berlage's plan of 1915, is an example of such large-scale *blokbouw*; and the districts in Amsterdam East (Indischebuurt) and West erected in the mid-1920s by private builders also respect this tradition — which one finds elsewhere in the Netherlands as well.<sup>41</sup>

However, under the impact of ideas from abroad, especially England, a hybrid layout evolved that, in its divergence from three- and four-story *blokbouw*, anticipated the *Zeilenbau* arrangement of open row housing (*strokenbouw*), a German solution that would be preferred for housing estates in the later 1920s. In this layout, low-rise dwellings are grouped in numbers from two to twenty or more to form straight or picturesquely curved or staggered rows that do not meet at the corners, so that the definition between public and private areas is less strict than in the case of the perimeter block.<sup>42</sup> As a beneficiary of this evolution, Betondorp is much less densely developed than the earlier housing districts of the metropolis. In the concrete village, the units are set down in discrete groups to allow a fluid interplay between the architecture and the landscape.



13. J. H. Mulder, dwellings on Onderlangens at Tuinbouwstraat, 1923–24

The buildings do not line the edges of the sidewalks here; flower gardens mediate between the public and private realms and supplement the private kitchen gardens located in the rear.

While reflecting national developments, Betondorp nevertheless remains unique to Amsterdam. At Keppler's invitation, three members of the Club of Amsterdam Housing Architects (Club van Amsterdamsche Woningbouwarchitecten) — Vorkink, associated with the original extension plan of Watergraafsmeer, J. F. Staal, and B. T. Boeyinga<sup>43</sup> — supervised the layout. The arrangement is at once more dynamic and more formal than that of other garden suburbs of this date. The architects refined the massing as well as the two-dimensional plan: where major streets meet, the buildings rise to three stories. A sense of coherence and community is attained through the subtle interrelationship of solids and voids; at key points, portal buildings (*poortgebouwen*) span the walkways. The discipline and formality of the plan were necessary to balance the introduction of another local practice, distinct from that prevailing in most Dutch cities where the design of a given quarter was customarily the responsibility of a single architect.<sup>44</sup> In Amsterdam the participation of several professionals was invoked to endow *fiat* neighborhoods with the heterogeneity prized in traditional towns that had grown over time.<sup>45</sup> At Betondorp, in any case, the diversity was inherent in the very process of testing different methods of concrete construction, to each of which was attached the services of an individual architect.

Although at Betondorp the modernist argument that the proper use of new materials inevitably breeds stylistic innovation is affirmed, the simplistic technological determinism that often underlies this proposition is not. Despite the quantitative and qualitative restrictions laid down by the municipal authorities, a range of formal expression is encountered here. At the same time, from the crucible of the concrete village has emerged an alloy of the incompatible ideologies that made the architectural profession a mirror of the larger society. Spurred by Amsterdam's commitment to aesthetic excellence, written into law in 1898,<sup>46</sup> and enforced by Keppler and his design consultants, the participants have sought to demonstrate the expressive potentialities of the new medium. Before examining Betondorp's singular architectonic achievement in detail, a brief summary of the more general art historical context is in order.

Two trends dominated the first wave of *Woningwet* construction in the 1910s, one nationwide, the other initially confined to Amsterdam. The national trend, emerging at the turn of the century, was directed against the fussy eclecticism that then marked — and marred — so much of Dutch architecture. This movement propagated the notion of *zakelijkheid* (more familiar is the German term, *Sachlichkeit*), and thus was a forerunner of, but not a twin to, the Nieuwe Zakelijkheid (International Functionalism, in the Netherlands synonymous with the Nieuwe Bouwen) of the 1920s.<sup>47</sup> A child of nineteenth-century rationalism,

the earlier manifestation might be called “traditional *zakelijkheid*,” for its representatives continued to build in unplastered brick, often trimmed with stone, and to provide simple decorative details. For many architects *zakelijkheid* seemed the only answer to the conditions that were steadily impinging on professional practice: the progressive mechanization of the building process, and new types of commissions from and for new kinds of clients. These conditions demanded an efficient architecture, pruned of superfluous decoration and elaborate historical motifs. Aesthetic effects were still attainable through the artful distribution of volumes and masses. This attitude has been concisely set forth as

the creative acceptance of the prevailing situation, which amounts to lack of funds for unnecessary decoration, lack of time for traditional detailing on which care must be lavished, and the necessity for construction of large blocks *en masse*, which made irrational the previous romantic and classical ideas.<sup>48</sup>

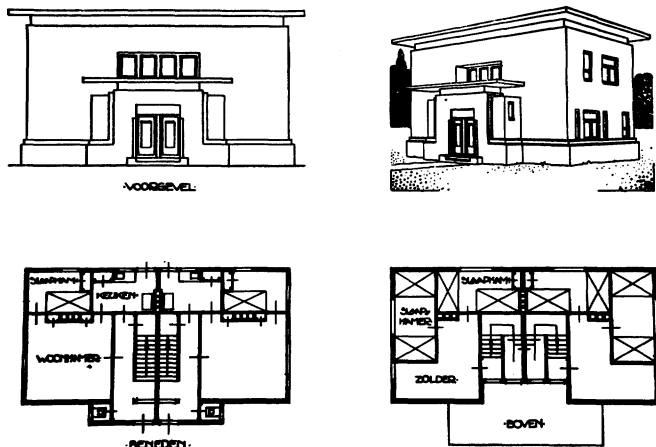
Berlage and van der Pek were among the most passionate advocates of *zakelijkheid*.

Opposition to this approach came not only from academic architects who continued to design ostentatious villas for the wealthy bourgeoisie, for whom a building overladen with ornament signalled financial and social status, but also from a younger, more radical group. Known collectively as the Amsterdam School, its members, for the most part born in the 1880s and 1890s, charged the proponents of *zakelijkheid* with abdicating the architect’s responsibility to supply inspired and inspiring images. They did not entirely eschew historical and vernacular references, but transformed these into “the sparkingly new, the arrestingly sensational.”<sup>49</sup> During the late teens and throughout the twenties, housing would provide the main vehicle for their virtuoso design talents. Like their more *zakelijk* colleagues, they made prominent use of native brick and continued the traditional structural solution of employing interior walls parallel to the façades as the primary bearing members in multi-family dwellings; the Amsterdam School, however, employed this technique to manipulate front and often rear elevations in a playful manner. Their designs for housing were as whimsical and fantastic as those of Berlage and van der Pek were serious and sober.

In the buildings of the Amsterdam School — characterized by dramatically shaped volumes, novel use of traditional materials, and extravagant details — may be seen a fusion of the fin-de-siècle concern for individualized craftsmanship with the impetus toward architectural expressionism that arose in the second decade of this century. Supported by subsidies issued through the *Woningwet* for a brief period after the First World War, the Amsterdam School realized in its major housing projects the idealistic dream of a *Gesamtkunstwerk* that would symbolize the aspirations of a communally oriented society. But the Amsterdam School held that the architect was the prophet, not the servant, of those aspirations.<sup>50</sup>

The imagery invented by these architects may be encountered throughout the Netherlands, in major cities as well as provincial towns. But ultimately the Amsterdam School was an autochthonous phenomenon that met with misunderstanding and derision beyond the borders of its native city. While it eventually won over some of its former opponents in the older, *zakelijk* generation,<sup>51</sup> new foes were assembling under the banner of International Functionalism, which had translated the tenets associated with traditional *zakelijkheid* into the Nieuwe Zakelijkheid of the Machine Age. Although originally this doctrine had its stronghold in Rotterdam, among members of *Opbouw*,<sup>52</sup> its influence spread everywhere in the Netherlands, and its adherents secured an increasing share of housing projects outside the metropolis. They accused the Amsterdam School of self-indulgence, of neglecting utilitarian requirements in favor of formalist posturing. A more searching critique came from the small avant-garde group established in 1917, *De Stijl*. In the periodical of the same name, its members damned the individualistic, naturalistic, and handcrafted appearance of the buildings of the Amsterdam School and the vaunted subjectivity of its design process.

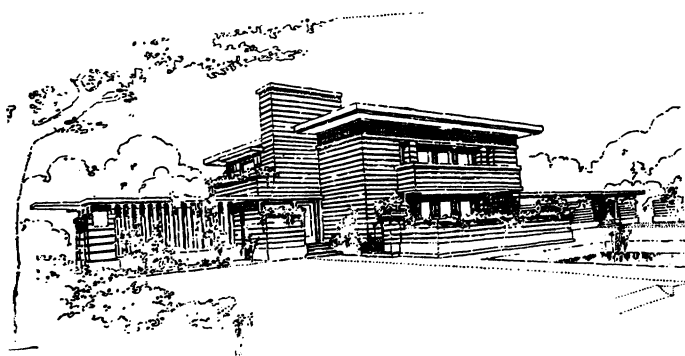
There have recently appeared so many fine publications on *De Stijl* that it would be superfluous to rehearse its principles and achievements here.<sup>53</sup> Suffice it to recall the sound observations of Giovanni Fanelli and Wim de Wit that in practice it was not as antithetical to the Amsterdam School as its rhetoric suggests;<sup>54</sup> indeed, some individuals appear to have circulated among the warring camps. De Wit has re-



14. J. J. P. Oud, project for a two-family workers' dwelling in concrete, 1918

minded us that “for both, a work of art had to express the essential character of contemporary society as a whole, and so testify to the existence of communal art (*Gemeenschap-kunst*). Furthermore, both groups considered the architect to be an artist. . . .”<sup>55</sup> This shared insistence on the primacy of aesthetic issues brought about similar design procedures, which stress the rise and fall, projection, recession, and interpenetration of architectural planes and volumes; the corners and terminations of buildings by both groups are animated by dramatic three-dimensional displays. However, the Amsterdam School tended toward curving, often representational forms, as well as natural colors and textures, and sought a unique image for each project. The members of De Stijl, by contrast, worked exclusively with rectilinear planes and volumes to create buildings that were part of a total and consistent design continuum. From 1922 on, geometric motifs borrowed from De Stijl entered the vocabulary of the Amsterdam School, whose members were inclusivist when it came to enriching their own formal repertory; their own visionary inventions, however, were consistently disdained by their adversaries. In the realm of polemics the two aesthetically oriented groups would share a common enemy in International Functionalism, but De Stijl’s “mechanidolatry,” its search for universals, and its eagerness to incorporate new materials and techniques made it much less offensive than the Amsterdam School to advocates of the *Nieuwe Bouwen*; indeed, several former De Stijl members, including Oud, Gerrit Rietveld, and Cornelis van Eesteren, were absorbed into the movement.

Although not as obsessed with the implications of new technologies as their slightly younger contemporaries, several architects from the Amsterdam School had explored the molded character of concrete in unrealized designs composed of curvilinear, plastic masses.<sup>56</sup> Those associated with De Stijl, on the other hand, adapted the revolutionary material to their geometric vision. In 1918 J. J. P. Oud designed a two-family workers’ dwelling to be constructed of concrete, and in the same year Jan Wils published a “country house with hollow concrete walls”; in an article accompanying his design, Wils stated that for economic reasons, the architect must increasingly resort to new materials, like concrete, and to standardization, but that oper-



15. Jan Wils, project for a country house with hollow concrete walls, 1918

ating under such restraints need not prevent one from creating dwellings at once beautiful and practical. Both architects' projects, together with Robert van 't Hoff's villa of 1916 executed in reinforced concrete, were illustrated in *De Stijl*. All show the influence of Frank Lloyd Wright, whose project for a Fireproof House in Concrete of 1906 must have been of particular interest.<sup>57</sup>

At Betondorp, representatives of the various factions within the Amsterdam School, *De Stijl*, and *De Opbouw* confronted each other, but no decisive battle ensued. If any were vanquished, it was due more to the inadequacies of the medium they employed than through the shortcomings of their own architectural positions.

