GENIUS AND NAZI?
WILLY GEHLER (1876−1953) − A GERMAN CIVIL ENGINEER AND PROFESSOR BETWEEN TECHNICAL EXCELLENCE AND POLITICAL ENTANGLEMENTS IN THE 20TH CENTURY

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Engineers in society and politics; development of building codes and standards; history of material science and of building materials, their production and use; biographies

Abstract

Willy Gehler, born in 1876 in Leipzig, studied natural sciences and civil engineering. As an executive civil engineer of the renowned German construction company Dyckerhoff & Widmann, he played a leading role e.g. in the construction of the Centennial Hall in Breslau and of the largest terminal station in Europe at that time in Leipzig (Germany) at the beginning of the 20th century. His greatest contribution to German and international civil engineering was the research, experimental testing and application of new materials. As the "father of standardization," his comments and explanations on the new design specifications and standards for reinforced concrete elements and structures were relevant to other researchers and civil engineers.

Unlike most of his colleagues, Gehler acted strongly politically. In the Weimar Republic, during the Nazi era and again in the GDR, he was a member of a political party. He joined the Nazi Party shortly after Hitler's appointment as chancellor. He was also a supporting member of the SS. In particular, his proximity to leading members of the Nazi elite is controversial. It is also known that he had performed numerous experiments for the Organisation Todt and the military on behalf of the SS. In the Soviet Occupation Zone and the former GDR, he was also closely linked to the political elites. Although he was demoted academically, he was involved in technical and policy decisions. In later decades, Gehler's work was largely ignored; younger generations of engineers are not familiar with his name.

Willy Gehler − a personality full of contradictions: highly respected expertise and social engagement on the one hand, party memberships in partly dictatorial systems on the other. Today, civil engineers and historians at the Technische Universität Dresden work together to investigate the person Willy Gehler with the method of scientific biographic. A main point will be the examination of his controversial proximity to the German dictatorships. Furthermore, we want to compare Gehler's distinct experiments with today's research in the field of reinforced concrete construction. First results will be presented in this paper.

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INTRODUCTION

Since June 2014, a research program at the Technische Universität Dresden (TU Dresden) has been taking place about the German civil engineer Willy Gehler, with a reflection of his life, work and leadership. Historians and civil engineers are working together on this project. It is a cooperation effort between the chair for history of technology (Prof. Hänseroth) and the Institute of Concrete Structures (Prof. Curbach). The project is funded by the Deutsche Forschungsgemeinschaft (DFG – German research community). Because of our background, we are going to look at Gehler's work and biography from a different point of view. On the one hand, we want to investigate his political entanglement during the changing history of Germany at the beginning of the 20th century. The main focus will be at the time of the Nazi era and the early German Democratic Republic (GDR). On the other hand, we will take a look into his research on reinforced concrete, including his commitment to standardization and the introduction of this new material. As well as his colleagues in Dresden, Kurt Beyer and Wilhelm Neuffer, we are going to compare Gehler's biography with other civil engineers of the first half of the 20th century, such as Emil Mörsch, Franz Dischinger and Otto Graf. Furthermore, we will focus on the theory of reinforced concrete in former times, including the conflict between the universities of Dresden and Stuttgart (known as the "Dresdner Schule" and the "Stuttgarter Schule"), and their influence on standardization and practical work. We are looking for reasons to understand the lost of relevance of Gehler's work to civil engineers through time as well. Is it because of his involvement with political forces during the NS era (e.g. Heinrich Himmler) or is it because of a change in the research of civil engineers?

WILLY GEHLERS LIVE AND WORK IN THE CENTURY OF EXTREMES

Gehler's career until 1933

Willy Gustav Gehler, born in 1876, was the son of an architect and a housewife (biographic data: (Hänseroth 2003)). He started to study civil engineering at the TU Dresden (at that time University of Technology Dresden, in German: THD) after he had studied sciences at the University of Leipzig for a while. During his studies, Georg Mehrtens and Otto Mohr, who were highly recognized at this time, were working at the university as professors in engineering mechanics and in structural engineering respectively. Gehler graduated in 1900 with the degree "Diplom-Ingenieur".

As a young engineer, he started his career as "Regierungsbauführer" (a degree below a governmental master builder), afterwards as "Regierungsbaumeister" (governmental master builder) for the civil service of Saxony and the Saxon State Railways. In 1905, he became the technical director of the Dresden branch of the Dyckerhoff & Widmann AG. As a leader, he was involved in the construction of a gasometer in Dresden and the cross-platform hall of the Leipzig's central station. Together with Günther Trauer, he was responsible for the construction of the Centennial Hall in Breslau (now Wrocław, Poland, see fig. 1). At that time, the self-supporting massive dome of this building, with a diameter of 65 meters, was the largest dome built since ancient times (Trauer/Gehler 1913& 1914).

