TECHNOLOGY, ENGINEERING AND MODERNITY IN TURKEY: THE CASE OF ROAD BRIDGES BETWEEN 1850 AND 1960

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ABSTRACT

TECHNOLOGY, ENGINEERING AND MODERNITY IN TURKEY: THE CASE OF ROAD BRIDGES BETWEEN 1850 AND 1960

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Almost all the sources on modernism originate material transformations in Western world to industrial revolution while mental ones to enlightenment. In all these narrations, technology, engineering, and modernism are considered as correlated. Besides these concepts, the everyday life rituals that were naturally constructed in the historical process also strengthen this attitude. Then, what are the meanings of the same concepts in a country that experience a reverse process instead of the modernization through industrialization? How new technologies had adapted to local circumstances of an unindustrialized country?

While having these questions in mind, this study intends to identify the role of engineer and to reflect on the importance of technology on Turkish modernization project, hence, this dissertation is an historical inquiry into the role played by new building technologies and civil engineering. It covers a broad period extending from late Ottoman to 1960. Among many prestigious building types of engineering such as silos, dams, harbors, factories, railroad etc. that also became popular representations of development, prosperity and modernity, the bridges have been focused on with a particular emphasis because of both their importance for engineering and construction of transportation networks.

Keywords: Road Bridges, Engineering Ideology, Technology, and Modernity

ÖZ

TÜRKİYE'DE TEKNOLOJİ, MÜHENDİSLİK VE MODERNLEŞME: 1850-1960 YILLARI ARASINDA KARAYOLU KÖPRÜLERİ

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Modernizm üzerine yazılmış hemen hemen bütün kaynaklar batı dünyasındaki düşünsel dönüşümleri aydınlanmaya bağlarken maddi dönüşümleri ise endüstri devrimi ile ilişkilendirir. Bütün bu anlatılarda teknoloji, mühendislik ve modernizm bağlantılı olarak ele alınır. Bu kavramların yanısıra söz konusu tarihsel süreçte doğal olarak oluşan günlük yaşam ritüelleri de bu yaklaşımı güçlendirir. Peki acaba endüstrileşerek modernleşmek yerine Türkiye gibi süreci tersten yaşayan bir ülke için aynı kavramların anlamları nedir? Yeni teknolojiler endüstrileşmemiş bir ülkenin yerel koşullarına nasıl adapte edilmiştir?

Bu sorular altında yapım teknolojileri ve inşaat mühendisliği üzerine tarihsel bir araştırma olan bu çalışma, teknolojinin, mühendisliğin ve mühendisin bizzat kendisinin Türk modernleşmesindeki rolünü tanımlamak ve önemini ortaya çıkarmak amacındadır. Sürecin daha iyi izlenebilmesi için geç Osmanlı döneminden 1960 yılına kadar geniş bir dönem çalışılmıştır. Baraj, silo, liman, fabrika, demiryolu vb. kalkınma, gelişme ve bayındırlığın popüler temsilleri olmuş diğer birçok önemli mühendislik eserleri arasında köprülere özel bir önem verilmesinin nedeni ise bu yapıların hem mühendislik açısından hem de ulaştırma ağlarının kurulması açısından önemi dolayısıyladır.

Anahtar Kelimeler: Karayolu Köprüleri, Mühendislik İdeolojisi, Teknoloji ve Modernleşme

To Nurhan, Hüseyin and Oğuz Tevfik Örmecioğlu
My friends, My mentors, My family

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BİD	Bayındırlık İşleri Dergisi
BİMAŞ	Birleşik İnşaat ve Mühendislik Anonim Şirketi
DSİ	Devlet Su işleri
GAC	Government Affiliated Company
GLC	Government Linked Company
HAFRABA	Association for the Planning of the Hanseatic Cities - Frankfurt – Basel
İDT	İktisadi Devlet Teşekkülü
IMF	International Monatery Fund
ITU	Istanbul Technical University
KDF	Kraft durch Freude
KGM	Karayolları Genel Müdürlüğü
KİK	Kamu İktisadi Kuruluşu
KTU	Karadeniz Technical University
MAN AG	Maschinenfabrik Ausbrug-Nünberg A.G
METU	Middle East Technical University
NATO	North Atlantic Treaty Organization
NİD	Nafıa İşleri Dergisi
NOHAP	Nidquist Holm Co
PIARC	Permanent International Association of Road Congresses
RC	Reinforced Concrete
SAFERHA	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi
SEE	State Economic Enterprises
SİMERYOL	Sivas – Malatya – Erzurum Railroad
SİT	Societe Industrielle des Travaux Co.
TMH	Türkiye Mühendislik Haberleri
TÜMAŞ	Türk Mühendislik, Müşavirlik ve Müteahhitlik Anonim Şirketi
UN	United Nations
YMMM	Yüksek Mühendis Mektebi Matbaası

CHAPTER 1

INTRODUCTION

In this chapter, the themes leading this thesis and the method used to carry out the study are presented. First, in order to make the main proposition more apparent, two central terms of Turkish modernization process concerning technology and built environment will be framed through the early republican and the late Ottoman periods. These themes are "contemporary civilization – *muasır medeniyet*" and "developed country – *bayındır ülke*". Although they both were vital themes of the early republican period, their meanings were rooted in late Ottoman modernization, and they had continued their effects in the subsequent periods of the Republic. Even today, they have still assumed as related with concepts of modernization and progress. After explanation of the main themes, the objectives of the thesis will be stated in relation to the literature survey and then the method used will be explained. Lastly, the organization of the thesis will be presented.

Before starting two points should be clarified; firstly, the notion of engineering today covers a broad area of study diversified from genetic engineering to social engineering, and it is used for a general name of all these professions embraced the principle of positivist thinking. However, it is employed in this thesis not for all these professions but only in place of civil engineering as commonly it was in the 18^{th}, 19^{th}, and early 20^{th} centuries before specialization of the profession. Besides, the specialization of engineering would not truly be launched in Turkey until the second half of 20^{th} century.

Secondly, as mentioned above there are two vital themes that had to be explained in depth before starting. Nevertheless, one of these two themes, "*bayındır ülke*" unfortunately has no direct translation in English. Although in this study, "developed country" is used to provide a meaning close to *bayındır ülke,* the word development describes a state in which things are improving in general. On the other hand, due to the socio-cultural construction of the term in time, the word *bayındır* had many other connotations different from "developed". However, the terms *bayındırlık* and *imar* had been used as suggestive of the term "development" until the invention of the word *kalkınma* in 1960s.

1.1 Themes

Linguistic history of local concepts of a country would give clues about transformation of a country together with its society. Hence, this part of the study embraces such a method to understand the above-mentioned themes more clearly.

1.1.1 The Concept of "Contemporary Civilization - Muasır Medeniyet"

Unlike today's conception, in almost two hundred years long process of the Turkish modernity project the terms "development" and "progress" had not always identified within the body of westernization. Much contrary, it was at first assumed as exportation of technologic improvements totally devoid of the westernized daily habitual. Ziya Gökalp (1876-1924), the official ideologue of the Young Turk movement and holder of the first chair of sociology at Istanbul University (1912) was one of the very first Turkish intellectuals proposing the selective adaptation of western knowledge.

As per Gökalp (2006a), the main problematic of Ottoman Empire on its way to reform was the problem of national identity versus international values of modernity. He defined *"medeniyet"* (civilization) and *"hars"* (culture) as two separable notions in the tension of national-international duality. His dichotomy was actually proposed as a solution for the identity problems of Ottoman-Turkish-Islamic society, confronting western-based modernity.

In his teaching, Gökalp delineates the term "culture" within the body of national identity. According to his theory, culture is national and specific to every ethnic group because it is based on "mores" of communities and do not have to be rational but rather has to be sentimental. On the other hand, he argues that "civilization" is a product sum of all the "traditions" which are produced by diverse sub-cultural groups –in other words ethnic groups- and passed on from one to another. At the end of this process, it becomes inter-group artifact rather than a group product. Therefore, he points that the culture is natural while civilization is artificial (Berkes, 1936, pp. 238-246).

Gökalp believed in the dualism of civilization and culture but at the same time tried to find out relations in between[1]. As Berkes (1936, pp. 242-243) explained, in Gökalp's theory the traditions of a particular civilization have to be in accord with mores of the particular nation, thus they may become incorporated in institutions. According to him, every nation can assimilate international traditions only by incorporating them into national institutions and by changing their original characteristics. By this way, the conflict of the traditions with individual experiences will results in the rise of scientific criticism and rationality, while cultural criticism or common sense results from the conflict between the traditions and the mores.

In this respect, Gökalp defended that Ottoman modernization should import the scientific and technological advances without importing the westernized way of living. His definition of civilization separate from culture, as products of different levels of interactions -in-group and inter-groups' interactions- enable him to propose a solution for "modernization without westernization." By this way, he can divide western civilization and western culture into two separate notions and, as a result, he can propose a logical base to adopt western knowledge in a selective process, which allows traditions of progress, rationality, science, and technology in but put western mores out. Throughout the all late Ottoman period, together with the common negative perception of westernization that can be best traced in the literature of *tanzimat* (administrative reforms-1839) and *meşrutiyet* (constitutional monarchy -1876) periods (Gündüz, 1997, pp. 271-981), Gökalp's theory became one of the leading ideologies among Ottoman intelligentsia, and guided the understanding of the term *muasır medeniyet* especially in the Young Turk political vocabulary before 1918. In this context, the diagnosis of Ottoman intellectuals to the decline of the Empire was to import the scientific spirit of enlightenment to reach the technological and the industrial level of development of western countries without their cultural and moral outcomes. As clearly stated in Gökalp's (2006b, pp. 89) words in one of his best known essays called *Türkleşmek, İslamlaşmak, Muasırlaşmak* (Turkification, Islamization, Modernization); "being contemporary with

[1] Dualities like civilization versus culture, international versus traditional and modern versus traditional etc. although seems like the main problematic of non-western modernization projects, they have been also valid discussions for European nations in anti-modernist and anti-globalization discussions. For example see: Herf, J., "Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich", Cambridge University Press, 1984. and Herf, J., "The Engineer as Ideologue: Reactionary Modernists in Weimar and Nazi Germany", *Journal of Contemporary History* (SAGE, London, Beverly Hills and New Delhi), Vol. 19, 1984, pp.631-648.

modern civilization means to make and use battleships, cars, and airplanes that the Europeans are making and using". In this respect, the definition of the term *muasır medeniyet* was limited with material outcomes of scientific and industrial development, and associated only with technological advance -especially related with military modernization- until the republican period. Featuring the products of science and technology as modernity and western civilization, hence, glorified them together with the socio-cultural role of engineer as its natural implementer. Since then technology and its artifacts earned representational meanings.

According to Ortaylı (1999, pp.23-25), the decision of reform in Ottoman was taken not out of admiration of the West, but out of domestic impulse of need for transformation. First modernization attempts were to overcome the problems that had been never met before, rather than being mere imitation of western methods. Hence, they were just partial solutions to critical problems of Ottoman military and administrative systems. The reforms began with the establishment of *Tıphane-i Cerrahane-i Şahane* (Military Medical School) and *Mühendishâne-i Hümayun* (Military Engineering School) and continued with administrative reforms in 1839 and proclamation of the constitutional monarchy in 1876. They were mostly about technical or administrative alterations rather than improvement of social and economical conditions.

Unlike their Ottoman counterparts, republican intelligentsia conceived the term civilization in more holistic manner due to the failure of previous reformist attempts. In their perception, civilization is so broad that cannot be reduced only to its artifacts. The battleships, cars or airplanes were more than being mere products of high technology and industry, were believed to be results of the social context and historical process in which they were created. Therefore, it can not be split from its cultural roots and importing one without other is impossible. In their opinion, all the outcomes of contemporary civilization without excluding any piece are welcome as indispensable parts of this integrity. In Ataturk's speeches of the late twenties and thirties, *muasırlık* and *medeniyet* became two central terms. Most of his 1930s speeches had references to the twin themes of modernization and civilization –in some cases correlated with *bayındırlık*; such as, "We shall elevate our nation to the level of the most prosperous and civilized countries…We shall lift up our national culture to the level of contemporary civilization.[2]" As Bozdoğan (2001, p.106) mentioned, republican intelligentsia perceived the notion of contemporary civilization almost in a teleological manner, hence as Ataturk stated, "the straightest, truest way is the way of civilization" (Akçakayalıoğlu, 1982, pp.626-627); and she continues, they believed that the contemporary civilization is a "universal trajectory of progress that every nation had to follow - a teleological destiny that could not and should not be resisted" otherwise it may "burn and destroy those who are not interested in it" (Giritli, 1988, p.44).

From Empire to Republic, Turkish intelligentsia had interpreted the culture-civilization relationship fundamental for the ideological roots of Turkish modernity politics. Moreover, whether for the conservative side or for the modernist side, the discussions about the dichotomy between culture and civilization had come up constantly with science and technology. Different understandings of tmodernity were central to the solution of this dilemma, because technical advance appeared to both sides of the dispute as vital importance for the solution. All these discussions posed a serious problem; how and to which extent traditions and national culture should be reconciled with technical advance? The answers, which varied due to definitions of *muasır medeniyet*, delineated the importance of the technology and accordingly the engineer, too.

As mentioned above, even in the late Ottoman reform era, when universal civilization had been approached suspiciously, adaptation of the western technological advance believed as the indispensable. The efforts of cultural absorption of technology into national Turkish culture let to a highly selective appropriation of modernity, which can be interpreted as a kind of "determinate modernism." For instance, construction of road first started in 1834 for mail services and later used for transportation of commercial goods, but not initiated the notion of travel in public life. Likewise, the use of *araba*s (coaches) as means of freight forwarding and communication was always allowed, although it was limited in urban life. For several decades the use of *araba*s were privileged to royal family and high-level aristocrats. For the reason that the women use them to go to *mesire yerleri* (recreational places), the use of coaches was be restricted in Sultan Mahmut I era (1752). The history of restriction on the use of coach was to be repeated several more times during the following centuries, but it would be inevitably popularized in the second half of 19^{th} century.

[2] "Yurdumuzu, dünyanın en mamur (bayındır) ve en medenî memleketleri seviyesine çıkaracağız. Milletimizi, en geniş, refah, vasıta ve kaynaklarına sahip kılacağız. Millî kültürümüzü, muasır medeniyet seviyesinin üstüne çıkaracağız" M. K. Ataturk, 10^{th} year speech, 1933.

Recaizade Mahmut Ekrem would write his famous novel *"Araba Sevdası"*[3] on this popularization (Tekeli and İlkin, 2004, pp.84-92).

On the other hand, the terms science and technology come up constantly with the term civilization in 1930s writings. Ataturk described science and techniques as torch for Turkish nation "on the road of development and civilization." Scientific thought and technical approach were not only defined as tools for material development but also guides for social and political cultivation of the nation. He said, "knowledge and science would be our guide in social and political life, and in ideological education of the nation" (Ülken, 1988). This understanding played a vital role in the social construction of science and technology, and cultural role of engineer in early republican Turkey. Besides, unlike in the Ottoman period, now the country was in peace and started a boom of reconstruction even with its limited economical sources. Hence, it increased activity and popularity of the Turkish engineering, which was almost reduced to the success stories of Hijaz Railroad project. Unlike in Ottoman period, in republican period, the terms technology, development, and progress had been not only abstract concepts but also turned into ocular physical artifacts and investments that even an ordinary citizen can see and be proud of. New engineering edifices were concrete evidences of new republic's victory in its struggle with economic conditions and with untamed geography of Anatolia.