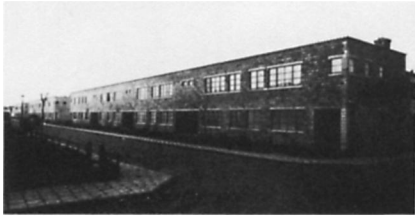
Who were the architects that worked at Betondorp? Three of them remain shadowy figures: J. H. Mulder, W. Greve, and J. Hulsebosch. It is known that Hulsebosch worked in Rotterdam, and that Mulder was active in Amsterdam, a circumstance confirmed immediately by this architect's contributions to Betondorp.<sup>58</sup> Greve was attached to the Office of Urban Development and Housing in The Hague and apparently had designed some traditional *Woningwet* housing in Amsterdam.<sup>59</sup> Happily, more information is available about the others.

Of these, Jan Gratama was the oldest, Dick Greiner the youngest; closely spaced between were J. B. van Loghem, Herman Frederik Mertens, H. W. Valk, and Dirk Roosenburg.<sup>60</sup> Gratama, van Loghem, Mertens, and Roosenburg had graduated from the Technical University at Delft, with the diploma of *boukundig ingenieur* (civil or architectural engineer). At Delft they would have received a rationalist education stressing a sound technical background and minimizing aesthetic exercises; architecture there was taught as the science rather than the art of building.<sup>61</sup> Valk was a Roman Catholic with vast experience in the field of church design.<sup>62</sup> He had worked in the offices of P. J. H. Cuypers, the "Dutch Viollet-le-Duc," a romantic rationalist who was active well into the twentieth century, and of his son Joseph Cuypers, whose work resembles that of Berlage's in its *zakelijk* treatment of themes from medieval and from vernacular architecture. Mertens<sup>63</sup> and Roosenburg<sup>64</sup> had each worked for Berlage; and Gratama

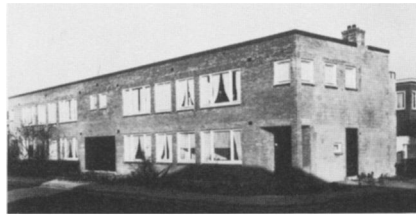
and his partner, G. Versteeg, had collaborated with him on the picturesque municipal housing estate in the Transvaalbuurt. Greiner, in turn, had worked briefly for Gratama and Versteeg after a stint in the office of Eduard Cuypers, the nephew of P. J. H. Cuypers.<sup>65</sup>

Gratama and Versteeg's numerous housing projects, including those for Eigen Haard and the AWV in Watergraafsmeer, reflect the traditional *zakelijkheid* then so pervasive. These ensembles achieve charm through their materials and massing: steeply pitched tiled roofs, occasional archways that call attention to the good brick craftsmanship, and handsomely detailed windows. Yet Gratama was very open to new ideas — it was he who in 1916 had given the Amsterdam School its name. A widely respected figure, he was editor, from 1908 to 1914, of *Bouwkundig Weekblad*, the magazine of the venerable Society for the Advancement of Architecture, and chairman, from 1921 to 1923, of the powerful Amsterdam Committee of Aesthetic Advice. Through his critical evaluations, which appeared regularly in *Architectura* and *De Bouwwereld* as well as in the publication he edited, Gratama became a sort of unofficial historian of modern Dutch architecture. The numerous drawings and color studies he made for concrete dwellings at Betondorp show his efforts to retain the best of the *zakelijk* trend while experimenting with the new formalist strategies of both *De Stijl* and the Amsterdam School.

Greiner was the architect at Betondorp most closely identified with the Amsterdam School, and the originality of his work there shows him to be one of the most talented members of this large group. Van Loghem — next to Greiner the architect whose dwellings are most frequently selected for illustration when the concrete suburb is referred to in the literature — had very different loyalties. Having set up an independent practice in nearby Haarlem immediately after graduating from Delft, van Loghem was kept busy designing everything from private villas to power plants. His early work, like that of many architects of his generation, shows the influence of Berlage. About 1916, again in concert with his contemporaries, he fell under the spell of Wright, and there suddenly appeared in his work the low-hipped roofs, projecting slabs, and clustered brick

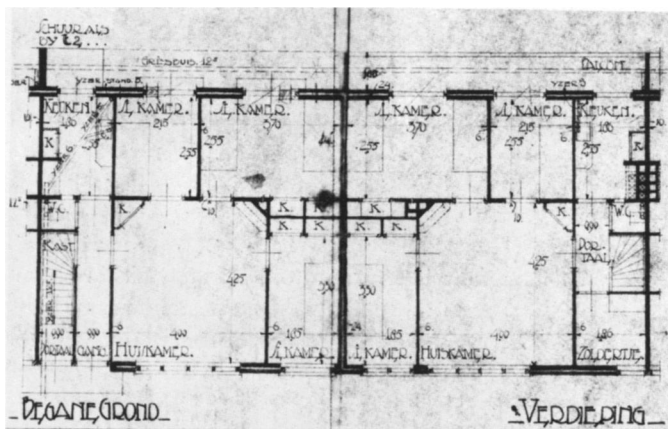
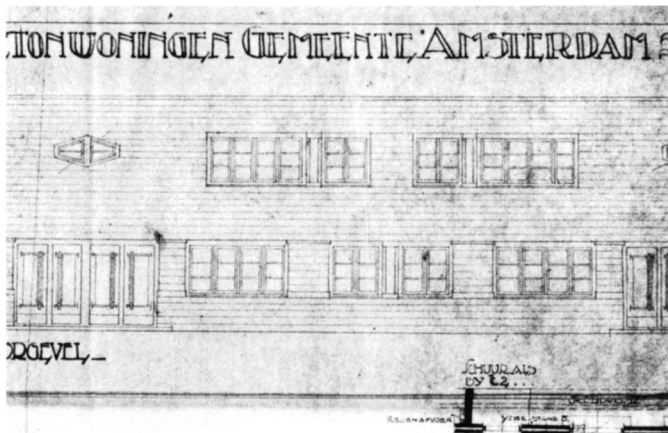


16. Herman Frederik Mertens, Isotherme dwellings, Oogststraat 28–42, 1922–23



17. Isotherme dwellings, Oogststraat 70–80, view in 1954 showing partial rebuilding in brick

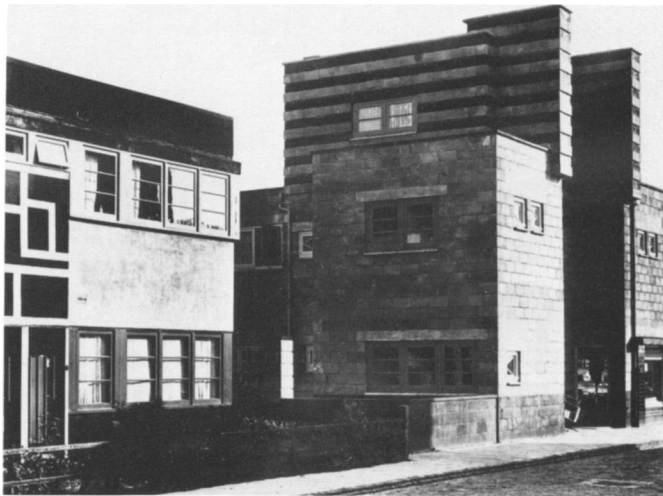
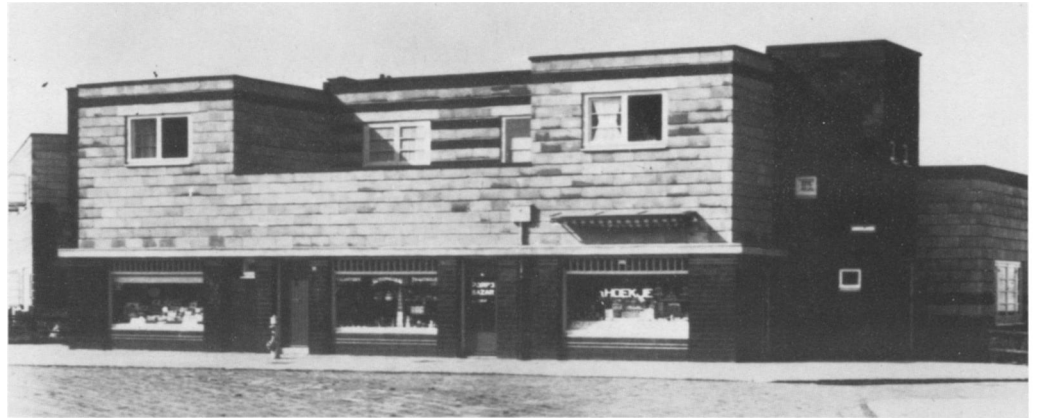
18. Mertens, Isotherme dwellings, plan and elevation of typical units (slightly altered in execution)



piers of Prairie Architecture. Van Loghem never joined De Stijl; his rationalist background was unsympathetic to its tendency toward abstruse philosophical speculation. But his designs for Betondorp show some influence from the movement. He was a firm believer in the garden suburb and designed several complexes of this sort for the city of Haarlem. His involvement with Betondorp gave van Loghem his first experience with concrete construction; his dwellings there, designed in 1922 and occupied some sixteen months later, are among the very earliest examples of the Nieuwe Bouwen in the Netherlands.<sup>66</sup> Ten years later, his commitment to the tenets of International Functionalism found written expression in *bouwen, bauen, bâtir, building Holland*.<sup>67</sup>

To assess how these architects acquitted themselves at Betondorp, it seems most logical to consider their work according to the methods of construction, also addressing the issue of technological determinism. Among the concrete-block systems, the simplest dwellings were those designed for Isotherme by Mertens, who, true to his rationalist training, relied on the alternation of windows and doors to enliven his *zakelijk* project. The double windows indicate a bedroom, the quadripartite ones the living room, and tiny square panes the stairwells. In accordance with Dutch custom, each unit has its own front entrance, which accounts for the cluster of doors in the central portions of the two-family rowhouses. Of the seventy-eight dwellings, only six are one-family; these are grouped in pairs to close the vista of Schovenstraat. Despite the modesty of these buildings, their palatial proportions endowed them with a grave dignity. Furthermore, through the play of the roughly surfaced blocks against the smooth reinforced-concrete beams over the windows, a sensual contrast of textures was obtained. The effect was lost, however, when the walls were rebuilt in brick. The replacement of the steel sash — a product new in the Netherlands in the early twenties — by wooden frames of a different format also damaged the sober integrity of the design. A comparison of the original

19. J. H. Mulder, Winget dwellings, Onderlang and Tuinbouwstraat, 1923–24



20. View of intersection of Onderlang and Schovenstraat showing, on the right, Winget dwellings at the corner by Mulder, 1923–24, and, on the left, Bims Beton Bouw dwellings on Schovenstraat by van Loghem

work with the renovated one provides a compelling demonstration of the difference in quality between a *zakelijk* building and one that is merely utilitarian.

Nevertheless, a much bolder architectural statement could be achieved with concrete blocks, especially those of large format. The heroic size of the Winget blocks was exploited by J. H. Mulder in designs made in June 1923, often misattributed to van Loghem. The openness to a wide range of formal motifs that was typical of the Amsterdam School can be seen in Mulder's work, which reveals the architect's fondness for the rectilinear geometries of De Stijl. Horizontals were emphasized by the alternating courses of the blocks and by the contrasting tones of the layers, produced with a black-tar paint that at the time was one of the few available for concrete surfaces. The three-dimensionality of the composition as well as the black tiles and handcrafted wooden sash that identify the shops in the Winget complex testify to Mulder's allegiance to the Amsterdam School. It is appropriate that these monumental units define one edge of the garden suburb, for they offer a striking example of the exciting aesthetic possibilities of concrete-block construction.