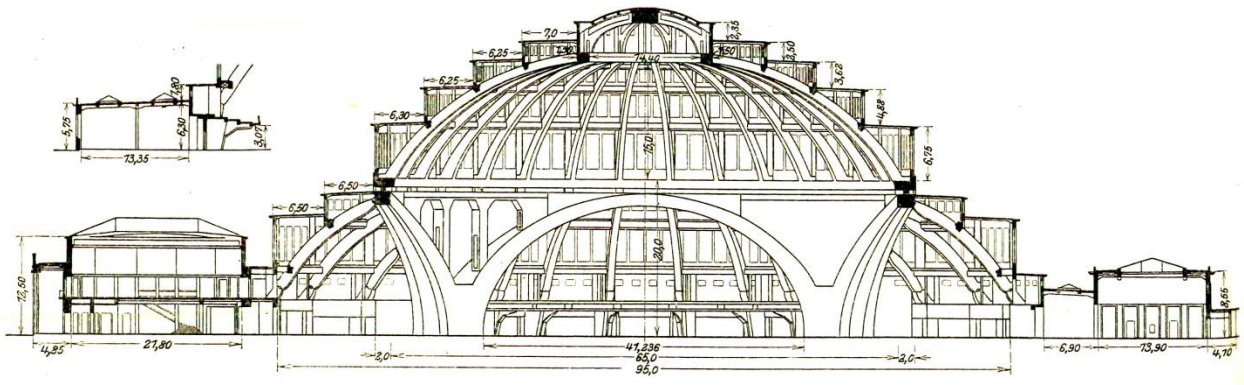

Figure 1: Cross section of Centennial Hall in Breslau (Trauer/Gehler 1913 & 1914)

In addition to his work in construction as an engineer, Willy Gehler was an assistant of Applied Mechanics at the THD. In 1906, he graduated and completed his doctoral thesis about secondary stresses in truss bridges, and soon after got a position to become a professor, known in Germany as “habilitation”. In the winter semester of 1912/13, he was appointed as Mehrtens' successor to the chair of statics, strength of materials and construction of steel bridges. Thus, for the first time, an engineer with practical experience was preferred instead of old-established state officials. Gehler stayed at the THD until his dismissal in 1945.

During the First World War, Gehler was the head of the department for building-inspection at the War Office. This is maybe a reason behind his strive to standardize mandatory regulations for concrete structures. A very important turning point in his career is the appointment as director of the department of civil engineering of the “Experimental and Material Testing Office” (in short: VMA) of the THD in 1918, which was one of four public testing institutes in Germany at that time. He maintained a busy professional correspondence with the heads of other institutions, especially with the director of the Stuttgart’s Material Testing Institute, Prof. Otto Graf.

Gehler’s researches in the NS era and his degradation 1945

Gehler joined the NSDAP very early. After 1933, he conducted experiments for the Ministry of Aviation and the Ministry of Defense, for the Organisation Todt and Himmler's SS (HstA 15764). In addition to tests of the fire behavior of concrete, he performed testing regarding bullet resistance. High-ranked officers took part at these tests and documents demonstrate further projects. A conversation protocol shows that Gehler was involved in researches about a 500-t-freighter; presumably out of concrete (UA TUD A/306 1942-1944). This assumption is supported by the fact that Gehler, in his curriculum vitae, under research for the Soviet Military Administration (SMA), referred to a "prestressed reinforced concrete ship" (UA TUD A/270). We found evidences that he offered patents (air raid shelter and hooped stoned baskets) to the Soviet Union. Another aspect is a document, with notes of Gehler’s colleague Benno Löser, which assesses the development of a bomb-proof wall structure by Gehler (UA TUD NL 120). Furthermore, there are evidences that Gehler had worked as a consultant for the armaments factories Junkers and Brabag (Sonnemann et al. 1988). The evaluation of new sources should illuminate more details about Gehler’s work during the period of 1933-1945. In several letters, Gehler stressed the importance of his war research. This corresponds to the state of mind at that time, and may be viewed as a legitimization of his work in front of Nazi authorities.