Nevertheless, in an unindustrialized country like Turkey, industrial and engineering achievements were also modest when compared with the other contemporary examples especially in the United States of America and was long away off being equivalent of the

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[3] *Araba Sevdası* (The Carriage Affair) is one of the most popular works of late Ottoman Turkish literature. Bihruz Bey, the main character of the novel is a snob, who has inherited fortune from his father, obsessed by women and carriages. The novel criticizes the futile activities of Turkish bourgeois and their affectation to technology. Parla summarizes the theme of the novel as follows:

"The Turkish novel's preoccupation with cars and carriages begins in the Tanzimat period, with Recaizade Ekrem's *Araba Sevdası* (The Carriage Affair)...Among the other novels of the *tanzimat*, Ekrem's novel occupies a unique place: it displays its writer's awareness of the cultural chaos of his age... The novel is composed as a parody of futile writing and reading activities, as futile as the rounds made by the fancy carriages of westernized beaus [snobs] in the fashionable Çamlıca. Bihruz Bey of *Araba Sevdası* is one such beau whose one fad in life is a carriage that he flaunts as he rides dressed in the most elegant and fashionable manner..." Source: Parla, J. "Car Narratives: A Subgenre in Turkish Novel Writing", *The South Atlantic Quarterly*, Duke Univesity Press, Vol.102, No.2/3, Spring/Summer 2003, pp.535-550.

enthusiasm felt for technology. Therefore, rather than through physical environment, the new *muasır medeniyet* concept of Kemalist ideology[4] represents itself best in the new iconography of the Republic and increasing popularity of technology in daily agenda. As Bozdoğan (2001, pp.114-151) narrated in detail, in popular journals like *Endüstri, La Turquie Kemaliste, Muhit, Resimli Ay* and official journals like *Nafia İşleri Dergisi, Demiryollar, Ülkü* etc. industrial and engineering works hailed as precursors of a long-awaited new age, which was obviously modern. Not only fast going trains, shiny cars, neat modern cities, long span bridges, and impressively high skyscrapers of industrialized west, but modest local engineering achievements such as silos, tunnels, bridges, new industrial plants, electricity, irrigation and telephone substructures were also embraced as primary agents of social change.

Meanwhile, as many socio-professional groups, architects were also intensely discussing bringing together technology with national values. Main discussion concentrated on reconciliation of technological advance with national architectural forms. While architects were having serious polemics on modern-national dichotomy, the Turkish engineers generally seemed not interested. In spite of heavily ideological modernist tradition of engineering, engineers gave the impression that deliberately kept distant to cultural politics while architects were more involved. Conversely, rather than architecture, the iconography of technology best embodied and represented in the engineering edifices on the daily agenda by literary and visual media. The artifacts such as bridges, silos, dams, harbors, factories, railroad etc. turned into icons of progress and prosperity and came into prominence far more than their economical and technological reality. All these fetishized images of engineering were "not only testimony to the new republic's mastery over nature, but also [they] exemplified an impressive aesthetic refinement of a utilitarian program" (Bozdoğan, 2001, p.120).

The glorification of technology and engineering edifices in collective mind as modern icons and aesthetic values also elevated value of engineering and accordingly the position of engineer. More than being mere professionals, since then, engineers had undertaken the role

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[4] "Kemalist ideology, which found its expression in Atatürk's reforms, sought to create a modern, democratic and secular nation-state, guided by educational and scientific progress based on the principles of positivism, rationalism and the enlightenment." Source: Available on 2.2.2010 at http://en.wikipedia.org/wiki/Kemalist_ideology. For further information see: Ciddi, S., "Kemalism in Turkish Politics: the Republican People's Party, Secularism and Nationalism", Routledge, NY, 2009.

of being the contractors of the modern republic. Soon after, they will become one of the forefront agents of the Turkish modernity project as individuals and as a professional group, and would undertake vital roles in bureaucracy, in private sector and even in government.

1.1.2 The Concept of "Developed Country – Bayındır Ülke"

In 1848, the first department, which then will be the seed for the Ministry of Public Works, was founded. It was called "*Umur-u Nafia Nezareti*" rather than direct translation of the European name, which is "A*mme İşleri Nezareti*". Later, this would be furnished evidence Works of a sign of an undemocratic governmental system of Ottoman Empire in the official Journal of the Ministry of Public.

> "...in an era of attributing everything to sultan was a tradition and a duty, and the public was not highly rated, it was not found proper to call the ministry with the same name called in Europe. Hence, without startling the sultan, it was called *"Nafia Nezareti"*.[5]
>
> *"Cumhuriyet Nafiası", Nafia İşleri Dergisi, 1938(f), v.5/5, pp.1-3.*

Before invention of the term *nafia,* the word *imar* was used as direct resemblance of development; however, it was directly related with improvement of the land without any reference to development of the public (Tekeli and İlkin, 2004, p.5). In classical Ottoman system, public is vassal unconditionally serving the Sultan rather than being citizen; and the land is property of Sultan, who decides the tenure. Although it was criticized above as not being daring enough, under such conditions, the establishment of *Umur-u Nafia Nezareti* was in fact a hidden introduction of the concept "public" and a sign of transformation of the state. Emergence of this kind of service was realized within the atmosphere after *tanzimat* decree, which altered the relationship between the ruler and his subjects, and naturally, the consequences were reflected in various social practices, such as law, education, and especially public works. This simple but remarkable change in the linguistic preferences of

[5] "Bu teşekküllerin memlekerimizde de kopye edilmeye başladığı ve Osmanlı İmparatorluğu'nun son devirlerinde Avrupa'da "Amme Işleri Nezareti" namı verilen nezarete aynı ismin verilmesi, her işi hükümdarlara izafe etmek bir anane ve bir mecburiyet olan ve halka bir mevki ve kıymet verilmeyen bir devirde, caiz görülmemiş ve padişahı da ürkitmeyecek şekilde umuru nafia nezareti denmiştir." Source: "Cumhuriyet Nafıası", *Bayındırlık İşleri Dergisi*, T.C. Bayındırlık Bakanlığı, v.5/5, Birinci teşrin (Oct.) 1938, pp. 1-3.

the new terminology was actually very significant. It was a sign of the change in the purpose of development from the enhancement of the Sultan's land to utility of the public.

After 1928, Ataturk started a campaign to eliminate foreign words as part of a nationalist program. Under this campaign, "*Nafia Vekaleti*" was renamed as "*Bayındırlık Bakanlığı*" in 1935. It was a politic stance in identification of culture through new ideals of the national modernity project. Unlike the word "*nafia*" derived from the root "نفع - *nef*" which means utility, the new word was coined from a Turkish root "*bay*" which chiefly means prosperous. (Develioğlu, 1970; Çağbayır, 2007; Kiraz, 2006; Nişanyan)

According to Tekeli and İlkin's (2004, pp.3-15) study on various late Ottoman *lahiyas*, the word development was used as *imar* in early 19th century. First *lahiyas* were concerning about diverse problems such as protection of trade networks, swamp drainage, habitation, and cultivation of population, and even preventing early pregnancy losses within the concept of *imar*. It was a general concept for development. The word "*imar*" was derived from its Arabic root "عمر - *umr*", which today we use as "*ömür*" (life). *İmar* was used as "reviving a place," the same as revive also derived from the Latin root "*viva*" (life).

However, the main attention was given to construction works such as construction of roads and bridges. From 1845s to 1880s, they observed that the emphasis on construction had increased and diversified, and the concept of *imar* started to cover other civil engineering facilities. The word *imar* was resembling for especially development in physical environment that, having buildings such as mosque, madrasah, han and bath were assumed as physical signs of development and these objects are named in general with an other word produced from *imar*: *imaret* while the subject is *mimar*. The meaning of the concept was narrowed down but was detailed in time, and changed into the word *bayındırlık* with all its connotations about construction transferred in the neologism. (Nişanyan, 15.9.2009)

The emphasis on construction within the concept of development[6] have increased and diversified in time. The development plans were first mentioning about roads and bridges, than later, construction of railroads and communication networks. Especially the Hijaz Railroad project would occupy the Empire's agenda in its last decades. Even before

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[6] Finally, it was replaced with another general concept, "*kalkınma*", in the second half of the 20th century.

proclamation of republic, the new government had recognized the urgent need for constructions under two main pressures; destructions of war and the exchange of populations with Greece. Solving both problems was vital for the perpetuation of the new regime. Former had political and economical importance on establishment of territorial integrity of country while later was vital for the integrity of populations and establishment of a new nation over ethnic differences. On this purpose, a construction boom was initiated including big scale infrastructure and engineering projects such as railroads and roads, dams and harbors, factories, silos and etc. and small scale urban projects called model villages for the settlement of immigrants. In addition, two different ministries, "Ministry of Public Works" and "Ministry of population exchange and settlements" were established in 1920. After three years, they were merged in one. Under these circumstances, *bayındırlık işleri* had political importance due to the establishment of integrity both territorially and demographically (Örmecioğlu, 2000, pp.20-27).

In the speeches and declarations in 1920s and 1930s, Ataturk mentioned frequently about the sub themes of the "*bayındır ülke ideali*" such as the construction of roads, railroads, dams, harbors etc. and refers them as both sin qua non ensigns and at the same time tools for development and prosperity. "...roads, railroads, harbors, land and maritime transport vehicles are material and political blood vessels of national existence; they are means of wealth and power" he said (İnan, 1930, p.266)[7]. On the other hand, he also said in inaugural speech of the National Assembly in March 1, 1922:

> "I explained you the basic principals of our activities in economical arena. Henceforth, we are waiting for our cabinet put into practice due to a plan on our basic principals. The construction works holds the most important place in such a project because activity of economical life depends purely on the condition of vehicles, highways, railroads and harbors...we have to embrace the construction works to perpetuate and to ensure economic development"
>
> *M. K. Ataturk, from the inaugural speech the National Assembly, March 1, 1922*[8]

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[7] "...yollar, demiryolları, limanlar, kara ve deniz ulaştırma araçları, millî varlığın maddî ve siyasî kan damarlarıdır; refah ve kuvvet aracıdır." M. K. Ataturk, 1930. Source: İnan, A., "Atatürk Hakkında, Hatıralar ve Belgeler", TTK Basımevi, Ankara, 1984, p. 266.

[8] "Sizlere, ekonomik alandaki faaliyetlerimizin ana hatları ile tesbit etmiş olduğum temel noktalarını genel olarak açıklamış bulunuyorum. Bundan sonra ekonomik politikamızda, tespit etmiş olduğumuz bu temel esaslara uygun olarak hazırlanacak bir plana göre, Bakanlar Kurulumuzun uygulamaya

As a result of the experiences of last hundred years of the Ottoman Empire, republican elites attributed vital importance assigned to *bayındırlık işleri* due to its relation with national sovereignty. Although Ottoman Empire had never been a colony, it had to accept the supremacy of foreign forces and lost its economical advance on its own land under capitulations. Even he had to get technological and economical support from foreign sources for the reforms and this situation made foreign forces closely involved with the decisions. In this regard Ataturk, by comparing with Ottoman era, asserts the freedom of *bayındırlık* as the symbol of national sovereignty; "...[Ottoman Empire] retained from developing country, construction of railroads, when it intends, foreign forces interlope immediately; even for construction of a school they do so."[9] Therefore, making the decisions about investments and constructing them with national sources and Turkish engineers was assumed as a sign of national sovereignty and had a symbolic importance beyond its economical meaning. In this circle, development and prosperity linked with the construction of *bayındır ülke*, and sovereignty was related with prosperity and economical advance. Hence, construction of *bayındır ülke* was related with sovereignty and independency. Therefore, Mustafa Kemal Ataturk's own words repeatedly alluded to this idea of *bayındırlık* in straight terms; "This broad country had to be built up. This nation had to be prosperous. Don't believe the possibility of existence when the country was not build up and the nation is not wealthy."[10].

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geçmesini bekliyoruz. Böyle bir projenin hazırlanmasında en büyük yeri bayındırlık işleri alacaktır. Çünkü, ekonomik hayatın işlemesindeki canlılık; ancak taşıt araçlarının, karayollarının, demiryollarının ve limanların içinde bulundukları duruma bağlıdır...Yaşamak için ve ekonomik gelişmemizi temin için, bayındırlık işlerine dört elle sarılmak mecburiyetindeyiz." M. K. Ataturk, March 1, 1922, from the inaugural speech on the National Assembly. Available on 10.10.2007 at http://www.bayindirlik.gov.tr/turkce/tarihce.php

[9] "Osmanlı Devleti, kendisini kuran esas unsurun, milletin insanca yaşamasını temin edecek işlere de girişmekten alıkonulmuştu. Memleketi bayındır duruma getiremez, demiryolu yaptıramaz, yaptırmaya giriştiği zaman derhal yabancılar karışır, hatta bir okul yapmak istediği zaman bile karışmayla karşılaşırdı." M. K. Ataturk; Soydan, M. , "Gazi ve İnkılâp", *Milliyet Gazetesi*, 24-25.12.1929. Source: Sevim, A. et al, "Atatürk'ün Söylev ve Demeçleri I-III", Ataturk Araştırma Merkezi, Ankara, 2006 (Available on 3.1.2007 at www.atam.gov.tr/index.php?Page=SoylevDemecler)

[10] "Bu geniş memleketi bayındır bir hale çevirmek gerekir. Bu halk, zengin olmak zorundadır. Memleket bayındır olmazsa, bu halk zengin olmazsa, size hâlâ yaşamak imkânından söz ederlerse inanmayınız." M. K. Ataturk; Soydan, M., "Gazi ve İnkılâp", *Milliyet Gazetesi*, 24-25.12.1929 Source: Sevim, A. et al, ibid.

1.2 Literature Survey

Almost all of the sources on modernism refer industrial revolution as the main threshold for material transformation of Western world in 19^{th} and 20^{th} century while dating enlightenment as its intellectual genesis. In these narratives, "technology" and "engineering" are presented as central concepts in understanding the Western contemporary condition. The historical process by which the meanings of these concepts are constructed also strengthens this attitude.

Starting around 1900s, a strong belief in technology as prerequisite of prosperity, development, and modernity was emerged and humanity started experiencing excitement of progress. In this context technology and its popular outcomes such as speed, steam power, locomotive etc. celebrated in every level of daily life with an extreme optimism. Thereafter, technology became a matter of discussion among intellectuals in almost every professional circle first with enthusiasm and then with anxiety. In the area of architecture Sigfried Giedion was one of the earliest scholars celebrating the capacity of new technologies and new materials in creation of new built environment. He wrote "*Bauen in Frankreich, Bauen in Eisen, Bauen in Eisenbeton*" in 1928 and "*Space, Time and Architecture*" in 1941 on determinant role of new materials on new architecture. Le Corbusier, Gropious and Mendelson also praised the engineering edifices in their various writings, hence Le Corbusier hailed American factories as "the first fruits of the New Age ."

However later, the expansion of technology into everyday life rituals oriented the discussions on questioning its meaning. Especially after world wars, social, economic, and intellectual responses to technology started to underline its vital importance in modern life together with its fatality. In this new era, leaded by Heidegger (1969), technology conceived not as products or processes but as the condition of modern life in which we consciously or unconsciously started to alter our existence. In the area of architecture Reyner Banham's "*Theory and Design in the First Machine Age*" (1960) was the first to question the role of technology in architecture. According to his criticism, modern architects did not fully comprehend the technological means of machine age but rather "expressed" them in their designs. In his latter work *"A Concrete Atlantis: U.S. Industrial Building and European Modern Architecture, 1900-1925"* (1986), Banham argues the resemblance between European modern architecture and American industrial buildings over grain elevators and daylight factory buildings. In his studies while he was criticizing modern architecture as visual resemblance of these engineering structures, he also praises these buildings, which were made by engineers as being honest expressions of function, technology, and structure.

Meanwhile, history of engineering and engineers started to attract more scholarly attention and emerged as other areas of inquiry. However, the history of engineers as the actual implementers of technology and their creations as symbols of the technological advance had been limited with the history of individuals and/or their products until recent decades[11]. After a period dominated under classic historiography of technology, a group of authors started to seek the social and intellectual responses of society to technology and engineering. They have been trying to highlight the ways in which attitudes toward technology were shaped in a wide variety of national and cultural settings and its the influences on creation of modern society. Although these "social construction of technology" studies contributed developing a critical conception on social history of engineering, their attempt was more in the side of sociology rather than history. Especially after 1990's, the issue of technology, engineering and modernity relations became popular and started to challenge the classical historical conceptions by means of a group of scholars such as Armytage, Picon, Kranakis and Misa. In these studies, authors investigated the both role of technology in creation of the modern world we live in today and in professional development of engineering and the engineer himself.

In all above mentioned sources, the notion of technology, engineering and modernity discussed in Eurocentric point of view. Although it seems reasonable when we consider west as source of industrialization, counter situation could also be quite interesting and fertile for the modernity studies. Thus, effect of technology and engineering in modernization of unindustrialized societies is a brand new study area and it remained dull so far, because of the implicitness of effects of technology in an unindustrialized society. In spite of various master and PhD studies studying relations of technology, engineering and modernity in industrialized societies such as Misa's (1987) *"Science, Technology and Industrial Structure: Steelmaking in America, 1870-1925"*, Ringrose's (1995) *"Engineering Modernity: Civil Engineers Between National State and Provincial Society in France, 1840-*

[11] Some of the most famous literature on this account can be listed as: Billington, D. P., "The Tower and the Bridge: The New Art of Structural Engineering.", Princeton University, Princeton, 1983; Billington, D. P., "Robert Maillart and the Art of Reinforced Concrete", MIT Press, Massachusetts, 1990; Billington, D. P, "The Innovators: The Engineering Pioneers Who Made America Modern", Wiley Pub., NY, 1996; Kirby, R. S., "Engineering in History", McGraw-Hill, NY, 1956.