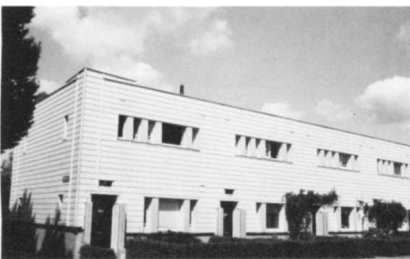
Valk, working with the relatively small Olbertz blocks, was similarly indebted to De Stijl, especially for the play of suspended, interpenetrating planes that occurs at the corners of his units. Both Valk and Mulder, however, took over certain visual features explored by De Stijl without subscribing to the neoplasticist ideology that generated these forms and that gave them meaning consonant with the movement's system of beliefs. The members of De Stijl looked toward an unprecedented union of the arts and composed "buildings" in which smooth planes of brilliant primary colors interacted with planes rendered in the non-colors, white, black, and gray, to resemble three-dimen-



21. Olbertz dwellings under construction, circa 1923



22. View of Sikkelstraat showing, in the foreground, Olbertz dwellings by H. W. Valk, 1923–24, and, in the background, Kossel dwellings at Ploegstraat and Sikkelstraat by J. Hulsenbosch, 1923–24



23. Olbertz dwellings clad in wood, Sikkelstraat, view in 1975

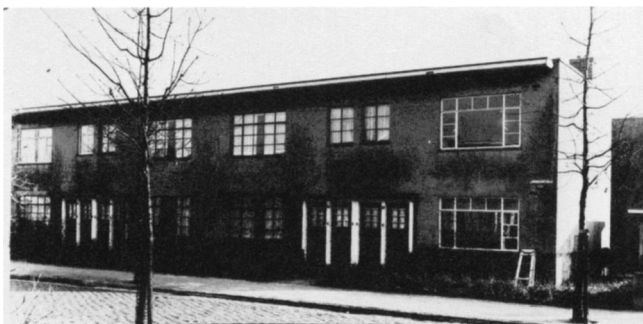
sional abstract paintings. At Betondorp Valk and Mulder, on the other hand, produced textured works of neutral color, stressing mass over volume. They also resisted the indifference displayed by the De Stijl group to the nature of materials; instead, they affirmed the intimate and concrete relationship between a design and the stuff of which it is conceived and made. Unfortunately, the wooden cladding applied to the Olbertz dwellings shortly after their completion destroyed the subtleties of the original creation, while the coating of the Winget blocks that obliterated their tonal contrast also harmed, though less drastically, the intentions of the maker. For once, the agenda of the Amsterdam authorities apparently shifted from idealistic aesthetic goals to more immediately pragmatic concerns.

A range of approaches can similarly be seen in the dwellings at Betondorp built in poured-concrete systems. The most plastic interpretation was given by Greve using Korrelbeton, a substance he invented.<sup>68</sup> The prowlike forms at the corners of his two rows of thirty-two flats add the dynamic force so frequently sought in expressionist architecture. This formal intervention necessitated a departure from the module of the formwork, but the buildings attained thereby an unusual allure not incompatible with the molten nature of poured concrete. The sharp black-and-white tonal contrast and the projecting bands at the roofline further distinguished these dwellings, which were designed as complete in themselves rather than as part of an infinitely extendable series.

24. W. Greve, Korrelbeton dwellings, Oogststraat, 1923, view in 1926

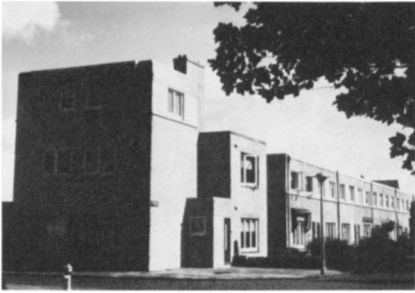


25. View in 1958 showing, at left, demolition of Korrelbeton dwellings, at right, rear elevations of Hunkemöller dwellings, and, in the background, AWW dwellings



26. Dirk Roosenburg, Non-Plus dwellings, 1922–24, showing steel sash in process of completion

The opposite approach — if one can use so deliberate a term for such a flaccid performance — was taken by Dirk Roosenburg in his dwellings in the Non-Plus system. He delivered the least inspired design in the entire complex; he seems to have been unable or unwilling to transcend the restraints of the program. The steel sash have a direct modern freshness that is at odds with the highly conventional treatment of the doors. The concrete surfaces are unpleasantly raw and the projecting cornice seems merely tacked on. A more appealing example of *zakelijkheid* is proffered by Hulsebosch, who had already used the Kossel system for municipal dwellings in Rotterdam. A native of that city, he was probably susceptible to the growing functionalist direction of the Opbouw group, but no doubt he was also aware of the artistic innovations of De Stijl; both movements appear to have had an impact on his work at Betondorp. Although the detailing is very simple, where the program permitted he has developed the massing in a manner akin to that adopted by Mulder. At terminal corners the blocks rise to three stories, and at other intersections where shops occur, there are setbacks. Hulsebosch did not configure the rows as simple slabs, as Mertens and Roosenburg had done, but made the units advance and recede in the rhythmic pattern visible on the site plan. His handling of the second story suggests an embryonic strip window; this is especially apparent on the rear façades,



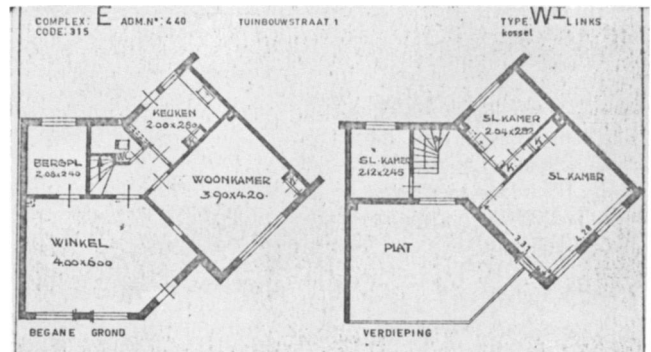
27. J. Hulsebosch, Kossel dwellings, Sikkelstraat and Onderlang, 1923–24, view in 1975



28. Hulsebosch, Kossel dwellings, Onderlang and Ploegstraat, view circa 1925

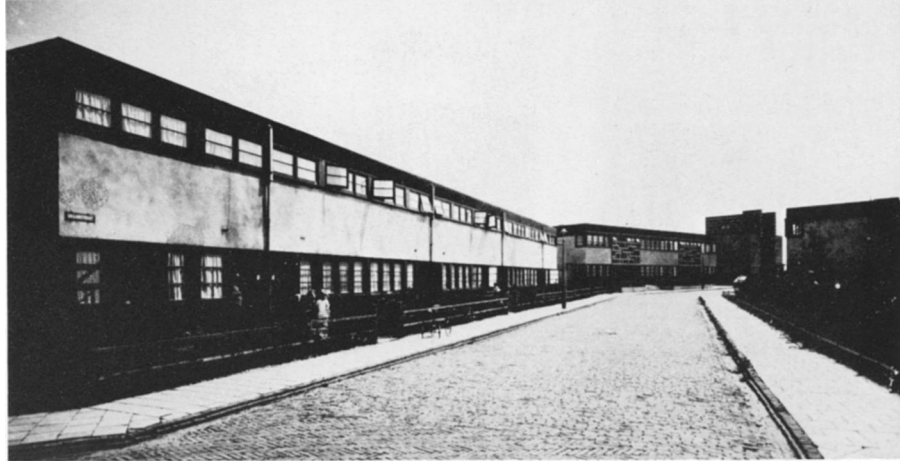


29. Hulsebosch, Kossel dwellings, rear elevation, viewed from Olbertz dwellings

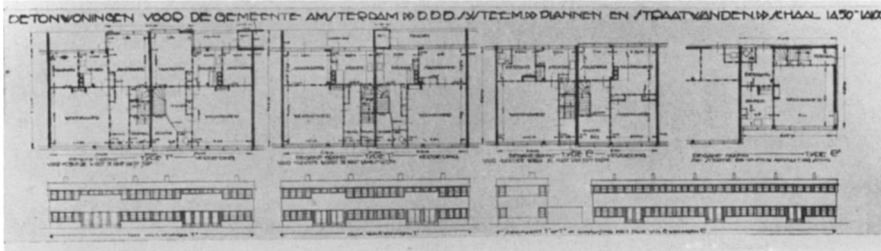


30. Hulsebosch, Kossel dwellings, plan of typical corner dwelling with shop

31. J. B. van Loghem, Bims Beton Bouw dwellings, Graanstraat, 1922–24. Winget dwellings are shown in background.

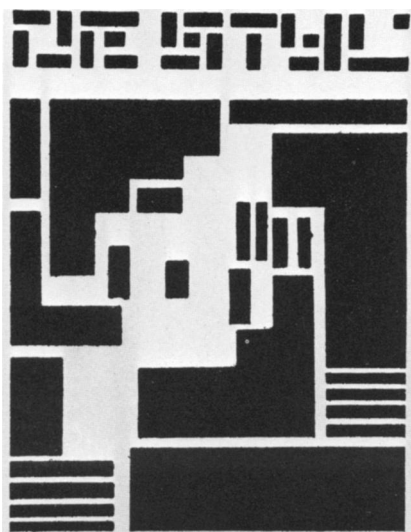


32. Van Loghem, Bims Beton Bouw dwellings, plans and elevations



33. Van Loghem, Bims Beton Bouw dwellings, Schovenstraat. Isotherme dwellings by Frederik Mertens are shown in background.