In the summer of 1945, Gehler was released as one of the first members of the former NSDA (Haritonow 1995). However, he was able to continue his research in the VMA under control of the authorities of the Soviet Union and the Soviet-occupied zone (SBZ). For a couple of years, he tried

to be reinstated to his former functions. It has been confirmed by various sources that he was not a convinced National Socialist (UA TUD II / 245). This "clean bill" changed the higher education service, but the actions of the authorities were very different. In summer and autumn of 1945, almost all former Party members had been dismissed. A lot of the so called "nominal" former party members were allowed to restart their activities. Their knowledge was essential for the new authorities. We don't know why Gehler was allowed to continue his experiments otherwise just as a laborer at the VMA. The fact that he was more than a member of the Nazi party, he promoted the SS, cannot be the reason. This fact is true for about a third of the professors at the THD, as well as the later rector Enno Heidebroek, who had been technical director of the Peenemünde Army Research Center for a few months.

Political engagement and self entaglements

Willy Gehler engaged in politics in the Weimar Republic, in the National Socialism and in the SBZ/GDR (Hänseroth 2003; UA TUD II/245). In 1919, he joined the German People's Party (DVP), a reservoir of conservative forces with a penchant for monarchy. But at this time, it was an unusual step for academic minds. The majority of them faced the first democratic government skeptical. Gehler was socially active, too. He was co-founder and chairman of the *mensa academica* and the Higher Education Association, which forced the construction of a student house at the THD.

In May 1933, Gehler joined the NSDAP. So he belonged to the group of the so-called "Märzgefallene" (march fallen), who primarily had a middle-class background. They joined the party in particular for opportunistic and career reasons after the Reichstag elections in March, 1933. This can be assumed solely as opportunism because Nazi's beliefs at that time were not explicitly linked to an anti-Semitic statement. In January 1934, the NSDAP leadership of Saxony criticized his appointment to the senate of the THD, because he tried to support the NS, but "in earlier times he was not friendly to it." (HStA 15542). His association and membership in the SS has been evaluated in context. This act symbolizes activity at Hilter's party without being active.

On May 23th, directly after the end of World War II, Gehler joined the Liberal Democratic Party (LDP), which was founded one year before the Soviet Occupied Zone. Again, this was a reservoir for the bourgeois milieu, although not that religious oriented as the CDU and less conservative than the later NDPD. As one of the parties of the "anti-fascist bloc", the LDP could confirm, that certain individuals had been only "nominal" members of the NSDAP. Similar to Gehler's party affiliation during the NS era, this step has to be seen in this context. The aim of his political commitment was his academic reappointment as Professor and reemployment and access to resources. In the LDP, he was Chairman of the Technical Committee and worked in a leading position in the committees of the state government as well as in the "Kammer der Technik" (Chamber of the Technology), the East German successor to the Association of German Engineers (VDI). This demonstrates again his proximity to decision-makers. However, the reinstatement to his previous positions remained blocked until his death in 1953s, despite of the influence of well-known colleagues and his work for the Soviet authorities.

GEHLER AS A "FATHER OF STANDARDIZATION"

In addition to his biography, a main part of our research is his leadership as a pioneer. At the beginning of the 20th century, efforts in Germany for a uniform calculation of reinforced concrete started. The first regulations of 1904 were vague and not mandatory in all parts of Germany. Germany, as well as Switzerland or Sweden, decided to concretize their regulations. Other states

(e.g. France 1906) left their regulations for a period untouched, to offer the designing engineer more liberty for his constructions. Initially, each city in the USA had its own regulations. In the early 1920's, an amalgamation of relevant associations published a basic paper which changed this issue in the USA. In 1907 the "Deutscher Ausschuss für Eisenbeton" (DAfEb, nowadays: DAfStb, is a German committee for reinforced concrete) was founded. Based on practical tests, the committee wanted to define precisely the existing regulations for the new material. As a result, the first mandatory regulations in Germany were introduced in 1915/1916 (Lorenz-Meyer 1928).

At the time he worked at the company of Dyckerhoff & Widmann, Gehler joined the DAfEb 1909. Therefore, he was involved in the development of the regulations and standards from the beginning. Whenever the regulations were updated, Gehler published a supplementary book (Erläuterungen zu den Eisenbetonbestimmungen) for practical civil engineers (e.g. Gehler 1933). In Addition, he was member of the DBV ("Deutscher Beton-Verein" − the first German committee for concrete structures). Moreover, Gehler had a high reputation in steel structures, which can be proved by his publications (UA TUD A/270) and his membership in the "Deutscher Ausschuss für Stahlbau" (DASt, it's a German committee for steel structures).