1914", Sangun's (1996) *"Technology and Form: Iron Construction and Transformation of Architectural Ideals in Nineteenth Century France, 1830-1889"*, Legault's (1997) *"L'appareil de L'architecture Moderne: New Materials and Architectural Modernity in France, 1889-1934"*, Stults's (2005) *"The Age of the Machine: Technology's Role in German Intellectuals' Definitions of Modernity, 1900-1945"* and Hecht's (2000) *"Technology, Representation, and the German Nation, 1900-1929"* academic inquiries on technology, engineering and modernity in industrialized societies are very limited in international bibliography.

Since 1935, the Ministry of Public Works had published a journal *"Nafia İşleri Dergisi"*, and various reports about state's engineering facilities including engineering education. The Chamber of Engineers has been publishing a monthly bulletin *"Türkiye Mühendislik Haberleri"* since 1955, representing the professional view of engineers on the country's socio-political agenda. Moreover, the General Directorate of Highways has been publishing a bulletin *"Karayolları Bülteni"*since 1951. Lastly in addition to these periodicals, three books of official history of Ministry of Public Works compiled by itself were found in various libraries. These are "*Bayındırlıkta 50 Yıl 1923-1973*", "*Bayındırlıkta 60 Yıl 1923-1983*", and "*Cumhuriyetin 70.yılında Fotoğraflarla Bayındırlık ve İskan Bakanlığı*". However, independent attempts to write the history of Turkish engineering dates back to end of 1950s. First independent source found in the libraries is Uluçay and Kartekin's study on history of higher education in engineering. The study is a narration of technical education in Turkey since 19th century, based on interviews and archival materials. Following studies are *"Mir'at-ı Mühendis-Hane-i Berri-i Hümayun"* by Kolağası in 1986, Mutlu's "Bayındırlık Bakanlığı Tarihi 1920–1988" in 1989 and "*İstanbul Teknik Üniversitesi'nin Kısa Tarihçesi*" in 1990 by Kazım Çeçen,. By the end of 1990s, these kind of classical historiography writings transformed into sociological views parallel with the changes in west. PhD studies of two Turkish scholars Nilüfer Göle (1998) and Ahmet Öncü (1996) which latter will be published were the first studies in the area. Together with Artun's (1999) "*Fordizmin ve Mühendisin Dönüşümü*", these three sources are trying to write the social History of Turkish Engineering. The other dissertations related with the concurrent development of engineering and modernity in Turkey are Nalbantoğlu's "*The Professionalization of the Ottoman-Turkish Architect*" (1989), Aguiar's "*Tracking Modernity: Writing the Rails of Empire*" (2000) and Büyükakça's master thesis titled "*Ottoman Army in the Eighteenth Century: War and Military Reform in the Eastern European Context*" (2007).

Cüneyd Okay's *"Osmanlı Mühendis ve Mimar Cemiyeti"* (2008), *"Atatürk Dönemi Mühendis Mektebi"* (2007) and *"Eski Harfli Mühendislik Dergileri: İnceleme"* (2004), and Beydili's *"Mühendishâne ve Üsküdar Matbaalarında Basılan Kitapların Listesi ve Bir Katalog"* (1997) and *"Türk Bilim ve Matbaacılık Tarihinde Mühendishâne Mühendishâne Matbaası ve Kütüphanesi, 1776-1826"* (1995) are the recent studies based on researches on archival materials. Batmaz's (2006) *"İnşaatçıların Tarihi: Türkiye'de Müteahhitlik Hizmetlerinin Gelişimi ve Türkiye Müteahhitler Birliği"* and Tekeli and İlkin's (2004) *"Cumhuriyetin Harcı: Modernitenin Altyapısı Oluşurken"* are other recent studies in the area. In addition to these above-mentioned sources, also the memoirs and corporate histories of various construction firms and professional organization such as Yıldız Sey's (2003) *"Türkiye Çimento Tarihi"*, memoirs of Mustafa Şevki Atayman (1984), Fevzi Akkaya (1989), and Abdullah Demir (2006) and institutional histories of Emek and Tekfen, (1987*)* *"Emek İnşaat ve İşletme A.Ş."*, (2001) *"Başarının Tarihçesi: Emek İnşaat ve İşletme A.Ş. 40 Yıl"* and Mehmet Altun's (2006) *"Tekfen Yaşlanmadan Büyümek"* were also extremely beneficial for the study.

1.3 Objectives and Method of Thesis

The aim of this research is to study the road bridges built between 1850 and 1960 and to reflect on the importance of the engineering works as a part of Turkish modernization project. In this process, the role of engineer as an agent and engineering work as product and/or tool of modernity would be explored. Among many prestigious building types of engineering, such as dams, harbors, factories, railroads, silos, etc. that also became popular representations of technology, development and modernity, the road bridges and among almost three hundred years of Turkish engineering history - from establishment of *Hendesehane* (The School of Geometry-predecessor of the School of Engineering) in 1734 to present - the period between 1850 and 1960 have been focused on with a particular emphasis. The reason of preference of studying road bridges in a period when railroads are more dominant is about the production process. Unlike road bridges, railroad bridges were bided within the part of line while road bridges were esteemed as singular engineering projects. In republican bridge building policy, the bridges were valued much more important than the roads since the public was not mobilized. When considered the harsh geography of Anatolia, bridging the wild rivers and high valleys had cleared up the physical deprivation even if the roads had not built yet (Şen, 2003, p.91). In the covered period even after the establishment of KGM in 1950, the road bridges hold its own prestigious position in collective mind as engineering edifices. The roads became more important than bridges following 1960s, after the increase individual car ownership and the developments in bridge construction technology such as prefabrication and post-tensioning. Thereafter, bridging long spans got easier, and the road bridges multiplied in number but decreased in importance. On the other hand, the reason for the preference of 1850 for the start of the study while modern road bridge constructions were starting after proclamation of the republic is about introduction of new building materials such as steel and reinforced concrete in Anatolia after railway constructions.

As is known, the narration of modernism often problematized within the western – nonwestern dualism based on differences in the levels of industrialization, while general tendency in architectural historiography is focusing on architectural object and its creator. Nevertheless, the history of building science, including histories of materials, know-how, labor and craftsmanship, process, organization, funding, patronage etc. gained importance in recent decades. Although the topic is becoming popular in Europe and America, it has not taken so much scholarly attention yet in the geographies of delayed industrialization. In these "other" modernisms, technological advance, is not a natural outcome of the industrial process, but rather is an adopted notion of modernization.

This is a study area, which unfortunately attracted less scholarly attention in the history of Turkish modernization and had never been adequately examined. The limited existing literature about Turkish civil engineering has been done from the socio-political point of view, and these social histories of profession commonly focus on the political acts of Turkish engineers as a professional group especially after 1960. Except recent works such as *"50 Yılda 50 Eser"* and *"Önemli Mühendislik Yapıları"* in 2007, there is no study specially focusing on the built artifacts of Turkish engineering. The recent scholarly attention on Turkish architectural agenda on conservation of industrial heritage unfortunately covers a small part of our engineering heritage. In this respect, except few long span buildings and some early modern industrial plants, the cultural, technological, and historical values of engineering edifices as important witnesses of our history of modernism have not been studied yet.

Within this framework, the intention of this research is to study one of these histories in order to find out new expansions in the histories of other modernisms. Although it is not primarily concerning the frequent study areas of Turkish architectural historiography, it is believed that this is not only beneficial but also crucial to study related areas of "building" in understanding the modern Turkish built environment. On this account, the main motivation of this inquiry could be summed up as re-reading Turkish modernity project through building science.

This study was done on both the theoretical subjects on technology and engineering ideology and the practices of engineers in state and private sector. It tries to draw attention mainly to construction processes of road bridges (establishment of national contractors, importation of know-how, construction processes, production of materials, labor processes, technical equipments etc.) together various popular discussions centered on technology and engineering. It is mainly based on histories of several institutions such as the Ministry of Public Works, the General Directorate of Highways, Istanbul Technical University and the Union of Chambers of Turkish Engineers and Architects etc. Hence, I studied archives of the institutions and investigated periodicals and daily media. The sources used for the study are especially the bridge files in State National Archives and General Archives of KGM, "*Bayındırlık İşleri Dergisi*", *"Bulletin of General Directorate of Highways"* and some popular media especially on newspapers. Together with the other professional periodicals like "*Arkitekt*" and *"Türkiye Mühendislik Haberleri (1955-today)"*, and some published histories of important constructions firms such like STFA Co., and Haymil Co., these journals constituted the main material for the study. I also consulted some memoirs of engineers worked under public service or private sector as contractors, some of who took part in production of the bridges in various levels.

Lastly, while this thesis covers all road bridges built in the defined period in general, it only mentions some of the important cases representing the technological, organizational, and constructional state of the period in depth. Nevertheless, it is believed that there is many more road bridges worth to mention, so the full-length list of the road bridges until 1960 is provided in appendix as raw data for further studies.

1.4 Organization of Thesis

Turkish engineering have been very effective since its foundation in 18th century and contributed the Turkish modernity project in various levels of action, not only by building but also by planning, managing, and governing, so it has not been possible to include everything of merit. Moreover, the case of road bridges have been a wide area of practice for Turkish engineers because of the importance of transportation networks for a country, which leaned its economy mostly on the exchange of raw materials not only for domestic trade but also in international scope. The selection criteria adopted for mentioned bridges was complicated and not only based on structures of natural engineering interest; such as development of a design or construction technique, the first, or an early, use of a new material or combination of materials, and development of a new structural form; but also other, less tangible, issues of socio-economical interest such as location, geographical importance for the local and national socio-economic politics, and cultural value in collective mind; and last, the construction process; such as craftsmanship and labor, obtaining the materials, production and funding, and its contractors, foreign, Turkish or joint venture, and its association with an important engineer, architect or contractor.

This thesis is organized under five main chapters explaining different levels of interaction between technology and modernity in Turkey in relation with engineering and construction of bridges. Although the thematic organization of the chapters is not in chronological order and they do not attempt to provide a complete history on role of building technology in Turkey; the thesis offers a reappraisal of the narration on constitution of Turkish modernism, through building science. Nevertheless, the inner organizations of the chapters also form a roughly chronological order. The first chapter defines the main themes of Turkish modernity project related with the thesis and outlines objectives, scope, and structure of the study. The second and third chapters cover the period from the first roadway line in Ottoman Empire between Gemlik-Bursa in 1850 to 1960s, and concern with the engineer as one of the key figures of "Turkish modernization", and "the developed country". The fourth chapter investigates the development of road networks in Turkey and in the world, and development of road bridges in Turkey by focusing on few important road bridges such as *the Riva Bridge, the Kömürhan Bridge, the Gazi (Unkapanı) Bridge, the Birecik Bridge* etc. Last chapter presents a brief evaluation of construction of "developed country" and "modernized society" in relation with engineering and technology within scope of road bridges.

The first chapter of the dissertation defines two basic themes of Turkish modernity project in relation with technology and built environment. Depending on the popular debates at the end of the 19th and at the beginning of the 20th centuries, these themes are explained in order to constitute the local framework of the study. The first concept is "*muasır medeniyet /*

contemporary civilization" and the second is "*bayındır ülke* / developed country". The first concept helps us to explain the notion of technology in relation with the changing westernization ideas, while the second is crucial for explanation of socio-economic importance of construction. The chapter also presents the objectives, methodology and defines the scope and the organization of the thesis.

The second chapter discusses "Formation of Engineering and Modernity in Turkey". This will be explained in the development process of the profession beginning with establishment of its education in Ottoman era, and continuing with expanding working areas of engineering from military to state, from state to private, and accordingly changing role of engineer as individual and as professional group form applicator to administrator, and administrator to manager. It will be dealt in turn with three interrelated notions; the role of military and state engineers as agents of a centralizing state, the integration of engineers into civilian life, and engineer as technocratic intellectual elite who made decisions. Focusing on the general theories on engineering ideology and its relation with modernity due to positivist way of thinking, the third chapter intends to demonstrate the role of engineer as an agent of modernity, and trace it within the own narrations of Turkish modernity project and Turkish engineering. In the third chapter "Agents and Actors of Bayındır Ülke" in addition to state, semi-state and private areas of action, it will also be mentioned the foreign engineers who were not only important as constructors but also as dealers of know-how.

The fourth chapter "Development of Road Networks in 20th Century" firstly narrates the establishment of road networks in the world and Turkey, their rise against railroads, and continues by investigating the construction practices of the road bridges in Turkey, including bidding, construction, labor, material, and controlling processes, and their relation with national and foreign circles. The narration of the processes would be explained in detail through the case studies, which are characteristic symbols of their periods both in technological and sociological ways.

To conclude the thesis, the last chapter recapitulates the theoretical and the historical materials displayed in the preceding chapters.

In addition to this main structure an additional part entitled "Road Bridges as Engineering Merits" gave general information about the structure, materials, and construction of bridges in an historical development process.

CHAPTER 2

FORMATION OF ENGINEERING AND MODERNITY IN TURKEY

During the last two centuries, Turkish intelligentsia has believed technology is prerequisite of development and welfare. Hence, from the very beginning of the modernization process, importation of technology and know-how has been assumed as vital and supported by the nation state. Unsurprisingly, this attitude was not only specific to the Turkish case. In 20^{th} century, many other late-industrialized or unindustrialized nations at the threshold of modernization like Turkey believed in the critical relationship between prosperity, modernity, and technology. From this point of view, the Turkish case has no significant difference from the others like Greece, Portugal, or Mexico in the main narration of nation building/modernity project and patriotic profile of the profession. Although it has the same basic characteristics like the many others, the story differentiates due to inner dynamics and reactions of a non-western society, which had been vassal of the empire in difficulties.

As Göle (1998, p.17) stated, more than many other micro-histories in Turkey, understanding the history of engineering can give clues for mapping the social transformations because of the unique role of technology in modenity. Hence, this part of the thesis explores the rising role of engineer as one of the agents of modernity project of Turkey. By dealing with these matters, it is aimed to understand the Turkish modernization process in another perspective.

We will deal in turn with, first, the engineering ideology, the two basic approaches on the role of engineer developed after industrial revolution -the Taylorist and the Veblenist approaches- and their reflections on Turkish case; and second, the development of profile of engineering -civil engineering in particular- both professionally and individually in Turkey for the last two centuries, including establishment of educational system, professional society, and changing areas of action -from military corps to state and private enterprise-.

2.1 Engineering Ideology and Modernity

According to Göle (1998, p.15), in order to understand the unique and dominant role of engineer in modernity project, one should first relate engineering ideology with industrial civilization; because, "to the extent that engineers had contributed structuring of the production systems, they had been effective on creation of the industrial civilization both socio-spatially and culturally".

After the second industrial revolution, surplus value and efficiency[12] concepts emerged as new aims of production, and then, everything –both objects and people- reevaluated through their contributions to production. Professions were also affected and transformed in this process. Unlike the other professions that were affected by the industrial revolution, engineering have been able to participate and affect the process actively in which all professions were redesigned. In this respect, engineers contributed the modernity project not only with their role in development of technology but also with their agency on new social organization.

In 1911, Frederick Winslow Taylor, an American mechanical engineer, published his seminal work titled *"Principles of scientific management"* to improve industrial efficiency. In this study, he defends the idea of increasing productivity and benefits of production by scientific management, and asserts that scientific management process can be achieved by rationality which engineering has naturally in its ideology (Taylor, 1997). Thus, among all professions, engineering earned a privileged position; and in this manner, the role of engineer was defined as the manager of production process rather than implementer; and engineer was empowered to run organizations on behalf of capital. However, as per Öncü and Köse (2000, pp.25-42), Taylorist definition of engineering as a miraculous agency for high productivity actually has no originality more than bourgeois re-reading of profession for unification of the world under single market for more profit.