34. Vilmos Huszar, logo for *De Stijl*, 1918



35. Van Loghem, Bims Beton Bouw dwellings, view in 1975

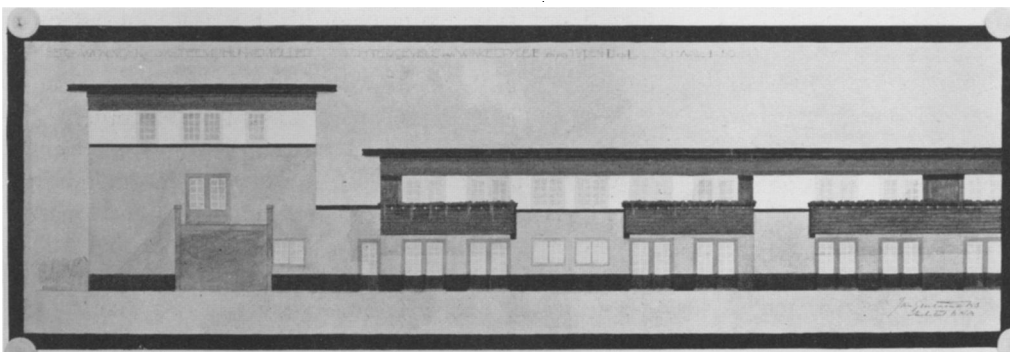
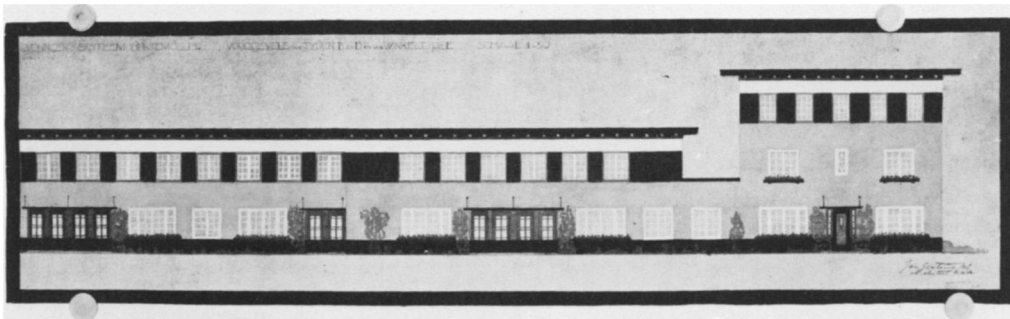
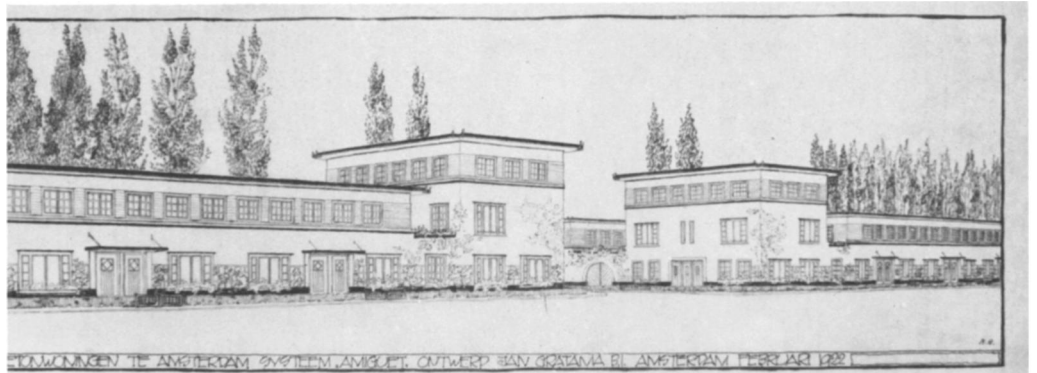
where a white band the same height as the windows works to create an illusionistic ribbon encircling the entire top story.

The strip window — Le Corbusier's *fenêtre en longueur*, one of his Five Points of the New Architecture — is, in fact, found at this very early date<sup>69</sup> in the dwellings by van Loghem, whose contribution is the most prophetic at Be-tondorp of the coming International Style. The B.B.B. system, consisting of reinforced-concrete columns on front and rear façades, steel joists, and bearing party walls, allowed van Loghem to embody a formal motif that would become very fashionable among proponents of the Nieuwe Bouwen, despite their dogmatic rejection of all aesthetic speculation: the wall treated as a thin, nonsupporting plane wrapped around a simple cubic volume. The upper band of windows projects slightly in front of the plastered pumice sheets that act both as formwork and as final walls, dramatizing the condition that windows are no longer holes punched in masonry walls but the transparent portion of the taut skin that envelops interior space. Van Loghem used color (the wooden frames of the lower sash were painted black, those of the upper story in varied hues) and two-dimensional patterns to energize the façade in a manner consistent with its character as a flat surface. On the garden façades, however, balconies project from the upper story just as they do in the very different dwellings designed by Gratama.

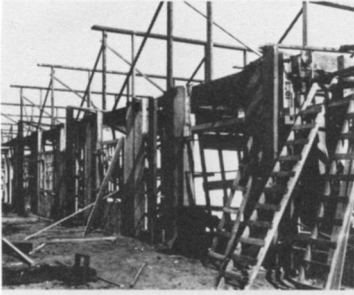
Inevitably, van Loghem contrasted the exteriors of the dual dwelling types. The fifty-six one-family units have a narrow, uninterrupted strip window to light the upstairs bedrooms. In the two-family flats — each story identical in plan — the interior arrangement is indicated by the quartet of doors and the windows of equal size on each floor; the glazed bands are checked by the doors of the ground level and by the narrow rectangular transoms that illuminate and ventilate the stair and storage area above. Van Loghem filled the field beneath these small windows with a right-angled, labyrinthine motif similar to the logo created by Vilmos Huszar for the periodical *De Stijl*. This, in turn, had no doubt been inspired by the designs of J. L. M. Lauweriks, who played an important role as architectural theoretician to younger Dutch colleagues associated with both the Amsterdam School and *De Stijl*,<sup>70</sup> and who pioneered the use of typographical ornament at architectural scale as a means of decorating planar surfaces. When the buildings were new, the graphic fields rhythmically punctuated the long façades, playing against the continuous black horizontals of base and cornice. The tonal contrast did not long survive. Eventually all the surfaces were painted white so that the units resemble even more than originally the monochrome architecture of mature International Functionalism.

If van Loghem's work was the most "advanced" stylistically at Watergraafsmeer, in terms of construction the most ad-

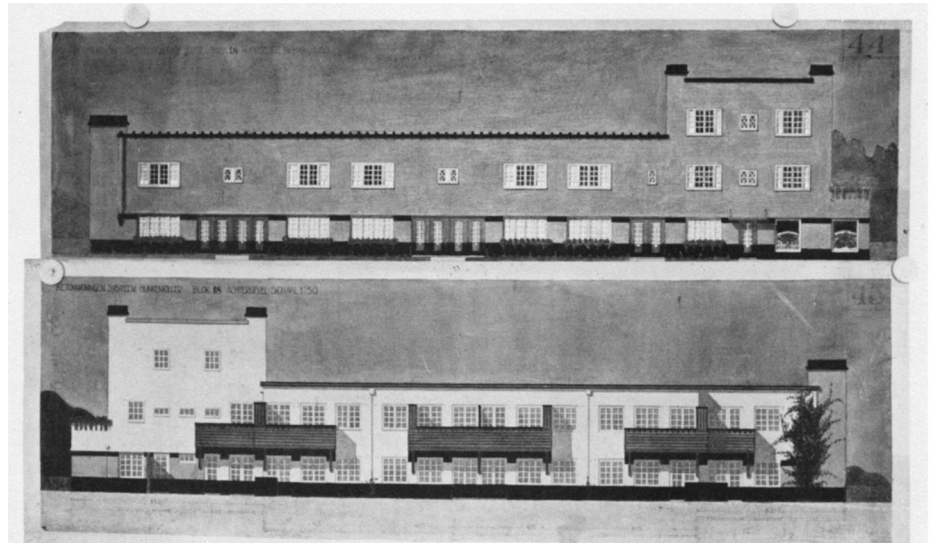
36. Jan Gratama, project for municipal dwellings, Amsterdam Amiguet system, February 1922



37. Gratama, project for municipal dwellings, Amsterdam, Hunkemöller system, October 1922, front elevation (above) and rear elevation (below)



38. Hunkemöller dwellings under construction, winter 1922



39. Gratama, Hunkemöller dwellings, November 1922, front elevation (above) and rear elevation (below)

vanced complexes were those utilizing prefabricated elements. These commissions went to two different architects not hitherto known for extensive engagement with new materials; their previous work had been executed in traditional Dutch brick. The architect for the Hunkemöller system was Gratama, who devoted a great deal of time to devising appropriate designs. His tendency to try new formal ploys while maintaining a degree of that security fostered by the familiar, mentioned above, explains his efforts for Betondorp. His eclecticism can be seen in a design of February 1922 for the Amiguet system:<sup>71</sup> An arched portal of Richardsonian proportions keeps somewhat uneasy company with the projecting slabs of the roofs, the source of which may be the Wrightian designs published in *De Stijl* (see figures 14 and 15). Noteworthy in the unexecuted Amiguet project is the way the concrete is scored at the second and third stories to link the windows in a continuous band. In studies for the Hunkemöller system made in October 1922, Gratama used color rather than texture to achieve similar ends. A comparison of the upper windows with the ground-story fenestration demonstrates the different effects gained by this coloristic treatment. On the garden elevation, a continuous strip of gray immediately beneath the projecting roof slab enhances its hovering quality. In articulating the façade in terms of dominant horizontals to stress continuity, perhaps symbolizing thereby the collective nature of the housing, Gratama has

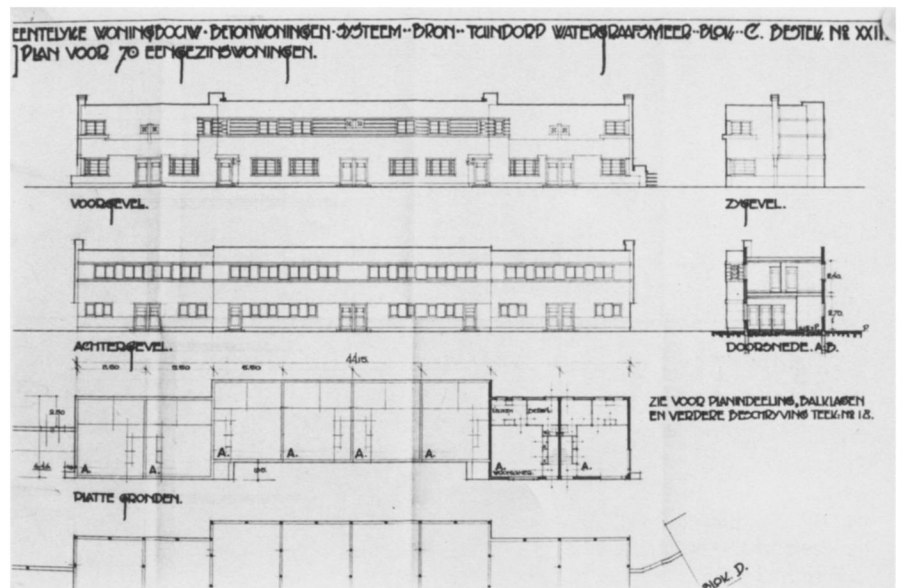
disguised the vertical format of the Hunkemöller elements. This departure from a strict expression of structure in favor of willed symbolic effects reveals Gratama's approval of the procedures of the Amsterdam School, while he simultaneously invokes De Stijl's use of color for *trompe l'œil* effects.

A more conventional design, dated November 1922, was chosen for execution. Although Gratama did not resort to a pitched roof, he mitigated the presumed starkness and untraditional character of the flat silhouette in two ways. First, he edged the top of the wall with a row of curved tiles. Then, although precluded by the structural system from making the elaborate sculptural gestures cherished by the Amsterdam School, he made the dwellings seem more solid by extending the elements upward at the corners. The fenestration of the realized design is also less novel: though flush with the surface of the wall, the windows are widely spaced in a conventional manner, and tiny squares with diamond panes, a typically Amsterdam School touch, light the stairwells. A further step away from any avant-garde congress with De Stijl was the proposed color scheme. Except for the plinth and the narrow strips above the first-floor windows painted in black (perhaps another perceptual trick to suggest a shadow line and thicken the appearance of the wall), the entire surface received a terracotta color, thus matching it to the brick public buildings, like the gym to which Gratama's dwellings were attached

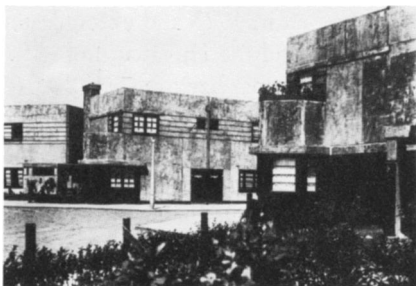
40. Gratama, Hunkemöller dwellings, Onderlang and Weidestraat, 1922–24. The community gymnasium by the Department of Public Works, Amsterdam is shown in the center of the dwellings.