Due to his memberships and his competence in Steel and concrete structures, it seems to be a logical consequence, that he was a founder of the "Normenausschuss der deutschen Industrie" (NADI, later DNA, nowadays DIN, is a committee for standards). Until the end of the 2nd World War, he was in a leading position of den NADI and was the coordinator of subcommittees like chimney construction or buckling risk of reinforced concrete columns. Furthermore, he was an advising member in other subcommittees, such as the commission for new design and construction. As conductor of the VMA Dresden since 1918, we believe that he had had a relevant influence on standardization. This is a point we will quantify. His influence after the 2nd World War will be investigated as well. At this time, Gehler was a conducting member of the "Landesausschuss Normung & Typung" (committee for standardization in Saxony) (UA TUD A/270).

GEHLER AS A REFERENCE FOR CURRENT APPROACHES AND THE REGARD FOR THE CURRENT RESEARCHES OF THE INSTITUTE OF CONCRETE STURUCTURES

Finally, to show the diversity of Gehler's work, we describe a selection of Gehler's main research with respect to reinforced concrete. Its relevance to our work today will be part of our description, too.

Influence of electricity on concrete

These early research works were published during Gehler's employment at Dyckerhoff & Widmann (Gehler 1910). Since 1910, no relevant papers on this topic have been published. Today, electricity network operators plan to build poles made of a relatively new building material, ultra-high performance concrete (UHPC). In this context, new research is necessary to determine e.g. electronic parameters of this modern concrete as well as the influence of alternating current on concrete structures. Another aspect is the behavior of concrete when it is striked by lightning. Currently, the knowledge is widely dispersed; Gehler's work is an important reference.

Tests for the improvement of innovative building materials

With the invention of rapid hardening Portland cement (Gehler 1926; Gehler called it "high quality cement") it was possible to accelerate the construction phase. Another advantage of this cement was the higher strength of the concrete, which reduced the amount of material needed and

the associated consumption of resources. The launch and the dissemination of steel with higher strength, as reinforcement as well as structural steel, were important for him, too (Gehler 1924). For the first time, reinforcement, with high strength and diameters up to 50 mm, was used for the design of the transverse platform at the rail station in Leipzig. Nowadays, optimization is still an important aspect for us. Therefore, efficient und sustained constructions are a main part of our work at the Institute of Concrete Structures e.g. we are working with new concretes and alternative reinforcements.

Standardization and design of reinforced concrete structures

For several years Gehler dealt with basic aspects of concrete e.g. the strength of concrete samples with different geometry, the material's behavior and the basic design criteria (e.g. Gehler 1928, 1934, 1943).

For current researches at our Institute of Concrete Structures, Gehler's tests form the 1920's, e.g. the issue of friction among surfaces are still important. Today, this phenomenon is well known for standardized tests, but its influence in multi-axial tests is essential for the interpretation and the assessment of test results (e.g. Curbach et al. 2011).

Another point is the geometry and the dimensions of the sample. Gehler investigated these effects and proposed interpretations. For standard concretes, the influence of these parameters is well documented, but for the establishment of new materials, these aspects are not yet considered consequently. Nowadays, tests are still an important base for the development of design criteria. In this context, it is necessary to name the tests and interpretations of Gehler about the plastic behavior of concrete (e.g. Gehler 1934, 1943). Furthermore, the discussion about the bending design with limited stresses has to be named as well. Since the first regulations (1904) for reinforced concrete, the ratio between the Modulus of elasticity of steel E_S and that of concrete E_c (its important within the so-called n-method, a former design method in concrete construction) was determined with a constant value of 15 ($n = E_S/E_c = 15$). This was supported by Mörsch (University Stuttgart), too. It was discussed intensively during this time if it was possible to determine the n-value as a constant and independently from the general conditions (Emperger 1931). After the 2nd World War, the n-method was established in the Federal Republic of Germany (FRD). The Material behavior at service-limit state was described via a linear stress-strain relationship. In other European Countries, including the GDR, the load-factor method was introduced. The load-factor method was the design Gehler preferred. We want to analyze if there was a political background for these different approaches. Subsequently, a bending design, independently from the n-value was introduced in the FRD, too.

Buckling of reinforced concrete columns

The stability failure of concrete structures (e.g. Gehler/Hütter 1954) and steel structures (Gehler 1924) were an important topic for Gehler. The investigations were general because they were taken directly into the standardization process. Furthermore, Gehler criticized other publications and generated a discussion with other experts. Gehler's research is still interesting because our designed columns with the new material UHPC can be very slender. Therefore, buckling is an issue again. In our evaluations, the knowledge of Gehler will be taken into account (Schmidt et al. 2014).

CONCLUSION AND PERSPECTIVE

Willy Gehler – a person of contrasts. At the first glance a political follower, at the second glance we have to state that further research is necessary to evaluate Gehler's life. It is easier to assess his expertise, which is high and generally accepted. Until now we don't know much about his contract research during the NS era, which will be analyzed as well.

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