On the other hand, Thorstein Veblen widened the limits of profession, which was restricted by Taylor within factory to broader limits of society in the same period, but his ideas were popularized after two decades as response to the great depression in 1929. Veblen's engineer,

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[12] For further information see: Marx, K., "Capital: A Critique of Political Economy", International Pub., NY, 1967 and Haggerty, P. E., "The Productive Society", Columbia University Press, NY, 1974.

unlike Taylor's, more concerned with social issues rather than economic ones. He/she gave priority to delineate the unique qualities of industrial society rooted in modern technology. Therefore, Veblen defends the idea that engineers who represent positivist values of reason and science should hold positions of management responsibility in governments and own the power. Moreover, this second type of engineer holds a unique position in antagonistic relations between capitalist production systems and social formations, and acts as a mediator. Despite not being political but merely a professional organization, engineering's approach sensitive to social transformations is named in many sources as ideology. Under this ideology, engineers as individuals and under professional organizations go beyond their role in production process, and they have been defenders of social development models, and to a certain extent they had undertaken the responsibility of social engineering (Veblen, 1911, p.10; Göle, 1998, pp.16-17)[13].

Turkey is a peripheral country on the borders of industrialization; therefore, the Turkish engineering practice and ideology differentiate from the main core countries (Köse and Öncü, 2000, pp.95-111). In these countries, engineer earned his/her position mostly based on how much he contributed profit-earning capacity of production. Therefore, rather than embracing Veblen's ideals, engineers mostly present a Taylorist approach. For instance, in France where technocracy had been very dominant until 1970s, engineers had contributed the rational management but deliberately avoided the socio-politic issues. As Picon (2007, pp.197-208) stated, in France, there was no profound connection between revolution and the concern for technological progress carried by the engineering profession. "Technology and engineering were indeed associated with progressive ideals, but they were supposed to put an end to revolution…rather than foster it. Despite almost two centuries of evolution, French engineers never totally repudiated this perspective [and] kept a relatively lower political profile"[14].

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[13] For social engineering and its vitals see: Popper, K., "The Open Society and Its Enemies", Vol. I: The Spell of Plato, Princeton University, New Jersey, 1996.

[14] According to Picon, a specific kind of ideology influenced French engineers called Saint Simonism. For further information on Saint-Simonism see: Saint Simon, H., "Henri Saint-Simon (1790-1825): Selected Writings On Science, Industry, and Social Organization", K. Taylor (Ed.), Croom Helm, London, 1975.

On the other hand, in the late-industrialized countries, engineers naturally embraced social-minded ideologies. Since these countries are mostly young nation-states, which had been not able to accumulate capital to form private enterprise and bourgeois class, engineers unsurprisingly adopt patriotic and social-minded ideologies under this non-capitalist but nationalist work environment. Although, the narrations of technology and engineering in late industrialized countries resemble each other[15], each of them has differences due to their own socio-cultural backgrounds. Among them, the Turkish case can best be compared with Greece due to the socio-economic similarities and the same historical background of two neighboring countries. In both cases, military based schools were the sole educational institutions providing engineering education until almost the end of 19th century. Hence, they built elitist and patriotic character, and adopted high politic profile under military circumstances of the war times. Moreover, both Greek and Turkish engineers actively took part in construction and design of major infrastructural projects since the late 19th century and in development of science based industrial sectors related to second industrial revolution under nationalism. Like Greek engineers, Turkish engineers were also participated actively in development and modernization processes as a state supported socio-professional group with strong elitist characteristics. In both cases, engineers promoted the ideas of rationalization and technocracy; moreover, as particular individuals and as professional groups they occupied dominant positions among the various social actors (Antoniou et all, 2007, pp.241-261). Hence, it can be asserted that they both not embraced Taylorist engineering ideology in the absence of national bourgeoisie. Nonetheless, while Greek engineers passionately took part in the political events during the construction of national identity, in the early periods of the republic, Turkish engineers preferred to left their political stance they developed in the late Ottoman period and had adopted the role of implementer of modernism rather than theorist of it.

Turkish engineers as individuals and as a national professional group established relationship with modernism on different bases with the other cases due to the different reactions of western and non-western societies. Three main factors affected the social construction of Turkish engineers' identity and their engineering ideology. Among these, primary reason is

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[15] See also; Saraiva, T., "Inventing the Technological Nation: The Example of Portugal (1851-1898)", *History and Technology*, 2007, v.23/3, pp.263-273; Lucena, J. C., "De Criollos a Mexicanos: Engineers' Identity and the Construction of Mexico", *History and Technology*, v23/3, pp.275-288, and Yiannis, A. et al, "The National Identity of Inter-war Greek Engineers: Elitism, Rationalization, Technocracy, and Reactionary Modernism", *History and Technology*, v.23/3, pp.241-261.

the westernization dilemma. As discussed in the first chapter the changing definitions of *muasır medeniyet* and its relation with technology delineated the identity of Turkish engineer. Engineering is naturally scientific, positivist and progressive, and consequently modernist. Hence, from the first stage of establishment of Turkish engineering education, the profession had always been a target of anti-reform groups. The oppositions to westernization impeded the development of engineering and caused breaks and returns in the history of Turkish engineering education. On the other hand, this also gave the profession its heroic character on behalf of modernization, and development. Therefore, from the very beginning, Turkish engineers have taken their place on the side of modern elites as both the representatives of rationality and implementers of modernization. In fact, the engineering had already been a privileged domain of knowledge in the Ottoman period by reason of its strategic importance in army as artillery corps. Then engineers gained power with late industrialization attempts of Ottoman Empire and construction of Hijaz Railroad line. By the reconstruction boom initialized after War of Independence, engineers became one of the important groups in society. Under the influence of the new political ideals of the time, State engineers began to define themselves as part of new elites who contribute to public utility and progress. The development they had in mind was not only material. It is possessed with a strong non-material connotation because prosperity as a result of development was seen as the solution to regenerate social relations; and day by day engineers consolidated their position in society and in the structure of state while they were also getting place in market by state supported private enterprises.

Second factor is the positivist tradition of Turkish modernism, which has been most effective during the early republican period. According to Bozdoğan (2001, p.125), the positivist way of thinking as the leading philosophy of the period and as the main idea of modernity project bases on "the progressive history concept", and presents parallelism with engineering ideology. Positivism and engineering ideology both put scientific knowledge and rationality in the first place, and they both have no place for ambiguities. Therefore, technocracy, which has social engineering utopia in its main core, has the belief in the scientific and rationalistic ways of problem solving even in social area, thus, in extreme cases even prefers scientific and rational approach rather than pluralist democratic mediums. In technocrat ideology, decisions earn their legitimation through absolute truths of scientific knowledge, so, the need for discussion and participation of society is not vital. Legitimacy is based on science rather than democratic approval of majority. Frankfurt School criticizes leaning technocratic power on scientific legitimacy and claims technocracy and democracy to have a strain in between (Göle, 1998, p.101).

The last factor is defined by Köse and Öncü (2000, pp.95-111) as the planned industrialization experience under public investment control in 1960s. The planned development concept was a global paradigm of post-war era especially took effect in late-developing countries. In Turkey, ever since the beginning of modernist reforms, industrialization and development was not actually handled with a truly holistic and planned approach before this time, except for partial laws and regional development plan proposals which are called *"lahiya"* (Tekeli and İlkin, 2004, pp.1-14). By the changing governments, main objectives and priorities of the development replaced by new objectives -almost the exact opposite ones such as from railroad to highway or from industry to agriculture etc.-, hence they were not resulted in a progressive advance. In addition to these local problems, there were also the global economic crises in 1929 and during WWII that constrained the Turkish economy. Between 1945 and 1960, the government had to make three devolutions, and finally the chaotic socio-economic circumstances especially after 1950s put Turkey on the brink of crisis (Toprak, 2002, pp.557-576). By the pressures of OECD very first attempts to make a plan for development is initiated at the last year of Menderes Government but interrupted by the military coup (Erder et al, 2003, pp.11-13 and 20-30). And by end of first pluralist democracy experience, the need for planned development arose urgently against operations done under populist politics. Consequently, 1960s had been the time of new orientations in development strategies.

In this period, development is conceived as quantitative progress in specific indexes which qualify economic and social life (Köse and Öncü, 2000, pp.95-111). The word planning is used mainly as growth-planning as it is in the Keynesian growth strategy and the problem was reduced to rational utilization of national resources on predefined objectives. In this sense, as Göle (1986, p.110) conveyed, development praxis which defined technically and independent from social dynamics had close similarities with technical and numeric reason of engineering ideology. This cooperation between technical reason and development strategy gave profession an elitist characteristic as having the merit of reason and a heroic mission as being agent of Turkish development (Öncü, 1996, 2003a, 2003b; Tanık 1991). Beginning from late 19th century, engineers had continued being one of the significant agents of modernity project as first implementers of technology and then scientific management until the end of 1970s.

The planned industrialization experience under public investment control also helped engineering ideology to accede and popularize. In 1960s and 1970s engineers and their ideology reached the climax of their power, hence technocratic power could not be limited with bureaucratic positions anymore. Beginning from 1965 on one hand engineers started to occupy many important positions as politicians, and on the other hand they started to be a part of social opposition by professional organizations after 1970. Engineering ideologies had been effective in the world and in Turkey until the end of 1990s.

2.2 Development of Civil Engineering in Turkey

In Ottoman Empire, engineers (and also architects) trained under traditional apprenticeship relations in Janissary Corps by constructing military buildings, fortresses, bridges etc. or in civilian building practices. However, it was not a formal education hence was not able to have the continuity of an elaborate knowledge in modern standards. Therefore, the history of development of Turkish engineering generally dated back to its institutionalization.

The history of institutionalization of Turkish engineering can be examined in four episodes in relation with the socio-economic history of Turkey. We can roughly classify these periods as the establishment period between 1850 and 1923, the early period between 1923 and 1948, the development period between 1948 and 1965, and the political action period between 1965 and 1990. In addition to this periodic classification, the ideologies such as meritocracy and technocracy and the concepts such as reform, westernization, scientific management, private enterprise, and planned development are also significant in understanding the development of Turkish engineering. Nevertheless, development of Turkish engineering in covered periods of the thesis should also be read in relation with nationalism, modernism, and westernization as natural characteristics of the era.

2.2.1. Development of Turkish Engineering in Ottoman Period

The first of the episodes of institutionalization is the military foundation of the engineering profession in 18^{th} and 19^{th} centuries. Like in many other countries, in Ottoman Empire, engineering was emerged as an activity related to war. Even though some of the sources refer to the second siege of Vienna in 1683 and the others to the treaty of Passarowitz in 1718 (Uluçay, 1958, p.11), according to Berkes (2006, pp.76-79) the era of reforms had been initiated after the Erlau campaign in 1596 when Ottoman army first met with firearms. From that day forward, technological backwardness believed as the absolute reason of defeat in a war against western armies and technological renewal of the army had always been on the agenda of Ottoman Empire.

Due to the reasons mentioned in the first chapter, development and transformation process of engineering was parallel with the history of modernization in Turkey. Hence, military reform was the initiator of modernization; it is not a surprise that first reforms made in the area of military technical education. One of the earliest reformist projects, the Rocheford Report was in the reign of Sultan Ahmet III, also known as the Tulip Era. De Rocheford was a French army officer who came to Istanbul in 1719 and submitted a ten page report to Sultan Ahmet titled "Establishment of a foreign engineer troop under Bab-ı Ali rule". He was the first one to give voice to the need of western originated technical support in traditional Ottoman military organization (Lewis, 2008, p.47; Berkes, 2006, pp.46-47; Ergün, 1990). Even though the project was not put into practice, it became the initiator of establishment of technical military education. A decade after De Rocheford, another French officer Compte de Bonneval was able to realize the foundation of engineer troops in Ottoman army. Compte de Bonneval who is also known as Humbaracı Ahmet Pasha came to Istanbul as an exile in 1729. He rendered valuable services in Ottoman army, especially in establishment and education of *Ulufeli Humbaracı Ocağı* (Corps of Bombardiers). The Corps of Bombardiers was organized in a different manner from similar corps in the Ottoman military organization, both from the military and from the administrative aspects. Besides the practical training, theoretical lessons were taught such as geometry, trigonometry, ballistics, and technical drawing at this corps. Under this Corps, the very first technical schools *Hendesehâne* and *Humbarahâne* (School of Bombardiers) were also established in Üsküdar Toptaşı in 1737. At these schools, besides Bonneval, Turkish scholars such as Hacı Mahmud Efendizade and Mehmet Said Effendi gave lectures. According to records, many geometry equipments designed by Mehmet Said Effendi were also used during lectures. Göle (1998, p. 94) draws attention to this event as the beginning of the way to positivism in Ottoman reign. From that day on, positivist thinking had rooted in the minds of state elites. Soon after the schools were closed down due to the risk of janissary rebellions, but reopened secretly in 1759 in Karaağaç and had kept on education until the establishment of *Mühendishâne-i Bahri*

Hümâyun (Imperial School of Naval Engineering) at Golden Horn Naval Shipyard in 1773. According to memoirs of de Tott, the first students accepted to *Mühendishâne-i Bahri Hümâyun* were out of the students of this first *Hendesehane* and *Humbarahane* (Uluçay and Kartekin, 1958, pp.17-19; Kaçar, 1998, pp. 69-137; Ihsanoglu and Al-Hassani, 2004, pp. 2-6).

In fact, the janissary the rebellions were much more related with the risk of loosing their economic position than being reactionary movement against modernization and westernization (Berkes, 2006, pp.77-78). The Janissaries were actually unqualified mercenaries and they earn economical benefits of being a soldier. Since being a treat to their deep-rooted existence, like other reformist attempts the military technical schools had also been on the target of janissary rebellions. On the other hand, concurrently established military medical school had never been under such kind of danger because it had never been a threat to existence of janissary corps.

The attempt of foundation of technical education failed two times by the janissary rebellions and the schools were closed and had to give break to lectures twice. Hence, these rebellions sharply impeded the development of engineering education. Although the rebellions were actually motivated by such kind of economic reasons, in time they became political and opposing reactionary movements against reforms gathered around them. Under these circumstances, engineering gained strongly politic and elitist profile ever since its very establishment period. These elitist military roots entailed a certain number of key characteristics. Among them, most significant was the engineers' solid belief to belong to an elite defined by virtues of courage and knowledge. In 18th and 19th century, in other European countries, engineer officers usually belong to nobility or sometimes to high class bourgeoisie, as it was in France, but not to public. It was believed that arming the public was dangerous. Therefore, in Europe the very first engineers generally belonged to aristocracy (Picon, 2007, pp. 197-208). Conversely, in Turkey, due to devshirme system of the Empire, engineering had never been empowered by aristocracy. For the reason that Ottoman army was gathered from the public and the first engineers were sole officers, engineering had been legitimized by science and positivist thinking and based on meritocracy, accordingly the profession created its own elite society. This elitist streak was further reinforced by the organization of the state after proclamation of the Republic in 1923.

Since Rocheford, technical renewal of military system and development of engineering was not only related with internal affairs, rather it was a part of broader international politics. During the American war of independence (1775-1783), France and Britain were in conflict of interests. Russia benefited from this conflict and had became a major economical and military power in European system towards the end of 18^{th} century. Against the Russian threat, European countries such as France and Germany treated Ottoman Empire as a buffer zone and decided to stand by him. Hence, they explicitly helped Empire to strengthen Ottoman army and gave support its military reforms. In the meantime, Ottomans were defeated two times by Russia. At first Crimea (Kırım) was lost in 1738 and latter in 1770 Turkish navy was destroyed in the Battle of Çeşme (Berkes, 2006, pp.50-72).

After Rocheford and Comte de Bonneval, François Baron de Tott, a Hungarian engineer and advisor to the Ottoman military, had been the third important foreign expert contributed Ottoman military renewal. Following the defeat of Çeşme military reforms were concentrated on naval forces and a naval school was founded at Golden Horn Shipyard during the reign of Sultan Mustafa III in 1773. Baron de Tott was appointed for the establishment of a course to provide education on plane geometry and navigation in this school. The course, attended also by civilian captains of the merchant marine, was given on board of a galleon anchored at Kasımpaşa. The temporary lectures turned into continuous education after foundation of a Naval Mathematical College on Baron de Tott's advises and endeavors of Kaptan-ı Derya Cezayirli Gazi Hasan Paşa on February 1776. The school, which later assumed the name of the *Mühendishâne-i Bahri Hümayun* was named in some French documents as *Ecole des Théories or the Ecoles des Mathématiques*. Baron de Tott, another French expert Sr. Kermovan, Cezairli Seyyid Osman Effendi, Seyyid Hasan hoca gave lectures in the school. Due to memoirs of Toderini an Italian traveler, the education was divided into practical and theoretical parts. The school had contemporary naval equipments and publications all around the world (Uluçay and Kartekin, 1958, pp.16-21).