41. Dick Greiner, Bron I dwellings, Zaaiersweg and Graanstraat, view showing, at right, original state and, at left, state circa 1950



43. Greiner, Bron I dwellings, elevations and plans, 1922



42. Greiner, Bron I dwellings, Veeteeltstraat and Zaaiersweg, 1922–24

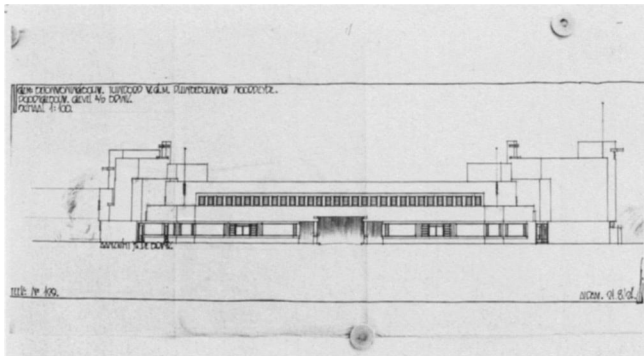


44. Greiner, Bron II dwellings, Veeteeltstraat 114, 1923, view in February 1925

and the housing units that would shortly be erected across the way on Tuinbouwstraat (see figures 5 and 6). Gratama chose to make his buildings contextually closer to the conventional dwellings of the housing societies that would be completed in 1924 than to the startlingly modern imagery of the adjacent units by van Loghem.

The name most closely bound up with the architecture of Betondorp is, however, that of Dick Greiner. More than any other individual involved in designing for the garden suburb, he seems to have transcended the financial restrictions and difficulties of the experimental medium to achieve an architecture comparable to the best brick housing erected by his fellow members of the Amsterdam School. The hauntingly memorable character of this housing marks the first group of dwellings he designed using the Bron system, the other prefabricated method tested at Betondorp (see figure 1). Construction of the seventy units that line the Zaaiersweg and parts of Veeteelt- and Graanstraat commenced in October 1923. Thirteen months later they were ready, the first buildings at Betondorp to be occupied. In them Greiner matched with very different means the powerful plastic effects that he had attained in his brick housing blocks in Amsterdam South. From the living rooms at the corner of Veeteeltstraat and Zaaiersweg protrude polygonal spaces that frame the intersection. The corner units advance, pavilionlike, in front of the central dwellings, the transition celebrated by a concrete relief of an eagle set above a projecting slab — a curious fusion of the Amsterdam School's figurative interests with De Stijl's passion for extended planes.

Eighty-four more units, designed in 1923 and executed the following year, are grouped around the Huismanshof. They show a greater degree of standardization, and the large, prefabricated elements of which the buildings are composed are more easily read in the design. Evidently this simplification delivered the desired economies — at 329,000 guilders, the costs came close to the proposed limit of 4,000 guilders per dwelling, which had been exceeded by most of the other systems. Nevertheless, Greiner maintained an urbanistic drama through the projection and recession of the individual units, producing a more dynamic backdrop to street and square than afforded by the



45. Greiner, Korrelbeton II dwellings and shops, August 1924, elevation on the north side of the *Brink*

arrow-straight rows designed by Mertens, Roosenburg, and van Loghem.

Apparently Greiner's work was highly valued, for scarcely were the second group of Bron dwellings complete than he was commissioned to extend Betondorp. In 1924, when the bulk of the complex — eight hundred seventy-three dwellings, twenty-nine shops with dwellings, and two municipal service buildings — had been finished, the Social Democrats decided that a neighborhood occupied by some eight to nine thousand people required urban amenities. They proposed the construction around the *Brink* of ten more workers' dwellings, ten larger apartments to attract members of the middle class, seven shops with dwellings, several workplaces for small tradesmen such as mechanics, as well as a public library, a community clubhouse, and some storage spaces for the Municipal Housing Service.

Typically, discussion of this proposal in the city council conflated political, economic, and aesthetic issues. The conservative members wanted the private sector, not the municipality, to execute the plan. Then it was argued, on grounds both of cost and beauty, that the new construction, whether financed by private contractors or by the local authorities, be carried out in brick. Figures were cited demonstrating that with brick prices sharply declining the use of concrete would increase expenditures by twenty-five percent. A further reason for using brick was advanced in the form of a report made by the Public Health Commission, which stated that nine out of the ten systems had failed, and that most of the dwellings were intolerably cold and damp. The Social Democrats countered with Keppler's assertion that only one had not succeeded, a claim that by this date was untrue, since two of the systems — Dorlonco and Olbertz — were already patent disasters. Nevertheless, Keppler's supporters carried the day with their arguments in favor of municipal financing and their demand that for visual consistency concrete be employed.<sup>72</sup>

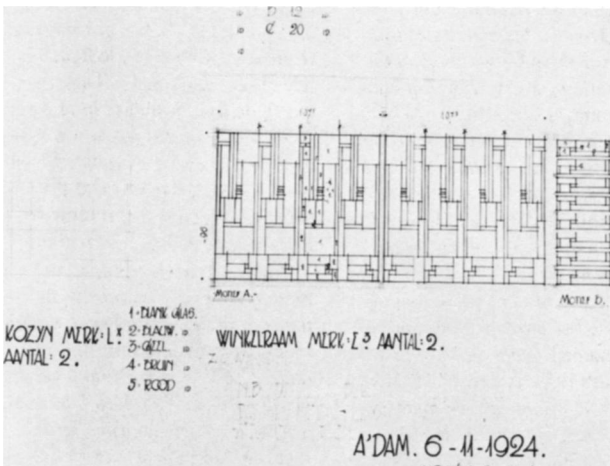
The results seem to bear out the wisdom of this action. The quality of the material had been greatly improved, and Greiner, experienced now in working with concrete, proceeded with new confidence and mastery.<sup>73</sup> The various buildings concentrated around the *Brink*, designed in 1924 and executed for the most part by 1927, validated the re-



46. Greiner, Korrelbeton II dwellings and shops on the Brink, 1925–28



47. Greiner, Korrelbeton II, public library, 1924–27



48. Greiner, design for leaded-glass windows for shops on the *Brink* in "clear, blue, yellow, amber, and red colored glass," November 1924

peated use of concrete on both practical and aesthetic grounds. On this round, Korrelbeton withstood better than any of the other systems the depredations visited by the climate, and Greiner's designs not only gave an urbane focus to the entire garden suburb but deftly harmonized its disparate parts. The communitarian ideal sought by members of the Amsterdam School no less than by those of De Stijl is embodied in the architecture of this second phase.

Greiner's work at Betondorp may be regarded as a bridge between rival movements. His apprenticeship with the Amsterdam School was responsible for the dynamic curve, brooding chimney, and thrusting tower of the Bron building on Veeteeltstraat east of the *Brink*, as well as for the textured surfaces, sense of poche, and custom detailing of the Korrelbeton complex. On the other hand, the abstract compositional ploys of De Stijl account for the asymmetrically balanced cubic volumes that make up the clubhouse and the library, and the right-angled patterns created in black-and-white tiles and leaded glass. Even the continuous band of windows, a favored motif of the *Nieuwe Bouwen*, is present here, though altered to suit the materiality of the wall.

By the time Greiner's masterworks were completed in 1927, however, confrontation was the order of the day.<sup>74</sup> The functionalists were in the ascendant and would brook no compromise with those who sought a middle way, accommodating new techniques and forms to traditional architectural values. Betondorp as a whole, and Greiner's work in particular, offered a solution that apparently was appreciated only by the workers who, despite practical shortcomings, clamored — as they still do — to live in Amsterdam's concrete garden suburb.

#### Notes

1. Aside from newspaper accounts, the most complete of which may be found in the *Oprechte Haarlemsche Courant*, I know of only two extensive articles on Betondorp. One deals exclusively with technical considerations: J. B. van Loghem, "De gedifferentieerde wand in warmtechnisch . . . opzicht," *De 8*

*en Opbouw* (1939): 199 ff. The other, in Dutch and English, gives a brief history and analyzes "life in a garden suburb" forty years after its founding: P. K. A. Pennink and W. J. Bruyn, "Het Betondorp," *Forum* 19, no. 5–6 (1965–66). There is a description of Betondorp in E. Ottens, *Ik moet een kleinere*

woning omzien: 125 Jaar Sociale Woningbouw te Amsterdam (Amsterdam: Gemeentelijke Dienstvolkshuisvesting, 1975). Indispensable to the preparation of this essay were the archives of the Gemeentelijke Archiefdienst Amsterdam, the Gemeentelijke Dienst Volkshuisvesting, the Instituut voor Sociale Geschiedenis, and the Documentatiecentrum voor de Bouwkunst, to which institutions the author is very grateful. Thanks also are due to Minnie Volkesma, the Reijnders family, who allowed me a glimpse of life in a concrete dwelling, and Hans Tupker, who first introduced me to Betondorp more than twenty years ago.

2. The *Woningwet* of 1901 empowered the national government to grant loans at low interest rates to municipalities and to housing societies established “exclusively in the interest of improving housing.” The product of a liberal administration, it relied on the individual municipalities to take the initiative. For a summary of its provisions, see Catherine Bauer, *Modern Housing* (Boston: Houghton Mifflin, 1934), and Helen Searing, “With Red Flags Flying: Housing in Amsterdam, 1915–1923,” in *Art and Architecture in the Service of Politics*, ed. Henry A. Millon and Linda Nochlin (Cambridge: MIT Press, 1978), pp. 230–69.

3. For a concise presentation of the “garden city tradition” in the Netherlands, see Donald Grinberg, *Housing in the Netherlands* (Rotterdam: Nijgh-Wolters-Noordhoff, 1977). There was a lively interest in the garden city movement; as early as 1906 Ebenezer Howard’s diagrams, translated into Dutch, were published (in J. Bruinwold Riedel, *Tuinsteden*). But the completely self-sufficient entities envisaged by Howard were impractical in the

Netherlands, especially in the heavily populated provinces of North and South Holland. Today this area constitutes Randstad Holland, a closely linked series of cities and towns that form a rim around an agricultural area and make economically and geographically unfeasible the British idea of establishing a totally new infrastructure of industry, farming, and commercial and public institutions. Rather it was the garden suburb that attracted the Dutch as a means of solving the housing shortage in existing cities. The Dutch coined their own terms — *tuindorp* (garden village) and *tuinstadwijk* (garden city quarter) — rather than translating the word literally, as *tuinvoorstad*. This was appropriate, as the Dutch garden suburbs would have little in common with the typical Anglo-American suburb of autonomous, single-family houses; the Dutch dwellings were always grouped in rows. As occurred elsewhere, to the annoyance of Howard’s true believers, the term *tuinstad* (garden city) was often used interchangeably with *tuindorp*. In 1923, when Betondorp was getting underway, a commission was established by the Amsterdam authorities to study the founding of a genuine garden city of fifty thousand inhabitants in the forested area known as the Gooi, to prevent the municipalities that were so much closer to this recreational preserve from encroaching on it with their own extension plans. The Social Democrats in particular supported this idea; but in the end it came to nought, and the garden suburb remained the major means of extension outside the urban core.

4. England, Germany, and the United States were way ahead of the Netherlands in concrete technology, a circumstance that a lecturer on “Gewapend Beton” in 1918

ascribed to the natural cautiousness of the Dutch. Perhaps the caution was justified; although the British had been experimenting with concrete cottages since the 1860s (reported on in S. Stratingh Tresling, *Het bouwen van arbeiderswoningen* [Haarlem, c. 1872]), as late as 1923 one commentator could dismiss the British results with the assessment that “as to materials, my own experience leads me to believe that alternative building methods and experimental materials have not fully justified themselves” (T. Alwyn Lloyd, “Housing Achievements, 1919–1923,” *Journal of the R.I.B.A.* 30 [November 1922–October 1923]: 353). In an article on the use of concrete for housing, published in *De Bouwwereld* (1919): 38, it was asserted that conditions in Holland were different from those elsewhere; with brick so plentiful, concrete could not compete. Still, reinforced concrete was used for hydraulic projects, and by the end of the nineteenth century Dutch factories supplied the material. See A. de Groot, “Rational and Functional Building,” in *Nederlands Documentatiecentrum voor de Bouwkunst, Het Nieuwe Bouwen: Voorgeschiedenis — Previous History* (Delft: Delft University Press, 1982). In 1911 the first reinforced-concrete house in the Netherlands was erected at Santpoort as a test for mass housing; it was cast *in situ* according to the method developed by Thomas A. Edison. Berlage is sometimes credited with the design, but more likely the architect was H. Hana. In any case this was considered a technical failure and had no issue. The Wrightian villa erected by Robert van ’tHoff in 1916 at Huis ter Heide had reinforced-concrete pillars and floor slabs but it was too singular to provide a model prototype. Nationalist prejudice no doubt played a role in

concrete’s initial unpopularity: in an article entitled “Beton of baksteen?” (Concrete or brick?), *De Bouwwereld* (1922): 367, S. C. Tinbergen conclude that “building in concrete can scarcely be desired as a surrogate for our own true native Dutch brick, since at the moment the advantages of concrete are more conceptual than actual.” Nevertheless, in 1920, when concrete began to be more competitive with brick in terms of price, a number of experiments were undertaken: in Rotterdam, The Hague and, on a very small scale, in Tuindorp Oostzaan, a semipermanent housing settlement in Amsterdam North. See “Proefnemingen met betonbouw,” *Centraalblad der Bouwbedrijven* 12, no. 40 (2 April 1921): 318, and A. Keppler, “De ervaring met het tuindorp Oostzaan,” *Tijdschrift voor Volkshuisvesting en Stedebouw* 5 (1924): 53–57.

5. It anticipated, for example, the widely publicized permanent housing exposition of 1927 constructed under the auspices of the Deutscher Werkbund on the Weissenhof in Stuttgart, where fifteen different architects and one partnership (Le Corbusier and Pierre Jeanneret) built model prototype dwellings, in some cases utilizing experimental materials and systems. Technologically this was scarcely more successful than Betondorp; costs far exceeded anticipations. The Weissenhofsiedlung was planned for a more mixed social milieu. Only four of the nineteen buildings were multi-family; thirteen were single-family houses and two were two-family semidetached dwellings.

6. Despite some early vicissitudes, its occupants showed a high degree of satisfaction with Betondorp, as Pennink and Bruyn, “Het Betondorp,” attests. In 1985 I spoke with several tenants who had formed a

committee to protect the architectural integrity of the project from the well-meaning but sometimes insensitive attempts of the municipality to upgrade the buildings. For reports on the recent renovations, which were in progress when I last visited Betondorp, and which are not illustrated here, see Tracy Metz, "Amsterdam restores its 'concrete village' and a way of life," *Architectural Record* (February 1986): 79, and Noud de Vreeze, "Renovatie en innovatie in Betondorp," *Wonen-TABK* 16–17 (1984): 8.

7. The first inhabitants of Tuindorp Watergraafsmeer had to rely on a privately operated steamtram, which took them to a point where they could transfer to the municipal tram network. However, tramline 9 was eventually extended along the Middenweg and today it rarely takes more than half an hour to reach the Dam and the Central Station.

8. Eigen Haard, founded in 1909, and the AWV, established the following year, were both Social Democratic housing societies. These *woningbouwverenigingen* were created through the *Woningwet* by groups of workers with common religious, political, or trade affiliations; because profit was not a consideration, the societies were expected to erect dwellings of a high quality. Membership in the societies required payment of dues, and therefore only the better-paid, skilled workers were eligible. When the inflation brought by the First World War made it impossible to construct housing that would be self-supporting, the government granted subsidies to cover the differences between rental income and operating expenses, for both the housing societies and the municipalities. For Betondorp, the municipality contributed an annual sum from its own coffers, in addition to

the state subsidy, in order to keep rents within the reach of low-income families. I have considered at length the nature and significance of the *woningbouwverenigingen* in "With Red Flags Flying."

9. A report made by the municipal housing service (in *Gemeentebld*, 1925, Bijlage E) investigating the relationship between income and rents showed that the average annual income of a member of Eigen Haard was 1,920 guilders, that of a member of the AWV 2,066 guilders, compared with an income of 1,766 guilders for a tenant in a municipal dwelling. Surprisingly, Amsterdam took this avenue permitted by the *Woningwet* relatively late; other cities initially were more active in building municipal housing.

10. Ary Keppler (1876–1941) had an international reputation as a housing reformer, and was czar of the Municipal Housing Service from 1915 to 1937. A study of his role in Amsterdam politics and housing is included in "With Red Flags Flying."

11. F. M. Wibaut (1859–1935) as alderman for housing from 1914 to 1921, usually worked closely with Keppler, who was his brother-in-law. In 1921 he became the alderman for finances, in which position he continued his involvement with workers' housing. Another Social Democrat councillor, S. de Miranda, who died in a Nazi concentration camp during the Second World War, took Wibaut's place as alderman for housing.

12. These were the 504 dwellings in the Spaarndammerbuurt by K. P. C. de Bazel (1869–1923) and the 407 units in the Transvaalbuurt by H. P. Berlage (1856–1934) in collaboration with the firm of Gratama and Versteeg. The municipality's stock was further enlarged when it

assumed operation of the dwellings erected by the philanthropic society, De Arbeiderswoning, constructed on three different sites to designs by Berlage and de Bazel. For a consideration of Berlage's housing schemes, see Helen Searing, "Berlage and Housing: 'the most significant modern building type,'" *Nederlands Kunsthistorisch Jaarboek* 25 (1974), and Manfred Bock, "Woningbouw," in P. Singelenberg and M. Bock, *H. P. Berlage*, exhibition catalogue in Dutch (The Hague: Gemeentemuseum, 1975).

13. By the mid-1920s a number of garden suburbs had been developed in Amsterdam North. Although until that time the area was relatively open, there was some industrial development on the edge of the terra firma immediately north of the IJ — especially relating to shipping and ship building — so that many of the workers living in the new *tuindorpen* did not have to cross the estuary to the inner city with its docks yards and industries. Today there is a tunnel, but the ferry ride takes less than fifteen minutes and is very pleasant in fine weather.

14. J. C. van der Pek (1867–1919) designed Amsterdam's very first *Woningwet* dwellings in 1909. He was married to the housing reformer, Louise van der Pek-Went; both were on the boards of several housing societies. His municipal dwellings in the Buiksloterham district of Amsterdam North number 1,468.

15. This expansion was necessary if a dent were ever to be made in the housing shortage. The population of Amsterdam had reached a high point in 1795 and had declined thereafter to 230,000 in 1850. In 1880 the figure had climbed to 330,000, a decade later to 424,000; in 1910 it had reached 591,000 and in 1921, 683,000.

16. One of the few obligatory measures of the original *Woningwet* was that municipalities of more than ten thousand inhabitants, or smaller ones whose population had increased by more than one-fifth in the previous five years, had to establish extension plans (*uitbreidingsplannen*), which in turn were subject to approval by the federal authorities.

17. I am assuming the development was intended to be low-rise because Watergraafsmeer had established in its building code a maximum height for housing of two-and-a-half stories. While Amsterdam's building code of 1905 had been admired as a model of strictness, it was not as stringent in some respects as Watergraafsmeer's, which might be considered an example of "gentrified" or "snob" zoning. The minimum surface area allowable for a flat was 48 square meters, compared with Amsterdam's 25 square meters; the minimum room height was 2.80 meters whereas Amsterdam prescribed 2.70 meters (*Gemeentearchief*, Dossier VH2279, 1918). Watergraafsmeer's citizens did not look forward to being absorbed by Amsterdam; the town officials held a mock funeral service and "buried" the former municipality the night before the annexation was consummated. A brief history of Amsterdam's relationship with Watergraafsmeer may be found in the *Gemeentebld*, 1918, Afd. I, pp. 2825ff.

18. Pieter Vorkink (1878–1960) and J. Ph. Wormser (1878–1935) worked in the sober vernacular tradition during the early years of their practice, but some of their later buildings, such as the group of country houses at Oostvorde of 1920, reveal an absorption of influence from the Amsterdam School.

19. Manfred Bock, *Anfänge einer*

neuen architektur: *Berlages Beitrag zur architektonischen Kultur* (The Hague and Wiesbaden: Steiner, 1983), pp. 104–20; idem, “What was the Nieuwe Bouwen,” in *Voor-geschiedenis*, p. 16; and Donald Grinberg, *Housing in the Netherlands*, chap. 7. Through lectures and articles in architectural periodicals, Berlage had popularized the ideas of Sitte and Joseph Stübben as early as 1892.

20. For discussions in English of the sources and vogue for geometric proportional systems in the Netherlands, see Suzanne S. Frank, *Michel de Klerk, 1884–1923* (Ann Arbor: UMI Research Press, 1984), pp. 25–29; Pieter Singelenberg, *H. P. Berlage: Idea and Style* (Utrecht: Haentjens, Dekker & Gumbert, 1972); and Reyner Banham, *Theory and Design in the First Machine Age* (New York: Praeger, 1960). In his thorough study of Berlage’s plans for Amsterdam South (*Het Plan Amsterdam Zuid van H. P. Berlage* [Alphen an/Rijn: Canaletto, 1976]), Francis Fraenkel has demonstrated how Berlage’s definitive plan of 1915 was generated from geometric figures.

21. The extension plan for Amsterdam South has been frequently published; in addition to the books by Grinberg, Bock, and Fraenkel cited above, it appears in Siegfried Giedion, *Space, Time and Architecture*, 3d ed. (Cambridge: Harvard University Press, 1954). The Sociaal-Technische Vereeniging van Demokratische Ingenieurs en Architecten seems to have been a short-lived organization; predictably, Keppler was a member. I cannot entirely accept the contention of Pennink and Bruyn, “Het Betondorp,” that Tuindorp Watergraafmeer is nothing more than a realization of the Vorkink and Wormser plan. The layout of some

of the streets has been altered and the type of development is much more open. Also one’s final impression is very much a function of the three-dimensional reality of the quarter, which was controlled by Keppler’s office in connection with architectural consultants.

22. This argument was derived from Raymond Unwin, *Nothing Gained by Overcrowding* (London: Garden Cities and Town Planning Association, 1912; reprinted in Walter Creese, *The Legacy of Raymond Unwin* [Cambridge: MIT Press, 1967]). Unwin held that land prices are directly linked to the allowable density per acre.

23. It was estimated that the van der Pek type would cost  $\pm$  1,000 guilders less than the two other designs. It did not meet the minimum spatial standards set by the building code of Watergraafmeer (see n. 17 above) within whose boundaries it would have been, but Keppler intended to get a variance. Site plans and designs of the proposed dwellings, and letters exchanged between Keppler and Wibaut concerning them, are in the Gemeentearchief.

24. The municipality was not alone in its concern about high building costs. The federal government had announced that it would not grant *Woningwet* loans for dwellings costing over a certain price per unit, and it encouraged municipalities to consider materials other than brick (*Gemeentebblad*, 1922, Afd. II, pp. 528, 952–72).

25. Brick manufacturers offered to tender low bids, and the confessional and Social Democratic unions suggested that their members would be willing to work for lower wages (*Gemeentebblad*, 1922, passim). Cf. the letter cited in n. 30 below.

26. These were the semipermanent

dwellings in Oostzaan, begun in 1919 to the designs of B. T. Boeyinga, who would later act as a consultant at Betondorp (*Gemeentebblad*, 1921, Afd. II, p. 1910).