After Sultan Mustafa III, Sultan Abdülhamit I continued the military reforms with a great enthusiasm of defeating the Russians and getting back Crimea. Under this motivation, Grand Vizier Halil Hamid Pasha (1782-1785) invited European experts, imported modern weapons, and made laws about military reforms. In this respect, a great number of French experts and officers came to Istanbul between 1783 and 1788, with renewed closeness between the Ottomans and France. The others after Rocheford were initially interested in fortification of defense of the Bosporus against a possible Russian attack. Due to Kaçar's study (1998, pp.69-137) and Uluçay's study (1958, pp.26-30) more than fifty foreign experts and supervisors on bombardier, artillery and naval construction came to Istanbul in this period. Among them, most important ones were Lafitte-Clavé, Monnier, Antoine Shabo, Monic, Grapen, Obert, Lorca, Durest, Aleksi, Betolen, Saint Remy, and Le Roy also gave lectures in *Mühendishâne*. Unfortunately, all of these French experts and officers left Istanbul as the result of the alliance between Russia and France when Ottomans entered into war against Russia between 1787 and 1788. However, it was observed that the migration of foreign experts –mostly Swedish- to Ottoman land in drive of high positions under state service was continued. Prior to de Tott, non-muslims had to convert to Islam in order to be employed in Ottoman army. The removal of this principle also positively affected the migration and made utilization of foreign experts easier. In addition to importation of know-how by foreign hands, the Empire began sending Turkish officers to Europe. İshak Pasha had been the first sent to France in Sultan Selim III (1789-1807) reign (Ahmet Cevdet, 1974, pp.5-48).

When all the French experts and officers returned to their country between 1787 and 1788, the courses continued to be given by Ottoman scholars, such as Gelenbevi İsmail Effendi and Palabıyık Mehmed Effendi, the famous mathematicians. This institution took the name of the *Mühendishâne-i Bahr-i Hümayun* with the regulation of 1806.

After a period of sixty years since the establishment of first Hendesehâne in 1737, a new technical school that continuously kept up the education until today was opened in 1795[16] (Kaçar, 1998, pp-69-72). The school was a part of Sultan Selim III's (1789–1807) program of westernizing reforms known as *nizam-ı cedid* (new order). Thus, it was called *Mühendishâne-i Cedide* (New School of Engineering) but later would be called as *Mühendishâne-i Berri-i Hümâyun* (Imperial School of Military Engineering).

The school was one of the most prestigious projects of Sultan Selim III that he involved the preparation of a regulation for the school and personally signed it. The regulation strictly defines aims and organization of the school. In the first part, it is said that the school was established on the objective of "generalizing the use of sciences such as geometry, algebra,

[16] In some sources 1793, see. Kaçar, M., "Osmanlı İmparatorluğu'nda Bilim ve Eğitim Hayatında Değişmeler ve Mühendishânelerin Kuruluşu (1808'e kadar)", *Osmanlı Bilim Araştırmaları II*, İstanbul, 1998, pp-69-72.

and geography; and learning, teaching and practicing war industry." For this purpose, a building was assigned in Hasköy and forty students from all levels were chosen from the existing students of previous technical schools. Due to the regulation signed in 1210 (1795) the organization of *Mühendishâne-i Berri-i Hümâyun*, just like the previous school, was four year and composed of for each level one professor, four assistants, ten students and the other officials including interpreters for translation of foreign books and papers. At the end of each year students selected among successful seniors became assistants. Although the students and graduates were soldiers, some of the successful ones were also appointed to Ministry of Water-works or Ministry of Architecture even to be the architect of Empire (Uluçay and Kartekin, 1958, pp.22-38).

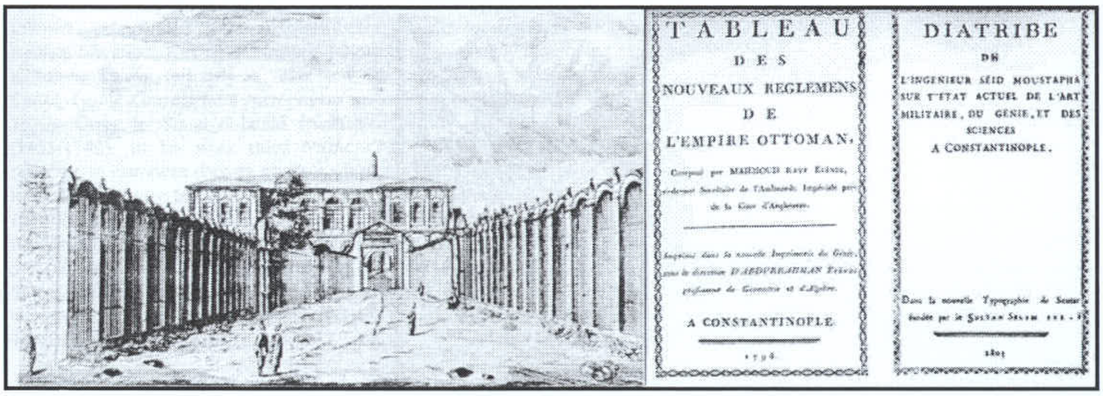

Figure 2.1 Right: Covers of two books published in the Mühendishâne-i Berri Humayun. Mahmud Raif Effendi, "Tableu des Nouveaux Reglemens de l'Empire Ottoman", 1798 and Seyit Mustafa, "Diatribe l'Ingenieur sur l'Etat de l'Art Militaire, du Genie et des Sciences a Constantinapole", 1803. Left: The building of Imperial School of Naval Engineering in Halıcıoğlu established in 1795. Sources: Çeçen, K., "Istanbul Teknik Üniversitesi'nin Kısa Tarihçesi", İstanbul Teknik Üniversitesi Bilim ve Teknoloji Tarihi Araştırma Merkezi Yayın No:7, İstanbul, 1990 and Kaçar, M., "Osmanlı İmparatorlu'ğunda Bilim ve Eğitim Hayatında Değişmeler ve Mühendishânelerin Kuruluşu (1808'e kadar)", *Osmanlı Bilim Araştırmaları II*, İstanbul 1998, pp.69-137.

In the first year of the school students took mathematics, arithmetic, introduction to geometry, drawing in engineering, grammar in Arabic and French; in the second year arithmetic, geometry, geography, Arabic and French; in the third year geography, planar trigonometry, algebra, topography and survey, and war history; and in the fourth year integral and differential calculus, mechanics, ballistics, astronomy and sapping. Except for the theory lectures in curriculum, students also had hands on lectures in workshop and on site. At the end of each year students had to take an exam to pass the next level. The criteria for academic advancement were also defined in detail and were strikingly similar with modern systems, for instance writing a thesis, a paper or a translation of a seminal scientific book were one of the requirements. The other significance in the regulation is the part saying that although the school was military except for the students and teachers, anyone who wants to study sciences was welcome regardless of their social class and profession, and professors had to teach them. These volunteers could also apply to school and be student soldiers or even assistants due to their capacity of knowledge. (Çeçen and Şengör, 1988, pp.28-30)

The classes in *Mühendishâne-i Berri* began in 1795 by new generation of Ottoman engineering teachers, such as Hoca Abdurrahman Effendi, Mahmud Raif Effendi, and Seyyit Osman Effendi, who had been students of the French experts at the Shipyard School of Engineering. The French effect and support was obvious that textbooks used in the *Ecole Royale Militaire* in Paris were imported to the school and professors promoted as a reward for translating them (Uluçay and Kartekin, 1958, p.41). The building of the school was also very modern that it had a library containing precious science books and equipments donated by Sultan Selim III[17] and decorated with world maps on walls and astronomical frescos on the ceiling, a workshop for students to construct geometrical equipments, a printing house, four classrooms furnished with modern classroom furniture and professors offices. The school would later raise famous scientists such as El Hac Hafız İshak Effendi and Vidinli Huseyin Tevfik Pasha (Fig 2.1).

While *Nizam-ı Cedid* reforms had been carried on with enthusiasm, Sultan Selim III was deposed by a bloody janissary revolt in 1807. In this uprising that Selim III was killed, the *Mühendishâne* and professors were also on the target. Although the school was not closed some of its professors were killed in this revolt. Mahmud Raif Effendi was the first killed by the rebels. This was followed by the execution of Seyyid Mustafa Effendi[18] , Selim effendi

[17] Although most of these books and equipments were lost during the occupancy of Istanbul by Alied Forces, some of the remained books and equipments donated by Sultan Selim III have been still in the archives of ITU Center for Research in History of Science and Technology. For more information see: Çeçen, K., "Istanbul Teknik Üniversitesi'nin Kısa Tarihçesi", İstanbul Teknik Üniversitesi Bilim ve Teknoloji Tarihi Araştırma Merkezi Yayın No:7, İstanbul, 1990 (Available on 22.07.2008 at http://www.arsiv.itu.edu.tr/tarihce/index.htm)

[18] Kazım Çeçen depending on Kemal Beydilli states that Seyyid Mustafa was not one of the victims of Kabakçı Mustafa Revolt. See Çeçen, ibid.

and at last Abdullah Ramiz Pasha in 1811. However, new sultan Mustafa IV passed exactly the same regulation of *Mühendishâne* prepared by Selim III (Çeçen, 1990).

Although Sultan Selim III's reign was ended with maleficent events, he was accomplished to root the reforms. A new generation who was empowered from positive science rather than religion or aristocracy was trained in technical schools and they started to supersede the old consultants. They were the foundation of Turkish intelligentsia who would later actively take part in the formation of *Tanzimat*, *Meşrutiyet* and the new republic.

Under these fragile circumstances, engineers and *Mühendishâne* had achieved to consolidate its position in military, social, and administrative system only after Sultan Mahmud II's (1808-1839) accession to the throne by abolition of janissary corps in 1826. After Sultan Selim III, Sultan Mahmud II is the second important character in the history of Turkish engineering. He made two important arrangements on engineering; firstly, he established a new military organization substitute for abolished janissary corps under the name of Asâkir-i Mansure-i Muhammediye and stipulated employment of two engineers in each corp. They were called *mansure mühendisi*. Secondly, he reintegrated the engineering education with European knowledge by sending scholars and professors abroad. However, Mahmud II's intention to send Ottoman students to abroad meet with resistance not only from uneducated public but also from educated class, for instance *vak'a Nüveys* (historian) of the age Esad Effendi also criticized him (Uluçay and Kartekin, 1958, pp.95-99)[19]. Even if the arrangements done by Sultan Mahmud II's helped to perpetuate the existence of technical education, there is no evidence that he intended to spread the positivist thinking and initiate a social transformation. His reforms such as foundation of faculties for technical and medical education were limited within military area. Hence, the proposal for a reform in higher education was not approved although there was a difficulty in finding qualified candidate students for military higher education institutions. (Berkes, 2006, pp.169-203)

[19] According to Uluçay (1958, op cit., pp.95-99), Mahmud II send England two officers and ten students from Mühendishane in 1834. According to Şişman's studies, this was only a beginning. Between 1839 and 1876, Ottoman Empire sent students to 244 students to France and England; moreover, the Empire established a school in Paris (Mekteb-i Osmani) for education of Ottoman students in western knowledge. See Şişman, A., "Osmanlı Öğrencilerinin Paris'te Tahsil Yaptıkları Mısır ve Ermeni Mektepleri", *AKU Sosyal Bilimler Dergisi*, v.5/2, December 2003, (Available on 24.07.2008 at http://www.sosbil.aku.edu.tr/dergi/V2/asisman.pdf) ; Şişman, A., "Yurt Dışında Tahsil Yapan Burslu Ermeni Asıllı Osmanlı Öğrencileri", *AKU Sosyal Bilimler Dergisi*, v.4/2, December 2002, (Available on 24.07.2008 at http://www.sosbil.aku.edu.tr/dergi/IV2/1-(1-30).pdf).

By the proclamation of *Tanzimat* in 1839, *Islahat* in 1856 and first *Meşrutiyet* in 1876 change in the understanding of state and its services, and as mentioned in the first chapter initiated new concepts such as *"imar"* and *"bayındır ülke"*. The reforms in administrative and industrial area revealed a brand new need, a demand for civilian engineers. The Ministry of Public Works had been established in 1839 and in 1834, first highway was constructed between Istanbul and Iznik while on the other hand new industrial plants were constructed in Istanbul such as *feshane*, Zeytinburnu Iron Foundry etc.(Tekeli and İlkin, 2004, pp.99-101 and 135-150). Between 1868 and 1894, nine schools were opened for civilian technical education[20]. Among them except for *Turuk-u Maabir Mektebi* (School of Roads and Bridges), *Sanayi-i Nefise Mektebi* (Academy of Fine Arts), and *Hendese-i Mülkiye Mektebi* (Civil Service School of Engineering) were closed without any graduates. *Sanayi-i Nefise Mektebi* perpetuated its education and became Mimar Sinan University. *Turuk-u Maabir Mektebi* was closed a few years after its establishment. Its most significant problem was finding qualified candidates for education that the school was designed as continuation of Galatasaray High School. Thus, almost all of the students were from minorities. Although his reformist consultants had advised Mahmud II, thus far there was no reform in primary education of Muslim society. After 1877-1878 Ottoman-Russian war, minorities declared their freedom one by one. Under these circumstances, nationalism gained ground quickly. Now the concern of engineering education was not only education of civilian engineering but also education of "Turkish Engineering." On one hand, there was the rise of mistrust to minorities among Ottoman state elites and the other the rights of minorities given by *tanzimat*. Abdulhamid II developed a tricky solution to the problem by opening the civilian engineering school under the administration of *Mühendishâne-i Berri Humayun*. Thus, they would get a militarily administrated civilian engineering education but would work for the

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[20] These schools were:

1. Sanayi Mektebi (1868)
2. Mülkiye Mühendisi Mektebi (1867)
3. Fenn-i Resim ve Mimari Mektebi (1876)
4. Turuk-u Muabir Mektebi (1871)
5. Sanayi-i Nefise Mektebi (1881)
6. Kız Sanayi Mektebi (1884)
7. Hendes-i Mülkiye (1884)
8. Sefain-i Ticariye Kaptan Mektebi (1885)
9. Fenn-i Mimari Mektebi (1894)

For more information see: Uluçay and Kartekin, op cit., pp.113-126.

state instate of the army. In Ottoman Empire, only Muslims were recruited that no non-muslim would be the student of civilian engineering school. This was the beginning of nationalism in domain of the profession. Like all the previous characteristics of Turkish engineering, this was also built by the state rather than inner dynamics of the profession.

In 1883, Abdulhamid II opened the new school, *Hendese-i Mülkiye*, which had a similar curriculum with *Ecole des Ponts et Chaussees* in Paris. He invited famous foreign experts such as geologist Von der Goltz and hydraulics professor Prof. Dr. Philipp Forchheimer who was a pioneer in the field of hydraulics. The education was previously seven years, four years professional education after three years scientific preparation, later it was extended to ten years. French école was the model for the first curriculum but later it was arranged under German influence. Finally, in 1909 the administration of *Hendese-i Mülkiye* was assigned to ministry of Public Works (Uluçay, Kartekin, 1958, pp.140-143).

In the first year of the school, students took logarithm, introduction to mathematics, and topography, Ottoman geography, history, painting and grammar in Arabic and French; in the second year 3D geometry, introduction to mechanics, Ottoman history, painting in watercolors, calligraphy, religious instruction and grammar in Ottoman and French; in the third year arithmetic, geometry, topography, chemistry, drawing in engineering, religious instruction and grammar in Ottoman and French, in the fourth year statics, dynamics, mechanics, botany, zoology, drawing in engineering, religious instruction and grammar in Ottoman and French; in the fifth year dynamics, steam mechanics and locomotives, building materials, highways, advanced topography, project, and grammar in Ottoman and French; and in the sixth year highways and bridges, railroads, architecture, masonry, iron and wooden construction, advanced topography (in French), project in mechanical engineering, nautical project; and in the last year coastal constructions, harbors, applied chemistry, economy, hygiene, telegraphic communication, photography, applied topography, tunnels (in French), project in highways and railways, project in architecture, project in nautical construction (Uluçay, Kartekin, 1958, pp.140-143). In 19th century Ottoman Empire, engineering was not specialized into branches and the activity area of the profession had not determined yet. In this respect, except for some of the preparation courses in first three years, the curriculum covered strikingly broad area of technical knowledge from nautical courses to roads and bridges, from telegraphic communication to architectural projects. As Tekeli and İlkin (2004, pp.2-10) and Berkes (2006, pp.179-184) states some terms emerged in the

Mahmud II's reign, such as *maarif, nafia, imar* and *fen*, covered broader than their today's meanings. The activity areas of the engineers were determined parallel with the vagueness of the terms *"imar"* and *"nafia"*.

In 1888, the school gave thirteen first graduates; next year it increased to twenty-five. Except for single cases, almost all of the graduates worked as civil servants in *Nafia Vekaleti* (Ministry of Public Works) in big scale national infrastructure projects. In 1891, few among these students and graduates sent to continue their education in Europe and they became next generation of professors of the school, professors of republican period such as Kemalettin Bey. Sultan Abdulhamid II personally gave attention to construction of infrastructure projects. He was interested in technology, building, and architecture. In spite of economical problems, he initiated many projects not only remarkable with technological but also political aspects. Among his projects, most successful one was Hijaz Railroad project. In 1900, he established a commission form intellectuals of the age some were professors of *Mühendishâne* and ask for a project, a railroad line to the sacred land where western capitalist forces were not interested, to strengthen his caliphate and reunion the fragmented Muslim world by using the technological advance. Financing was provided merely based on national sources, taxes, donations and dedicated efforts of intellectuals. The army gave the labor support and all the managers, consultants, and members of the commissions worked with out fee. Finally, the Hijaz Railroad project was accomplished in 1908. It became the symbol of technological and political challenge of Ottoman Empire against western forces and national success of Turkish engineering. The other project, Yemen Railroad, started in 1913 was also equally important but cancelled because of Italian attacks (Talay, 1991, p.309 and Gülsoy, 1997, p.44-49).

Together with developments in railroad network, Sultan Abdulhamid II also gave special weight to construction of communication and highway networks. His main politics was to use networks to develop effectiveness of central authority of state also in periphery and enable territorial integrity. In his reign, two programs for nationwide construction was prepared, first was the program of the Minister of Public Works Hasan Fehmi Pasha in 1880 (Fig 2.2) and second was prepared in 1908 by Gabriel Noradunkyan who was also Minister of Public Works. In both of the programs, construction of communication and highroad networks dealt in special care and proposed solutions for realization of them with national resources under state control. Although this aim was not achieved due to economic situation of the Empire, this was the main principle in constructions. Despite all difficulties, both networks wide spread in Sultan Abdulhamid II's reign. Even telegraph lines arrived most of the cities before railroad did.

Figure 2.2 The map showing the prospective areas of action such as railroad and highway lines and irrigation schemes. It was prepared by Hasan Fehmi Pasha, The Minister of Public Works, in 1880. Source: Tekeli İ, and İlkin S., "Cumhuriyetin Harcı: Modernitenin Altyapısı Oluşurken", Bilgi Universitesi Yayınları, Istanbul, 2006, p.114.

Another activity area of engineering in this period was construction of bridges. Along with that of the railroad and highroad projects, bridges became one of the most experienced areas of the graduates of *Hendese-i Mülkiye*. Besides construction of bridges on the lines, the period is also striking with the realized and unrealized innovative projects such as project of Galata Bridge opened in 1912, proposal for construction of bridge on Bosporus in 1900, proposal for construction of a railroad tunnel under Bosporus in 1902. All these were projects of foreign companies; first was designed and constructed by a German company MAN A.G., second was proposal of a French architect Fernidan Arnoden, the third proposal, Tünel-*i Bahri*, was an American project by F. Storom, F.T. Lindman, and A. Hilliker (Mutluçağ, 1968, pp.32-33; Dinççağ, 1973, p.14; İlter, 1973, p.40). The projects realized and proposed -from bridges to telegraph lines- were very avant-garde and daring technological proposals under early 20th century circumstances. For instance, it had been twenty years since construction of the Brooklyn Bridge when the tunnel and the bridge projects were proposed for Bosporus. These infrastructure projects to integrate Ottoman market with global trade initiated an urban renovation in costal cities with international harbors. In this context, the first metro line was constructed in Tünel-Istanbul as a small part of comprehensive unrealized metro project in Galata and Istanbul by a French engineer Henry Gavand's in 1875 only twelve years after the first metro line in London. In addition to these kinds of technological developments initiating modern life rituals, the period was also critical on the discourse of usage of new materials. In 1907, reinforced concrete was used in construction of renovation of piers on Topkapı-Azapkapı and Sirkeci-Unkapı coasts after long discussions between French company and Ministry of Public Works. In 1910, first cement factory was established by *Aslan Osmanlı Co.* in Darıca by Denmark originated foreign investment (Sey, 2004, pp. 11-13). The progressive approach of the reign of Abdülhamid II was strengthened by the use of new materials and innovative technologies in infrastructural projects in spite of lack of national resources. The successes of Turkish engineers such as Hijaz Railroad project reinforced his attitude, also gave rise to national engineering.

As the result of consistent complaints, *Hendese-i Mülkiye* was removed from military jurisdiction and was placed under the authority of the Ministry of Public Works in 1909. The school had 230 engineers graduated thus far. Despite of change in administration, not so much things changed in its legal arrangement. The school kept on education under the Ministry of Public Works with almost the same professors with some changes in curriculum. Initially the school's name changed into *Mühendis Mekteb-i Alisi* (Engineering School) and the curriculum compressed into six years, one-year preparation five years engineering education. The courses such as theology, zoology, botany, Ottoman history, grammar in Ottoman etc. replaced with professional courses such as iron construction, machinery in gas and petroleum, electricity, and tunnel construction. Additionally, foreign language training got further importance and addition to French second language learning became optional. First administrator of the school, Refik Fenmen, was a modernist professor. He made many reforms, such as establishment of laboratories, arranged technical trips inside and outside the country, invited foreign experts and first time in Turkish education arranged summer trainings (Uluçay and Kartekin, 1958, p.213). The change of administration of the school affected rather the social life of students. Within the positive mood of the second *meşrutiyet*, students enjoyed the wind of freedom after forty years discipline under military administration. They established student clubs, ran magazines[21], and organized extracurricular activities. Their most important clubs were *Genç Mühendis İktisad Cemiyeti* (Young Engineer Economy Society) and *Mühendis Mektebi Talebe Cemiyeti* (Students Association of the School of Engineering). Especially under political atmosphere of the period -*İttihat ve Terraki* governments, 1919 elections, and Balkan wars- all the students of *darülfünün* (higher education) took part affectively in social reactions. Under the harsh circumstances of wars and occupation of allied forces, the school could not give education effectively but never gave up teaching. It lost part of its students and professors in the wars since Balkan wars in 1912[22] and misplaced major part of its library and equipments while moving from a building to another under allied occupation of Istanbul between 1918 and 1923 hence the school had graduated only 202 students until the Republic (Uluçay and Kartekin, 1958, pp.170-172). Despite all negative factors, these young engineers accomplished nationwide construction projects such as Hijaz Railroad and road construction projects (roads between Düzce-Bolu, Harput-Tatvan, Çaltı-Sivas, Çaltı-Harput, and Trabzon-Erzurum) within the limited sources of the fading Empire.

In the meantime, the military and naval engineering branches of the Royal Schools had continued but the need for civilian technical staff kept up increasingly. After the Istanbul Industrial Exposition in 1863, Ottoman statesmen once again recognized the lack of competitiveness of Turkish industry against European hence they decided to establish schools for industrial education. Hereupon, first *Sanayi Mektebi* (Industrial School) was established in 1869 and gave education since early 1930s. Although establishment of a school to educate qualified technical staff for construction work had already pronounced in 1869 regulation, *Kondoktor Mekteb-i Alisi* (Higher Conductor School) was managed to be established in 1911. The curriculum of this two years school prepared from the model *Ecole de Condecteur* in Paris. Main courses were general construction, roads and railroads,

[21] The publications of Mühendis Mekteb-i Alisi was limited because of lack of printing house however students run at least seven newspapers and magazines, and lecture notes and text books of the professors published in manifold writers. First printing Machine bought to school in 1923. Source: Uluçay and Kartekin, op. cit., pp.195-206.

[22] The school had no graduates in 1915 and in 1921 because of the WWI and the War of Independence. Source: Uluçay and Kartekin, op. cit., pp.170-172.

topography, geometry, construction materials, architectural drawing, calculus, bridges, mechanics, and algebra (Uluçay and Kartekin, 1958, pp.70-102).

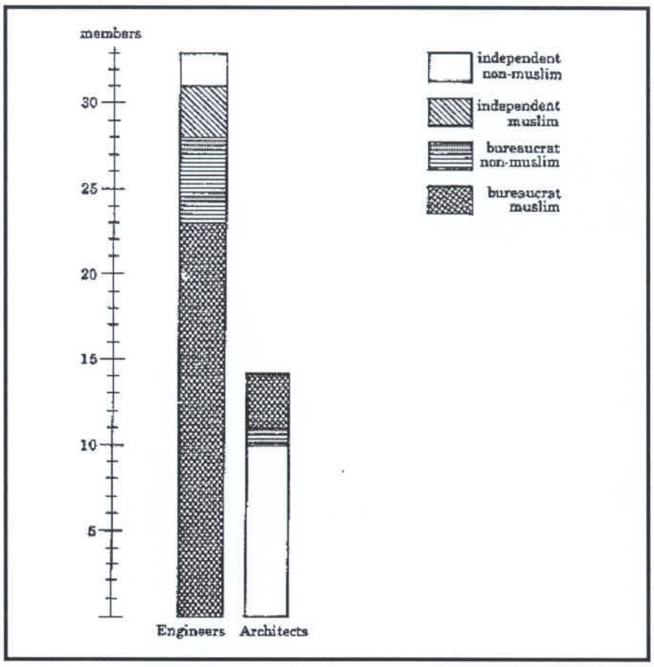

Figure 2.3 Membership chart of the Ottoman Society of Engineers and Architects based on occupation and religion from Osmanlı Muhendis ve Mimar Cemiyeti Mecmuası, v.1/1, 1324 (1909), p.8 ; v.1/2, p.28, Source: Nalbantoğlu, G., "The Professionalisation of the Ottoman-Turkish Architect", PhD Thesis, University of California, Berkeley, 1989, pp.258-260.

Within the atmosphere of freedom and political liberalism of second *meşrutiyet*, government made a new law to support the formation of independent societies. The engineers were one of earliest to respond this law by establishing the Ottoman Society of Architects and Engineers in the same year under leadership of Kemalettin Bey (Yavuz, 1981, p.17). Aims of the society published in the first issue of the society's journal as follows;

> Article 2: The aims of the society are as follows:
>
> 1. To protect the rights of Ottoman engineers and architects.
>
> 2. To improve the state of public works throughout the Empire.
>
> 3. To provide a center of assembly for Ottoman engineers and architects

4. To provide support for needy engineers and architects

5. To do research and publication on matters relating to engineering and architecture.

6. To reinforce the bonds that already exists among Ottoman engineers and architects.

7. To publicize the merits of those who serve for the improvement of engineering and architecture and the contractors and builders who are known for their knowledge, ability, and integrity.

"Maksadımız", Osmanlı Mühendis ve Mimar Cemiyeti Mecmuası, Vol.1, No.1, p.9.
(Nalbantoğlu, 1989, pp.114)

In the history of Turkish engineering, this was the first time of engineers making their self-identification while it had been defined and oriented by non-professional statesmen thus far. Under the nineteenth century concept of westernization, primarily based on admiration of western technological development, the state defined engineers as key figures for technological advance of their progressive ideology. Engineers as well made their self-identification on the roots of state's definition of engineer in modernity project; hence, they stated their primary goal as the advancement of Ottoman science and the improvement of public works. However, this was not surprising within the context that engineers owed their existence both ideologically and economically to the State, which was the primary source of constructional patronage throughout the Ottoman period, even the early republic. In the Society's demographic distribution, sixteen of forty-four members were in private sector but only five of them were engineers. Rests were mostly Muslim -or in other words Turkish- engineer-cum-bureaucrats, most of whom worked in the ministry of public works and taught in the Civil Service School of Engineering (Fig 2.3). Nalbantoğlu (1989, pp.109-111) states, in such a context professional ideals always paralleled political ideologies, or at least never contradicted them. While they embrace the goal of adoption of western material achievements, they also gave weight to get it within a nationalistic framework. In this respect, the society always protected the rights and defended the equality of the abilities of Turkish engineers with foreign counterparts. Furthermore, they had a project for adaptation of professional terminology in Turkish. However, within the WWI circumstances, the society showed limited activity and dissolved before proclamation of the republic.

2.2.2. Development of Turkish Engineering in Republican Period

Unlike the many professions introduced by the new period, it is hard to claim that proclamation of the Republic is a foundation for engineering. When the republic was declared, the Ministry of Public Works was a department, which had a settled organizational formation. Even limited in number, there were experienced civilian and military Turkish engineers. Moreover, technical education and its curriculum were also settled and had not needed to be changed until 1928. Nevertheless, the radical structural change in socio-economic sphere in 1923 had still divided the history of the profession into two periods as before and after proclamation of the republic. If the first part was the history of establishment of Turkish engineering, second part had to be the history of establishment of Turkish building contractorship.

In Ottoman period, as mentioned above, main emphasis was first on reforms in military area; after they understand that military advance is based on development in larger scale, main attention turned to economical and technological development. Hence, there emerged a new concept of *imar* and the urgent need for civilian engineering. In two *umur-u nafia programı* (development plans) prepared in Ottoman period in 1880 and 1908, nationwide construction projects were proposed. Both the plans were mainly focused on infrastructural projects besides touching upon irrigation projects.

Realization of such big projects needs to have financial and labor resources, and organizational and legal structure. To realize the projects, the Empire had already initiated the education of technical staff and charged them in public service in control of these projects. However, the legal, organizational, and financial frameworks had not prepared yet. In both of the plans, Hasan Fehmi Pasha (1880) and Noradunkyan (1908) considered to finance the projects by foreign investment and expertise, and expect to manage them by giving these foreign companies concessions in several contracts instead of managing them by well-reasoned regulations. In fact, these contracts, signed under pressure of western countries, did not protect the interests of Ottoman Empire against foreign companies. For instance in some cases, construction took twice the estimated duration and cost, but the companies were given no penal sanctions. Hence, the development programs wounded as is the case in construction of one of the first road lines the 314 km Trabzon-Erzurum line in twenty-two years, which affected construction of road networks very negatively. In addition to deficiency in legal framework, realization of development plans were totally depends on the availability of foreign sources that is willing to finance it. Unfortunately, along with capitalist ideals, foreign interest focused on utilization of natural resources rather than public interest. Therefore, they invested only in the railroad projects, connecting to mineral resources to neighboring harbor and did not interest in road lines. Hence, establishment of road network delayed. Moreover, various competing colonialist western countries did not prefer collaborating with each other, that they disallowed unification of the railroad lines under single network. This was resulted with regional improvement rather than total development under competitive politics of western colonist countries. As is seen, realization of the Ottoman development plans were totally depended to outer sources. Under these circumstances, Hijaz Railroad project becomes important as the only project achieved despite these problems.

First *umur-u nafia programı* of the republic was made in the postwar transition period from regency to republic. When the plan was proposed in 1923, Ankara was not chosen as capital city, and the republic had not been proclaimed yet. Main priority of the first Grand National Assembly was to enforce the Allied Forces the independency in the Treaty of Lausanne nevertheless the rest was still ambiguous. However, there was also a predominant need for construction under two main the problems; the destructions of war and the exchange of populations with Greece. Solving the both problems was vital for the perpetuation of the new regime. Former had political and economical importance on establishment of territorial integrity and integration with capitalist world while later was vital for the defragmentation of populations and establishment of a new nation over ethnic differences. "The Ministry of Public Works" and "The Ministry of population exchange and settlements" were two of the first ministries established in 1920. Nonetheless, a comprehensive politics on *bayındırlık* through detailed projects was not defined yet. Hence, development plan of Fevzi Pasha in 1923 was just an abbreviated version of the two previous plans. The main decisions such as giving weight to railroad networks, financing by foreign investment or employing foreign expertise was maintained. Nationalization of existing lines was not on the agenda, instead the program was proposed to cheapen the tariffs. Unlike the nationalistic profile of the future assembly, the first assembly had not opposed to foreign resources and approved Chester concession in 10 April 1923. Chester plan was an American proposal for control of the oil resources in Middle East by a railroad concession. According to the project, the American corporation would have the rights to use all resources found within a 20-kilometer zone on each side of the railroad lines, as well as the privilege of carrying on such subsidiary activities such as the laying of pipelines and building harbors. Although the first assembly looked on the plan with favor under the aim of gaining political support of US against the Allies in Lausanne, it would be a kind of capitulation agreement if realized (Tekeli and İlkin, 2004, pp.233-267; Time, April 28, 1923).