27. Figures given during the discussion of the issue indicated that for a worker’s dwelling of 250 cubic meters the costs were 1,600 guilders for material and 800 guilders for wages before the war; in 1922 they were 2,000 guilders for material and 2,000 guilders for wages (*Gemeentebblad*, 1922, Afd. II, p. 2178).

28. H. van Hulst, A. Pleysier, and A. Scheffer, *Het Roode Vaandel volgen wij* (The Hague: Kruseman, 1969).

29. The productive associations — also called Federatie van groepen — needed the skills of the syndicalist construction workers, but the latter struck the associations for higher wages. The idealistically motivated productive associations seem not to have survived the 1920s. For their work at De Dageraad, see Helen Searing, “Amsterdam South: Social Democracy’s Elusive Housing Ideal,” *VIA IV: Culture and the Social Vision* (1980): 58–77, and idem, “With Red Flags Flying.”

30. *Het Bouwvak*, 14 September 1922. This scarce newspaper may be found in the archives of the Instituut voor Sociale Geschiedenis in Amsterdam.

31. From the far left, the Social Democrats were attacked for their willingness to cooperate with the conservatives then in power at the national level. In any event, the Communists were skeptical about housing reform through the *Woningwet*. They claimed it was merely temporarily palliative; their preferred solution to the housing problem was that of Friedrich Engels — the redistribution of existing stock after the revolution. They com-

plained that in any case *Woningwet* dwellings were too expensive for the average worker to rent because the cost of such housing was inexcusably driven up by high interest rates (and was entirely unrelated to wage levels in the building trades). From the right, the Social Democrats were accused of extravagance, of catering to the workers by giving them unnecessarily luxurious accommodations at public expense. The conservatives also wished to revive the private sector’s role in the housing market, a goal supported by the national government (see Searing, “Amsterdam South,” and idem, “With Red Flags Flying”). Keppler had a particular enemy in A. W. Bos, director of Public Works from 1907 to 1926. The two services were rivals; Public Works was supposed to prepare and lay out the sites for housing, but Keppler fought to have his service design the street plans. In a letter of 1 June 1920 to Wibaut, Keppler states decisively that he does not want Public Works to execute the garden suburb of Watergraafmeer, and that it should instead be designed and realized by architects working in close connection with the Municipal Housing Service (*Gemeentearchief*, Dossier 2680VH). For further discussion of this rivalry, see Helen Searing, “Architecture and the Public Works in Metropolitan Amsterdam,” *Modulus 17* (1984): 9–33.

32. L. van der Wal, “Een Nieuwe Dorp,” *Tijdschrift voor Volkshuisvesting en Stedebouw* 6 (1925): 38–41. He notes that “difficulties with the workers have not occurred during construction, something which is unique in Amsterdam, the finishing of the dwellings is excellent and, last but not least, the units were ready almost four months early.”

33. Already on 25 November 1919, in his address to the council as alderman for housing, Wibaut had suggested the possibility of “introducing new building methods in which other categories of workmen will be employed.” The first results were the semidetached, semipermanent dwellings in concrete erected in Oostzaan (mentioned above in n. 26).

34. The firms were Occident with the German Bron system; Betonbouw with the Hunkemöller system; Leyenaar and van Essen with the Bims Beton Bouw system; Korrelbeton with the Korrelbeton system; Nederlands Betonbouwonderneming with the Schnellbau Kossel system, also developed in Germany; Bredero’s Bouwbedrijf with the Olbertz system; and, finally, the Nederlandsche Aannemingsmaatschappij, which executed four systems: Isotherme, Winget, Dorlonco, and Non-Plus.

35. The international economic crisis of 1920 affected neutral Netherlands as well as the formerly belligerent countries that were her trading partners. The depression lasted several years, causing on the one hand unemployment, on the other the extinction of governmental generosity toward public housing. In 1920 the ministry in The Hague published an “Album” illustrated by plans for small dwellings ranging from 225 to 300 cubic meters, the maximum size allowed by the *Woningwet*. The administration in Amsterdam had to face this governmental decree, as well as fears among its own councillors concerning further expenditures for municipal dwellings. On 7 June 1922, six plans were placed before the council, in response to the recommendation made in March to scrap one-family dwellings altogether in the

future Betondorp. Three of the schemes did just that, making it a quarter of dwellings of a minimal type — *zeer klein woninkjes* — that had not been built before in Amsterdam. The Health Commission had pronounced such dwellings perfectly sound, and Wibaut acknowledged that to include a few at Betondorp would not be inappropriate, as many newlywed couples were in search of such inexpensive housing. But he steadfastly refused to countenance exclusively two-family units, even though some of the parcels were arranged so that in more affluent times the two flats, one above the other, could be converted into one-family row houses. Instead, he pleaded — successfully — for a plan that Keppler had brought forth that addressed the divergent interests represented on the council, in which the two-family units averaged two bedrooms rather than one (*Gemeenteblad*, 1922, Afd. I, p. 893ff). Professional groups also pondered the problem of the minimal dwelling: The International Federation for Housing and Town Planning investigated the issue at two successive conferences — at Paris in 1928 and at Rome in 1929. At the instigation of Ernst May, the renowned housing director of Frankfurt, the first conference held by CIAM (Congrès internationaux de l’architecture moderne; Internationalen Kongresse für Neues Bauen) after its founding in 1928 was likewise dedicated to this subject. Questionnaires were circulated among the CIAM members and an exhibition consisting solely of one hundred ground plans was presented; these were published in *Die Wohnung für das Existenzminimum* (Frankfurt am Main: Englert and Schosser, 1930). There were no plans from Amsterdam but two each from Utrecht and Rotterdam, probably by Gerrit Rietveld and

J. J. P. Oud, respectively. For an excellent critique of this conference — or congress — see Auke van der Woud, *Het Nieuwe Bouwen: C.I.A.M.: Volkshuisvesting, Stedebouw*, partial English translation (Delft: Delft University Press, 1983), pp. 58–66.

36. The hollow Isotherme blocks were manufactured in a hand press that could be operated by two unskilled workers, who could produce 1,200 blocks in an eight-hour day. The blocks were of two different compositions and formats: those for the outer walls contained a gravel aggregate and measured 28 by 16 by 13.6 centimeters; those used on the interior contained slag and were only 9 centimeters thick. There is a 10-centimeter cavity between the interior and exterior walls, which are connected by galvanized iron ties. Light concrete slabs, 6 centimeters in thickness, made up the interior partition walls. Reinforced concrete beams spanned the openings for windows and doors, but they were a major cause of leakage and contributed to the destruction of the original steel sash. The Winget system was similar — indeed the same contractor executed it — but the blocks were much larger, 80 by 29 by 17 centimeters. A gravel aggregate was used for the exterior blocks, slag for the interior blocks; the walls were hollow, and reinforced beams were employed to span the windows. The costs were also comparable: 319,600 guilders for the seventy-eight Isotherme dwellings, and 254,400 guilders for the fifty-two dwellings and nine shops made according to the Winget system. The Olbertz blocks, measuring 44 by 22 by 9 centimeters were composed of sand, gravel, and cement; they made up both the exterior and interior walls. Each block had two cavities and, on the

inner surface, a trio of projecting ribs. Against these ribs was affixed a light concrete sheet, the same width as the individual block but 40 centimeters high, so that each sheet covered two masonry courses. The system, used for fifty-two dwellings, had serious drawbacks — window openings had to be relatively narrow, and rainwater penetrated the walls.

37. The Schnellbau Kossel system combined slag, pumice, sand, gravel, and cement to make a concrete that was supposed to be proof against resonance and condensation. The mixture was poured into prefabricated wooden forms from a cart attached to a moveable crane, facilitating the speed of construction. Wooden cylinders placed in the walls during the pouring were withdrawn before the mixture set to create insulating air pockets. Outer walls were 24 centimeters thick; party walls 15 centimeters. For the partition walls within each dwelling, light concrete sheets or cheap bricks were specified rather than the poured Kossel mixture. The Kossel system accounted for fifty-seven one-family dwellings and ten shops. The Non-Plus system was similar, but a larger proportion of sand in the aggregate made for greater solidity, and standardized wooden forms were used. Also because air pockets were not introduced into the walls, the concrete conducts heat and cold more readily than in the case of the Kossel system, and condensation has been a problem. Korrelbeton, which initially accounted for fifty-seven dwellings, was a mixture of cement and slag that was poured into reusable metal frames to make the walls. Floors were of reinforced concrete. The fourth poured system, Bims Beton Bouw (B.B.B.), utilized reinforced-concrete columns and steel joists. To make the

walls, a heavy concrete composed of cement, sand, and slag was poured between lightweight pumice sheets held apart by galvanized iron ties; the sheets remained in place as part of the wall and were finished with plaster sprayed from a cement gun. B.B.B. accounted for one hundred twenty one- and two-family units.

38. The Hunkemöller system was used for four shops and two hundred six dwellings — the largest number to be built with one method. It employed elements modest in width (50 centimeters), but a full story in height (3 meters); they were factory-produced by unskilled workers. Although they had to be cemented together to form the walls, U-shaped flanges on the edges of each element created a channel that could simply be filled with mortar, eliminating the need for skilled masons. Prefabricated wooden sashes proportioned to the module of the structural elements contributed to the ease of construction. The prefabricated elements of the Bron system were much larger: the width of a room and the height of a story. They were reinforced with metal and prepared on the site in forms laid horizontally on the ground. When dry, the parts were lifted into place with a crane. The size of the openings could be varied according to need, and decorative striations cast into the material. First seventy, then an additional eighty-one, dwellings were constructed by the Bron system.

39. Although the concrete blocks were larger than the average brick, which measured 22 by 11 by 5.5 centimeters (according to J. W. Janzen, "Normalisatie van baksteen," *Het Bouwbedrijf* [1925]: 63–65), an official report found that "the use of concrete blocks brought no savings in man-hours." The report further

stated that only if the other systems were used for many hundreds of dwellings could significant economies accrue (cited in van Loghem, "De gedifferentieerde").

40. In the second group of dwellings built in 1912 for the *woningbouwvereniging* Rochdale, also designed by J. C. van der Pek, the short ends of the building were left open so that the green space between the two long sides is more accessible to the community. The quarters of the Amsterdam housing society *Het Westen*, designed by H. J. M. Walenkamp, are grouped around a large landscaped courtyard — the *Zaanhof* — that is completely open to the public. See Grinberg, *Housing in the Netherlands*, pp. 68, 70.

41. The first municipal quarters in Rotterdam designed by J. J. P. Oud (1890–1963) in the Spangen and Tusschendijken districts were perimeter blocks. The justly famous Spangen development by Michiel Brinkman (1873–1925) is an astonishingly original interpretation of the courtyard tradition in the Netherlands. For Oud's housing, see Hans Oud, *J. J. P. Oud* (The Hague: Nijgh & van Ditmar, 1984). The entire fifth issue of *Forum* (1960–61) was devoted to Brinkman's Spangen.

42. For example, consider Heyplaat, of 1915, and Vreewijk, of 1916–19, both in Rotterdam. For a copiously illustrated survey of these garden suburbs, refer to Giovanni Fanelli, *Architettura, Edilizia, Urbanistica Olanda, 1917–1940* (Florence: Francesco Papafava, 1978).

43. Both Jan Frederik Staal (1879–1940) and Berend Tobias Boeyinga (1886–1969) were associated with the Amsterdam School. Staal was an independent architect who designed a great deal of brilliantly

conceived housing for both private builders and the housing associations. Boeyinga worked from 1907 to 1917 for a man whose office was the main breeding ground for the Amsterdam School, Eduard Cuypers (1859–1927) (see Helen Searing, "Berlage or Cuypers? The Father of Them All," in *In Search of Modern Architecture: A Tribute to Henry-Russell Hitchcock*, ed. Helen Searing [Cambridge, Mass.: MIT Press, 1982]). Subsequently he was attached to Keppler's service and designed important municipal housing quarters, among them Tuindorp Oostzaan.