The 1923 elections done for a new assembly was the first sign of change in politics. This assembly was very radical in action that proclaimed the republic and abolition of the caliphate few months after. Unlike the previous one, its politics were visibly nationalist and statist. Due to the lessons learned from Ottoman experience, the new republic recognized the importance of establishment of national autonomous bourgeoisie on national sovereignty. In the Izmir Economy Congress held in the same year, the groups of farmers, industrialists, tradesmen and laborers conveyed their financial and legal demands for establishment of national entrepreneurship (Inan, 1989). Building contractors were not belonging to one of the either groups represented in Izmir Economy Congress however the construction works especially the transportation networks was fundamental for integrity of internal market and accordingly the establishment of autonomous national bourgeoisie.

There were three possible approaches for these constructions, employing foreign capital and expertise, constructing by state's own financial resources or financing building contractors by national resources. During the first decade, the new republic preferred the first two methods; hence, foreign firms, which usually found the investment, undertook almost all the construction work. For instance; construction of Kütahya-Balıkesir and Ulukışla-Boğazköprü railroad lines were undertaken by German Julius Berger Co. in return to for sixty-five million marks credit from Banks Association of Germany in 1927. Same kinds of contracts were done with Belgian Societe Indüstrielle des Travaux Co. (SİT) and Swedish-Danish consortium Nidquist Holm Co. (NOHAP) in 1926 and 1927, too (Yıldırım, 1999; Tekeli and İlkin, 2004, pp.458-461).

The rise of building sector as an entrepreneurial activity and emergence of building contractor as a key figure in building organization had been realized only after evolution in the state's (a) financing system, (b) legal framework and (c) control mechanism. Following a decade of foreign superiority in building sector, Turkish building contractors finally gained advantage over foreign firms by the change in state's financing system. In 1933, the state modified its politics in finance system and started to employ internal finance. First domestic government bonds were prepared for construction of Fevzipaşa-Diyarbakır line with 7%

interest per year by the Law No.2094 in January 12, 1933. Refunds would be paid in twenty years period after 1953. Following the huge demand for the bonds, new ones were prepared for Sivas-Erzurum line in 1934 and for eastern lines in 1941. Despite the failure of first internal finance attempt for 18 million Liras in late Ottoman period, the new republic act very attentively and achieved a huge success in this new financing method. Between 1933 and 1941, total long-term credit earned by internal finance was 102 million Liras (Tekeli and İlkin, 1982, p.277; Yıldırım, 1999). Under this new economic sovereignty in finance of nationwide construction projects, competitiveness of Turkish building contractors increased and in 1934, the bid for construction of Sivas-Malatya-Erzurum line won by Turkish SİMERYOL consortium against American Fox Co. This was a milestone in the history of Turkish building sector, and celebrated as national success (Cumhuriyet, May 4, 1933; Cumhuriyet, May 23, 1933; Cumhuriyet, June 13, 1933; Cumhuriyet, July 14, 1933); thereafter no foreign firms was able to won railroad bids again.

Concurrently with financial regulations, the state was developing new legal and technical framework and educating required technical staff for the control mechanism of the constructions. The very first legal study on construction was the preparation of unit cost index for construction works by Hallacyan Effendi the Minister of Public Works in 1909. The second was the regulations *Emlak-ı Mülkiye Kanunu* (the Law on Common Property) in 1877 and *Vakfiye'nin Tamir ve İnşası Nizamnameleri* (the Regulation on Construction and Renewal of Charter Buildings) in 1880. Except for these regulations, there was no legal framework for the mass amount of construction works done in last period of Ottoman Empire during the 19th century. The projects were all allocated by negotiations directly between government and foreign firms not by tender and conducted within specific contracts. The Law No.661 "*Hükümet Namına Vukubulacak Müzayede ve Münakasa ve Ihalat Kanunu*" (the Law on Public Auction, Underbidding and Import done on Behalf of the Government) in April 19, 1925 was the first legal framework for public procurement and tender (Batmaz et al, 2006, p.52). At the beginning of the law, it was reasoned within nationalist mood as follows:

"...other than big capitals, to ensure the participation of small capitals in tenders, and to allocate governmental construction projects to national contractors and consequently to keep national capital within the country"[23]

Preamble of the Law No. 661 on Public Auction, Underbidding and Import Done on Behalf of the Government in 1925 (Tekeli and İlkin, 2004, p.457)

Although, the law also embraced *"emaneten yapım usulü"* (force account work method) under compulsory conditions, it mainly proposed sealed-bid tender method to ensure a fair tender and have competitiveness. *Emaneten yapım usulü* means the system of carrying out a construction project by public authorities itself, instead of performing the work through a private contractor, and embrace of such a method shows us both the poor conditions of Turkish construction sector and governmental skepticism in capacity of private sector in 1920's. In sealed-bid method, the tender was undertaken by *"haddi layık teklif"* (the appropriate bid). However, it was still incomplete under current conditions because there was no explanation about how to calculate the appropriate. The notion of "estimated cost" would not be mentioned until the Law No.2490 *"Arttırma Eksiltme ve Ihale Kanunu"* (the Law on Auction, Bids and Award of Contracts) in 1934. The new tender Law No.2490 was much more detailed when compared to the Law No.661. The seventy-six articled new tender law was noteworthy with its support to small national contractors against foreign companies. In article no.2, the law made displaying activity in Turkey at least for a decade as a precondition to tender in bids lower than 15.000 TL cost for foreign firms. By the article no.45, it also implemented invitation method for tender of special constructions. Moreover, by the articles no.46 and 48, the law initiated the estimated cost method to clarify the appropriate bid. The estimated cost would be calculated due to the construction cost index (Gökalp, 1977). According to article no.10, the contractors had to be licensed to participate in a tender. In order to manage the license system, the government enacted a law on architecture and engineering profession in 1936.

In spite of its detailed articles supporting the national private construction sector, the Law No.2490 was criticized because of the auction method. Vehbi Koç who started his career as a

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[23] "...büyük işlere yüksek kapitallerden başka ufak sermayeli ciddi teşebbüs erbabının da iştirak edebilmesini temin etmek ve devlet alış ve satışlarıyla taahhütlerini mamleket çocuklarına yaptırma ve binnetice paramızı memleket içinde alıkoymak" Source: Tekeli and İlkin, "Cumhuriyetin Harcı: Modernitenin Altyapısı Oluşurken", Bilgi Üniversitesi Yayınları, Istanbul, 2004, p.457.

building contractor in 1930s stated the auction method as the reason of his quitting the building sector.

> "All the good building contractors went bankrupt and the state bear loss because of the non-discriminatory treatment between good and bad building contractors, and all the bids undertaken by who gave the lowest price due to the Law No.2490. Under these circumstances, I also quit construction work and invest in other areas".[24]
>
> *Koç, V. "Hayat Hikayem", İstanbul 1983, p.50*

This law had remained in effect almost fifty years until it was replaced with the Law No.2886 in 1984. Except for the Law No.2490, during 1930's, the state also made various laws regulating building works such as laws on municipalities, on public hygiene, on buildings and roads, etc.

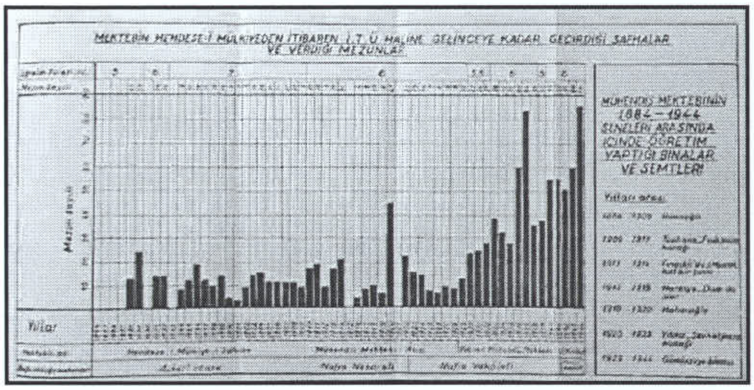


Figure 2.4 Table showing the number of graduates of the School of Engineering. Source: Uluçay, Ç, and Kartekin, "Yüksek Mühendis Okulu: Yüksek Mühendis ve Yüksek Mimar Yetiştiren Müesseselerin Tarihi", İstanbul Teknik Üniversitesi Matbaası, İstanbul, 1958, Appendix

On the other hand, education and employment of technical staff for the management mechanism was the other serious concern of new state's construction activities. Ever since

[24] "İyi ve kötü müteahhit arasında fark gözetilmediği, bütün işler 2490 sayılı kanun gereği kim daha düşük fiyat verirse ona ihale edildiği için, iyi müteahhitlerin hiçbiri yaşamadı, devlet de bundan büyük zarar gördü. Bu durumu görünce ben de inşaat işlerinin tümünü tasfiye ettim, başka işlere geçtim" Source: Koç, V., "Hayat Hikayem", Istanbul, 1983, p.50.

the second half of 18th century, the empire gave weight to the education of technical staff who would be employed under governmental institutions. As mentioned before, technical education was one of the very early fields of reform. By 1900s, there were three civilian higher education institutions on engineering; these were *Mühendis Mektebi* (Higher School of Engineers), *Kondoktör Mektebi* (Higher School of Technicians), and Robert College School of Engineering (1912). First two were established under French influence and the third was the first Anglo-American type of higher education institution in Turkey. Among them, *Mühendishâne* was the main institution responded the new state's urgent need for engineers. In spite of wars, rebellions, and other troubles, between 1888 and 1928, the school graduated 476 engineers and architects most of who served under state's control mechanism (Fig 2.4) (Uluçay and Kartekin, 1958, p.439).

Construction of *"bayındır ülke,"* especially the construction of networks, was vital for perpetuation of the new regime both economically and demographically. By the proclamation of republic, the building facilities, which almost had come to the end, were accelerated again. However, there was a big deficiency in number and variety of technical staff. Under these circumstances, the state gave priority to improvement of legal and physical statuses of the existing schools.

In spite of physical insufficient conditions, *Mühendis Mektebi* had a settled curriculum in Ottoman times. This curriculum, which was prepared on the model of *Ecole des Ponts et Chausses*, would remain in effect until 1928 when the school changed into *Yüksek Mühendis Mektebi* (Higher school for engineering). In 1928, the state initiated radical reforms in *Mühendishâne* and made changes from its name to its legal status and educational organization. The engineering education was specialized under three new branches, road and railroad-engineering department, architecture and construction department, and waterworks-engineering department. The curriculums of these new branches were rearranged on the model of German *Technische Hochschule*. Foreign professors especially drained from German spoken countries enriched the teaching staff. Among them most significant was Terzaghi who was the founder of soil mechanics in the world. By the Law No. 1275 in 1928 the school, which would be the core of the first technical university, became an incorporated body with a supplementary budget. This was democratic even today's circumstances that the concept of university autonomy was not only perceived as administrative autonomy, but also evaluated with the other dimensions such as financial and academic autonomy. By this revolutionary decision, the state displayed its trust in technical education. Unfortunately, this very avant-garde law was repealed in 1936 and the autonomy of the school was suspended.

Concurrently, "*Kondoktor Mektebi*" a two years school for education of technicians was established (1912). It had a curriculum prepared on the model of *Ecole des Conducteur* at Paris. In 1922 its name was changed and it was called *"Nafia Fen Mektebi"* (Construction and Science School) until 1937 when it became *"İstanbul Teknik Okulu"* (Technical School of Istanbul). Meanwhile, the school underwent radical restructuring, two years education was upgraded gradually to four years education and new departments were opened.

By the end of 1940's, the established pattern of the Turkish university based on the Continental European models underwent a critical change under the need for English speaking engineers emerged after closer relationships between Turkey, United nations and United States of America. In order to fulfill the qualified labor requirements of the growing market economy and newly established governmental institutions after Marshall Funds such as General Directorate of Highways (KGM), and General Directorate of State Hydraulic Works (DSI), two new technical schools were established on American university model. These were Karadeniz Technical University (KTU) in 1955, and Middle East High Technology Institute which later be called Middle East Technical University (METU) in Ankara in 1956. The new liberal government worked for the expansion of university system and development of technical education that invested on both of the universities in enthusiasm. Modern campuses that were produced by architectural competitions were constructed for both of the schools. The METU was given special rights including freedom in financial matters by the Law No.7307 and became a juridical entity in 1959. In addition, government established a board of trustees by appointing important characters of bureaucracy, private sector, political and academic arena such as Vecdi Diker Director of General Directorate of Highways, Vehbi Koç and Adnan Menderes himself. As seen in composition of the board, the school was expected to fulfill the expectations of various sides of technological progress. By the late 1970s, METU's privileged system of governance was abolished by the government (Batmaz et al, 2006, pp.118-120).

In late Ottoman and early republican times, the state was the only employer for the young graduates. Approximately 85% of the engineer members of *Osmanlı Mühendis ve Mimarlar Cemiyeti* (Ottoman Society of Engineers and Architects) were bureaucrats in year 1909. This kept same in early years of the republic when the state was developing financial, institutional, and legal frameworks for private building sector. First and most important governmental institution concerning construction works has been the Ministry of Public Works since 1848. Besides the four main departments, the railroads and harbors department, the roads and bridges department, the waterworks department, and the railroad and firms commissaries, the ministry had various other units including mining, irrigation, and communication for young engineers to work in the early years of its establishment (NID, 1938(f), p.8). In 1940s, these parted from the ministry's body and became independent institutions. After the period of economic stagnation during the years of WWII, the state allied itself with the West, and in return received US financial aid through the Marshall Plan to strengthen its economy and defenses. Hence, KGM was founded in 1950 and DSİ in 1954 with supplementary budgets under the Ministry of Public Works and became the most desired public institutions for engineers because they provide the opportunity to broaden their knowledge through vocational trainings and fellowships. In the early years of their foundation, KGM and DSI sent many engineers to America for vocational training that would later play important roles such as Süleyman Demirel and Vecdi Diker.

Municipal architects and engineers were also a part of an alternative definition of bureaucracy. Technical urban apparatus happened in a dynamic relationship with the evolution of the role of the state and by the growing need for urban planning and urban infrastructures, the state enacted in 1930 *"Umumi Hıfzısıhha Kanunu"* (Law on General Hygiene) No.1593 and in 1933 *"Belediye Yapı ve Yollar Kanunu"* (Law on Municipality Buildings and Roads) No.2290. Hence, Turkish municipal architects and engineers embodied the ideal of the modern and hygienic city.

While most of the former engineers worked in the control mechanism of the projects undertaken by foreign firms, the others worked as subcontractors of these firms. In these early years when state was developing its institutional infrastructure, Turkish building contractors developed their (a) know-how, and (b) organizational capacity, and (c) accumulated capital while carrying out subcontracted works. In addition to these three factors, Tekeli and İlkin (2004, pp.453) also stress the importance of construction of mutual trust between the contractor and the state.

In almost a decade after the first time a Turkish construction firm undertook a tender in the construction of Samsun-Sivas line in 1925, Turkish contractors had gained enough experience to be invited even for railroad tenders out of the country. In this first decade, Turkish subcontractors constructed almost 66% of the railroads undertaken by foreign firms (Tekeli and İlkin, 2004, pp.288-292). Consequently in 1934, Turkish contractors were invited to the tender of an important railroad line, Sivas-Malatya-Erzurum, which aimed to connect the northeast of the country with the rail network and to create a third north-south connection by linking the Sivas-Malatya-Erzurum line with Adana-Malatya-Diyarbakır line. A Turkish consortium Sİ-M-ER-Yol undertook the bid. This event had been a milestone in the history of Turkish engineering. Thereafter, they were not able to undertake one more km railroad bid and lost their superiority in railroad tenders. Their dominance had been limited only with the construction of dams and harbors. This event had been the second victory of Turkish engineering that gave rise to the nationalization of popularization of the profession since construction of Hijaz Railroad. After 1935, the political slogan "one more centimeter railroad" transformed into "railroad by Turkish capital, Turkish intelligence and Turkish contractor and labor."