44. Hilversum's municipal architect, Willem Marinus Dudok (1884–1974), was responsible for the design of schools, city buildings, and housing quarters throughout the city, which accordingly afford a comprehensive view of his stylistic development. In Rotterdam one architect would be placed in charge of the dwellings of an entire district; Oud's work is noteworthy here.

45. The same formality of layout leavened with variety in the three-dimensional execution can be observed throughout Amsterdam South. See Francis Fraenkel, *Het Plan Amsterdam Zuid*, and Searing, "Amsterdam South."

46. In 1898 Amsterdam became the first Dutch city to have a Schoonheidscommissie — Committee of Aesthetic Advice. For the impact of this committee on the design of *Woningwet* housing, see Helen Searing, "Housing in Holland and the Amsterdam School" (Ph.D. dissertation, Yale University, 1971).

47. *Zakelijk* is commonly translated as "objective," although the words "straightforward," "practical," "businesslike," and "functional," but not

the word "utilitarian," might give a better sense of its flavor. Berlage originally identified this quality with "impressionism" in two major articles that he published in *Architectura* in June 1894. For discussions of the first stirrings of *zakelijkheid* in the Netherlands, see Pieter Singelenberg, *H. P. Berlage*, and the review of this book by Suzanne S. Frank, in *Architectura* 2 (1973): 190–92, as well as Frank's *Michel de Klerk*. For the Nieuwe Bouwen, see the series of five catalogues, *Het Nieuwe Bouwen*, published in Dutch with English translations by the Delft University Press in 1983.

48. Manfred Bock, "What was the Nieuwe Bouwen," pp. 12–13. This article also defines the relationship between the old and new *zakelijkheid*.

49. "Het tintelend-nieuwe, het sensationeel-schokkende," the words of Michel de Klerk (1884–1923), the indisputable leader of the Amsterdam School. On de Klerk and his colleagues, see, in addition to Frank's monograph, Wim de Wit., ed., *The Amsterdam School* (Cambridge, Mass.: MIT Press, 1983), the most recent work on the group, with a full bibliography.

50. For an excellent survey of the background from which the Amsterdam School emerged, see Richard Padovan, "Building Towards an Ideal: Progressive Architecture in Holland," in *Art Nouveau Architecture*, ed. Frank Russell (New York: Rizzoli, 1979).

51. Berlage, for example, came to appreciate the work of the Amsterdam School and even adopted some of the group's strategies in housing projects made in the 1920s. Other traditional *zakelijk* architects were less forgiving; see Searing, "Amsterdam South."

52. Established in Rotterdam in

1920, Opbouw originally had no fixed ideological stance and brought together architects of very different viewpoints, such as Willem Kromhout (1864–1940), an important forerunner of the Amsterdam School, and M. J. Granpré Molière (1883–1972), a *zakelijk* traditionalist. Shortly after its founding, however, architects joined the group who would make Opbouw a stronghold of the Nieuwe Bouwen: Oud, van Loghem, Mart Stam (b. 1899), and Cornelis van Eesteren (b. 1897), among others. In 1928 the organization joined forces with De 8, formed in Amsterdam in 1927 to represent the Nieuwe Bouwen there. The groups jointly published the influential architectural periodical *De 8 en Opbouw* from 1932 to 1943, and their members formed the chief Dutch delegation to CIAM. See *Bouwen '20-'40: De Nederlandse Bijdrage aan het Nieuwe Bouwen*, exhibition catalogue, (Eindhoven: Stedelijk van Abbe-Museum, 1971), and Helen Searing, "The Dutch Scene: Black and White and Red All Over," *Art Journal* (Summer 1983): 170–77.

53. Among the most definitive are Mildred Friedman, ed., *De Stijl: Visions of Utopia* (New York: Abbeville Press, 1982), and Nancy Troy, *The De Stijl Environment* (Cambridge, Mass.: MIT Press, 1983).

54. In 1968 Giovanni Fanelli published the first comprehensive consideration of modern architecture in the Netherlands; it was enlarged in a Dutch translation by Wim de Wit: *Moderne architectuur in Nederland 1900–1940* (The Hague: Staatsuitgeverij, 1978).

55. Wim de Wit, "The Amsterdam School: Definition and Delineation," in *The Amsterdam School*, pp. 30–34.

56. The most important of these

projects are illustrated in *The Amsterdam School*: see de Klerk's competition entry for a water tower in reinforced concrete, and projects for a church and a house, from 1915 and 1917 respectively, by A. Eibink (1893–1975) and J. A. Snellebrand (1891–1963). Eibink published an article on the applications of reinforced concrete in *Wendingen*, the house organ of the Amsterdam School (2, no. 11 [1919]).

57. The design by Jan Wils (1891–1972) appeared in vol. 1, no. 8 (June 1918), the house by Robert van 't Hoff (b. 1877) in vol. 2, no. 3 (December 1918), and the project by Oud in vol. 2, no. 7 (May 1919). Frank Lloyd Wright's concrete house was made for the Curtis Publishing Company, to join his other two *Ladies Home Journal* Houses. It was published in Frank Lloyd Wright, *Ausgeführte Bauten und Entwürfe* (Berlin: Ernst Wasmuth, 1910). In the "big" Wasmuth edition, Wright described it as follows: "A simple house, four sides alike, for sake of simplicity in making forms, with entry added at side, and a trellised terrace. The chimney supports the floors and carries the water from the roof. An insertion of square colored tiles occurs just beneath the soffit of the eaves, certain ones opening for circulation of air in summer. The house may be placed upon the lot two ways, as shown in schemes A. and B."

58. The drawings are signed J. H. Mulder, Amsterdam. Fanelli, in *Architettura, Edilizia, Urbanistica Olanda*, ascribes to Mulder two important municipal complexes in Amsterdam North: Asterdorp, of 1925, and portions of Nieuwendam, begun in 1926.

59. According to Fanelli, Greve designed some dwellings near the *Zaanhof* (see n. 40).

60. Jan Gratama (1877–1947); Dick Greiner (1891–1964); J. B. van Loghem (1881–1940); Herman Frederik Mertens (1885–1964); H. W. Valk (1886–1973); and Dirk Roosenburg (1887–1962).

61. In 1863 (a time when architectural courses of no great distinction were given at academies in Amsterdam, Rotterdam, and The Hague), the Delft Academy was reorganized to become the Polytechnical School; in 1905 it was again reorganized as the Delft Technical University. It had a monopoly on advanced architectural education well into the twentieth century, though it stressed engineering skills. See A. de Groot, "Rational and Functional Building, 1840–1920," *Voorgeschiedenis*, pp. 44–49.

62. His son, the architect G. H. F. Valk, kindly supplied me with biographical information. Some fifty churches were constructed under the elder Valk's direction. Given the sectarianism that rules Dutch life, it is natural that Valk would have worked with two preeminent Roman Catholic architects. He had a practice in 's Hertogenbosch (Bois-le-Duc) near Roermond, the birthplace of P. J. H. Cuypers (1827–1921).

63. Mertens received his diploma from Delft in 1910. He first worked for a time with Berlage, and then was active with the Department of Public Works in Arnhem. In the 1920s he established an architectural office in Bilthoven, near Utrecht; he was responsible for the design of a number of large buildings for commercial and financial institutions, including the Nationale Bankvereniging, Unilever Corporation, and the Handelskamer. I am grateful to his son for information and for the drawings of his project at Betondorp; Mr. Mertens, also an

architect, pointed out that the drawings were signed by the contractor as well as his father, making it an early example of a "joint venture."

64. Roosenburg was in Berlage's office from 1913 to 1915. In 1922, the same year he designed the dwellings in Betondorp, he entered the competition for the *Chicago Tribune*. His entry, a shaped tower with a skeleton clad in massive masonry with carved detailing (illustrated as pl. 235 in *The International Competition for the Chicago Tribune* [Chicago: The Tribune Company, 1923; abridged reprint, New York: Rizzoli, 1980]) is very different from his joyless housing units.

65. I am extremely grateful to Dick Greiner's widow and to his son, the architect Onno Greiner, for their generosity in sharing information and drawings with me.

66. Van Loghem's dwellings at Betondorp share the honors only with the trade school at Groningen designed in 1922 by J. B. Wiebenga (1886–1974) and L. C. van der Vlugt (1894–1936), one side of which looks like a realization of Mies van der Rohe's project of the same year for a concrete office building, the other façade of which has astonishingly extensive window walls. Illustrated in *Bouwen '20-'40*, p. 81.

67. J. B. van Loghem, *bouwen, bauen, bâtir, building Holland* (Amsterdam: Kosmos, 1932; new edition, Nijmegen: S.U.N., 1980, with an introduction by Umberto Barbieri). Although van Loghem was on the editorial board of *Wendingen*, the house organ of the Amsterdam School, edited by H. Th. Wijdeveld (b. 1885), his work did not exhibit expressionist tendencies. The most complete review of van

Loghem's career is in *Plan 12* (1971); the entire issue, edited by Johan van de Beek and Gerrit Smienk, is dedicated to a consideration of his work and ideas. See also B. Colenbrander, "J. B. van Loghem, a combative [sic] architect," in *Voorgeschiedenis*, pp. 121–34.

68. See *Centraalblad der bouwbedrijven*, 5 November 1921. While this article expresses reservations about the aesthetic effects of building in "such boxy blocks" — something Greve in his design for *Betondorp* was at pains to counter — it praises the system for the way "the most varied plans of dwellings can be built." The author claims that the presence of many small openings in the material, "the pores of the concrete," maintained a fixed isolating layer of air, which prevented capillary action and protected against extreme temperatures, making these dwellings warmer in winter, cooler in summer than those constructed of brick or other kinds of concrete. The author states further that "a great advantage is that skilled workers are not required. An experimental villa with its garage was erected by a dozen unemployed farmers under the direction of one concrete worker."

69. Oud, for example, did not use the strip window until 1925, in his municipal dwellings in the *Kiefoek* garden suburb of Rotterdam.

70. For the status of J. L. M. Lauweriks (1864–1932) as important precursor of the Amsterdam School, see Wim de Wit, "The Amsterdam School, Definition and Delineation," pp. 47ff.

71. The legend on the drawings for the Amiguet system says "concrete dwellings for Amsterdam." They are dated some five months before the city council approved the proposal

for the experiment in concrete, but the wily Keppler had already been making inquiries and inviting designs.

72. *Gemeentebld*, 1925, Afd. I, pp. 1360ff.

73. Greiner's comments about *Korrelbeton*, which was executed by the same contractor, *Occident*, with whom he had worked for the *Bron* system, are recorded in the municipal archives. He said that "although it is bound to a formwork of fixed measurements, it allows many possibilities in the execution precisely because it is so perfected and nonetheless so simply composed. All outer and inner walls, floors, plates, stairs, etc., are cast of the same material. . . . However, all the systems have problems and in this one it is the exterior finishing which gives some trouble. The layer of plaster which the architect chose was too expensive, but the architect could not accept the one proposed. Finally, a manner of finishing was approved by the head of construction; at first the plasterers refused to execute it because it was too stiff; the difficulties disappeared when wages were raised." Still, Greiner regretted that need for plaster, preferring to leave the concrete as it came from the forms.

74. See Searing, "The Dutch Scene."

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33. *De Stijl*, passim.
- 36–38. Documentatiecentrum voor de bouwkunst, Amsterdam.