Under these circumstances, the building sector emerges as one of the most popular entrepreneurial activities. The affluent merchants and landowners preferred to invest in building sector. As it is the case today, building contractors were not required to have the civil engineering formation in 1930s; nevertheless, they were willing to collaborate with engineers by established partnerships. These kinds of collaborations between the capital of emerging bourgeoisie or of landowners and the engineering knowledge resulted with successful construction companies, like the partnerships of Abdurrahman Naci Demirağ and Nuri Demirağ, and Hazık Ziyal and Emin Sazak. Abdurrahman Naci and Nuri brothers had been so successful in railroad construction that they constructed 1012,50 km that was more than half of the total lines constructed by Turkish firms by 1948 (Şakir, 1947, p.52) hence had a surname means railroad, *"Demirağ"*, from Ataturk himself. Even, rest of the Turkish construction firms interested in the tender for construction of Sivas-Malatya-Erzurum railroad line had to make a consortium to be a competing corporation to the Demirağ partnership.

Between 1923 and 1948, bureaucrats were very influential as operative agents of the modernity project. They were well educated, idealist, and brave enough to take the initiative. The bureaucracy gained ground as result of its accomplishments and as Batmaz (2006, p.96) conveyed, "became almost an independent class". As a common property for entrepreneurs of 1930s and 1940s, most of the building contractors were also state supported ex-bureaucrats. According to a survey done in 1968, the rate of more than fifty labor capacity private enterprises established by ex-bureaucrats is 13% between 1921 and 1930, 78% of the between 1931 and 1940, and 31% between 1941 and 1950. Moreover, until 1950, 47% of the elected parliamentarians were also ex-bureaucrats (Batmaz, 2006, p.56, 96). Due to the Law No.3467, graduates of the Higher School of Engineering had a compulsory public service obligation in order to have their diplomas. These young and idealist graduates, who could not able to get a change to collaborate with a capital owner, employed their engineering formation and experiences under public service "as a capacity to start a building construction business" (Tekeli and İlkin, 2004, p.466). As in the case of Fevzi Akkaya and Sezai Türkeş, the bureaucrat background of the engineer-contractors helped them to set up trust-based relationships with the state. There are many other memories telling the positive effects of mutual trust between state and contractor in formation of active contractor-engineer-client relationships. From these memoirs, we understand how they utilized mutual trust system to pass the bureaucratic obstacles and to counterbalance the poor economical conditions and almost zero level building industry of the day; and how finally they achieve to finish the constructions (Akkaya, 1989, pp. 122-123,135; Koç, 1983, pp.43,48). Nevertheless, by the end of 1940s, most of these first generation building constructors went bankrupt due to the instability of economical conditions and the problems in organizational capacity of the construction firms (Akkaya, 1989, p.67).

Between 1944 and 1948, Turkey experienced a number of developments related to political and economical integration with the new world order set in post-WWII period. These had effects on both building contracting and engineering. The effect of these developments on engineering was related to its education due to needs of the internationalizing sector; while, on building contracting business, it was alteration in finance methods and demands. As mentioned above, under the new requirements of the sector two new technical universities different from continental European école, KTU and METU were established in 1950s. By means of adaptation to American centered new world system through the memberships of UN in 1945, IMF in 1947, European Council in 1949 and NATO in 1951, Turkey had new financial resources for its development plans. Nevertheless, these new agreements with America and NATO also changed the demand in building contracting sector. While NATO was supporting construction of defense infrastructure such as construction of harbors, airports, communication networks etc., American finance including Marshall Funds focused on the establishment of transportation networks.

Table 2.1 Foreign investment in Turkey by the end of February 1955, Source: "Yabancı Sermaye Kanunun Neticeleri", *Türkiye Mühendislik Haberleri,* Doğuş Ltd. Şti. Matbaası, Ankara, July 1955, p.11.

	In rem	Cash Investment	Sum
America	17.332.456 tl	14.805.200 tl	
Germany	14.430.473 tl	303.33 tl	
Italy	12.351.920 tl	179.200 tl	
England	3.910.760 tl	1.506.560 tl	
Holland	2.530.00 tl	1.530.000 tl	
France	1.301.120 tl	10.600 tl	
Israel	1.462.000 tl	0 tl	
Switzerland	965.770 tl	157.015 tl	
Uruguay	700.000 tl	0 tl	
Austria	471.000 tl	140.000tl	
Belgium	336.000tl	118.400tl	
Denmark	0 tl	400.000 tl	
Greece	33.600 tl	0 tl	
Finland	0 tl	28.000 tl	
TOTALS	55.541.099 tl	19.535.683 tl	77.073.094 tl

By the election of Democratic Party (DP) in 1950, the US and NATO supported economical revival fostered the construction sector via projects of a brand new development plan. During 1930s and 1940s, railroad program was the main subject of the development plans and the major source for establishment of a private building sector. Nevertheless, in the new plan, it was transformed into a highway program by a major break in transportation politics. The new liberal government embraced "the Nine Years Highway Program", which had already been initiated by İsmet Pasha Government in 1948, and the General Directorate of Highways, which was established just few weeks before the elections in 1950, was maintained with enthusiasm. During 1950s, government allocated increasing amount out of the state budget for the program, that in 1957, almost 10% of the budget was reserved for highway constructions. Hence, the program had been the first big resource for the finance of building contracting sector in liberal times and helped to make great leap forward. The nine years highway construction program -between 1948 and 1957- had been very successful as a development program that in 1954, United Nations asked for establishment of a training center on highway construction for education of engineers in developing countries (Cündübeyoğlu, 1954, pp.5-10).

Almost six years after the initiation of the first wave, the second leap forward was realized by means of NATO projects. Within the framework of integration, construction of defense infrastructure such as harbors, airports, oil pipelines, highways etc. was supported by NATO funds. In 1951 and in 1953, two new laws passed to expedite the construction of these projects; these were respectively "*Yabancı Sermayeyi Teşvik Kanunu*" (the Law on Encouraging Foreign Investments) and *"NATO Müşterek Enfrastrüktür Programı Gereğince Türkiye'de Yapilacak İnşa ve Tesis İşlerine Dair Kanun"* (the Law on Construction and Establishment Works in Turkey in Relation to NATO Joint Infrastructure Program). These laws authorized the public bodies, which were in charge of the projects (1) to transfer money from other projects to NATO projects, and (2) to advance a sum to the contractor (Batmaz, 2006, p.102). In addition, they (3) eased the strict custom rules for importation of the construction machinery, equipment, and materials for the projects. Therefore, NATO projects, were very advantageous fiscally and technologically, and had been most favorite tenders for the contractors during 1950s. Turkish firms involving the construction of NATO projects as contractor or subcontractor developed their knowledge through the experience on international construction sites.

> "...most of these firms utilize the contemporary technology because they work with NATO. We learnt [from them] what a wheel dozer, finisher, bulldozer or scraper is. Until 1950 we barely know 250lt concrete mixer and barrow"
>
> *Quote from Tarık Şara. Sourece: Batmaz, 2006, p.103.*

NATO projects as well as KGM and DSI have, in turn led to accumulation of capital and establishment of technical and technological base for the overseas activities of Turkish construction sector after 1980. The firms involved in the construction of these projects as contractors and/or sub-contractors have gained valuable experience and have renewed the machinery parks at low-costs, later would be leading firms in the sector by their experiences.

As in the reign of Abdülhamid II, Menderes era also represents a progressive approach strengthened by the use of new materials and innovative technologies in infrastructural projects in spite of lack of national resources. In addition to realized highways, dams and irrigation projects, many other innovative and avant-garde projects such as tunnel for Bosporus, nuclear power plant and tunnel for Mount Bolu, which were still fresh in today's agenda, were proposed in this period. One of the critical issues of DP governments in this process was to make the right decisions among all these proposals for utilization of the foreign finance effectively while establishing of a permanent construction sector. Like agricultural mechanization, the real problem about the construction of "*bayındır ülke*" was the government taking into action without forming the necessary socio-economic basis. Generally, imported financial help, even economical or cultural, destabilizes the inner equilibrium if it is not well organized. Especially in a developing country like Turkey, the destruction is broader. As in the case of imported tractors that did not suit with the conditions of Anatolian villages with no diesel oil, the government had actually initiated an ambitious construction boom by imported machinery and building materials. The total cement spent on construction of Yeşilköy Airport (1953) and Esenboğa Airport (1955) was equal to annual production of Eskişehir Cement Factory (Batmaz, 2006, p.106). The foreign credits returned to the same countries because of the emerging need for importation of building materials for the big scale projects. Thereupon, Prime Minister Menderes ordered the founding of twenty new cement factories all over the country.

Table 2.2 The table showing the construction investments and total investments and ratios in between in years between 1963 and 1965. Source: "Planlama", *Türkiye Mühendislik Haberleri*, Doğuş Ltd. Şti. Matbaası, Ankara, Ocak 1965, p.19

	1963	**1964**	**1965**
Total investment (Million TL.)	10.053,6	11.846,0	12.700,0
Investment in Construction Works (Million TL.)	6.464,0	7.673,4	8.191,5
Ratio of investment in construction works to total investments	%64,23	%64,77	%64,5

The spontaneous investments done without planning transformed the economical revival during the first DP government into a huge economic crisis. Hence, the construction sector, which was the locomotive sector for operations of the first DP government, became the reason of economic crisis in the second period. Due to the experienced devastating effects of unorganized foreign investment, the urgent need for planned development strategies arose by the end of second Menderes Government. By the growing housing problem and building materials shortage, the critiques focused on the construction politics. First attempt on planning of construction sector was by European Economic Corporation in 1956 (TMH, Oct. 1957, pp.61-63). A total planning was also initiated by pressures of OECD at the end of 1950s, but interrupted by the military coup (Erder et al, 2003, pp.11-13 and 20-30).

Besides the economical crisis, second notable issue remained for 1960s was the establishment of professional organizations. In 1954, Turkish Chamber of Engineers and Architects was established by the Law No. 6235 for operating on behalf of entire professional society and capable of acting independently from any individual political ideology. Establishment of the chamber was an important step forward in professionalization of Turkish engineering. Thereafter, professional rights of the engineers either working for state or private sector, the quality of engineering education, the problems of Turkish contractors etc. have been defended by the chamber. Moreover, the professional agenda was not limited with only professional issues; they also discussed the national and political issues in relation with the concept of "*bayındırlık*".

After 1960 military coup, new government embraced the concept of planning. The planned development model became a constitutional principle in 1961 and was initiated by the first five years plan in 1963. The priority of the plan was to rearrange the inordinate construction investments (Kunt, Oct. 1960, p.20). The plan proposed to reorder regulations of construction works such as tender methods, and relations between treasury and other state institutions related with construction. However, the proposals of the plan could not be applied due to political reasons and the plan had to be revised in 1965.

The construction works were vital for the development plan. Approximately 64% of the total investment was spent on construction works in planned development period. Hence, as it was conveyed in the report of development plan-1965, "...the success of two years part of the development plan was notably limited by the problems in planning of construction works" (TMH, Jan. 1966, p.41).

"Civil engineering is the profession that plans the nation state's structure and realizes it. Regardless of which part of the development plan you look at, there is the need of the knowledge and effort of civil engineers in the realization of the plan....Hence the importance and honor, the responsibility and duty of the profession are immense."[25]

TMH, March 1964, p.3.

By the emerging concept of planned development, engineers, as natural implementers of at least 60% of the plan, demanded positions that are more powerful. They desired to be actively involved in the planning process and started to state their opinion in professional journals (Salihoğlu, March 1963, pp.7-10; Kulin, July 1963, pp.2,48). Thereafter, they displayed a politically sensitive approach. They had even started defining themselves as the guarantee of freedom and democracy.

"Since the previous politicians did not make planning or act in accordance with the planning; investments did not returned to national economy in a particular period of time, and they tried to cover failure in a peculiar statism. The primary characteristic of that statism is limiting the rights and liberties. As is seen, absence of planning and forethought led to failure, and the failure, in turn, led to deprivation of liberties... It is required to provide the assurance of rights and independencies in planned and systematical investments, namely in engineering."

Nejat, A., "Devlet ve Çizgi", Türkiye Mühendislik Haberleri, Ankara, Oct. 1960, p.22-24.[26]

In 1960s, Turkish engineers were identifying themselves as non-profit democratic pressure group working for common wealth (TMH, Feb. 1970, p.11) and they called themselves

[25] "İnşaat mühendisliği yurt yapısını planlayan ve o planı uygulayan bir meslektir. Kalkınma planının hangi koluna baksanız planın gerçekleşmesinde inşaat mühendisinin bilgisine ve emeğine büyük oranda ihtiyaç vardır. yıllık yatırımların %60'ı inşaat işlerie ayrılmaktadır. O halde bu mesleğin önemi ve şerefi, ödevi ve sorumu büyüktür". Source: "Başyazı", *Türkiye Mühendislik Haberleri*, Rüzgarlı Matbaa, Ankara, March 1964, p.3.

[26] "Dünkü politikacılar bunu yapmadığı yada yaptığına uygun davranmadığı içindir ki, yatırımların karşılığını belli bir süre içinde milli ekonomiye geri dönüş bulamamış, uğradığı bu başarısızlığı, garip bir devletçilik anlayışıyla örtmeye çalışmıştır. O devletçiliğin birininci özelliği hak ve hürriyetleri gittikçe kısması ve sınırlamasıdır. Görülüyor ki hesapsızlık başarısızlığı, başarısızlık da hürriyetsizliği getirmiştir. 27 mayısın yaratılmasında biz, hürriyetsizliği bir parametre, fakat asıl nüveyi orijindeki hesapsızlık olarak görüyoruz. Hak ve hürriyetlerin sigortasını hesaplı ve programlı yatırımlarda, yani mühendislikte bulmak gerekmektedir". Source: Nejat, A., "Devlet ve Çizgi", *Türkiye Mühendislik Haberleri*, Rüzgarlı Matbaa, Ankara, Oct. 1960, pp.22-24.

"technical force"[27], "technical army" and "power of technical workforce" (Özkol, TMH, Apr. 1970, pp.46-49). The chamber of civil engineers have published a professional journal named *"Teknik Güç"* (Technical Power) since June 1972 and propagated the ideals of scientific and technological progress. By recognizing the effect of their power, they expanded the meaning of being "technical force" and started to highlight the importance of alliance of technical power and political power in their official publications (TMH, March 1963, p.1). After 1950s, the number of technocrats owned both powers had multiplied. In 1957, fourteen engineers entered the parliament (TMH, Dec. 1957, p.4) while in 1965, including the prime minister, there were three engineers in the cabinet of the first Demirel government (TMH, Nov. 1965(c), pp.1,8; TMH, 1965(d), p.5).

	Meslek	1967	1970	1977	1982
Talep	Mühendis	25 500	33 700	63 200	94 800
Arz	»	16 900	20 800	31 900	39 000
Açık	»	8 600	12 900	31 300	55 800
Talep	Teknisyen	42 600	60 400	142 500	261 400
Arz	»	35 900	40 400	54 600	72 200
Açık	»	6 700	20 000	87 900	189 200
Talep	Sanatkâr	1 387 000	1 782 900	2 894 600	4 129 700
Arz	»	1 286 000	1 391 400	1 761 200	2 263 700
Açık	»	101 000	337 500	1 133 400	1 666 000

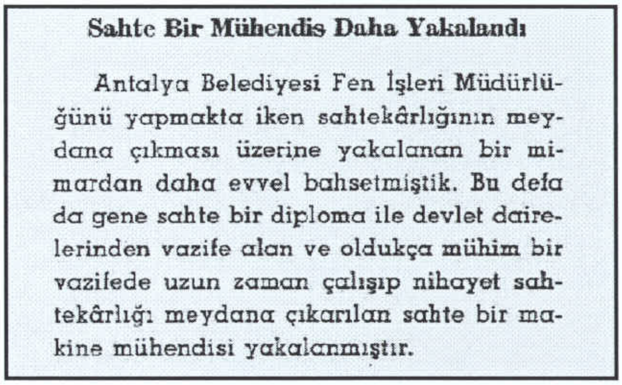
(Kaynak: İkinci Beş Yıllık Kalkınma Plânı)

Figure 2.5 Estimated numbers of technicians, engineers, and artisans for 1967, 1970, 1977 and 1982 in the second development plan for five years. Source: *Türkiye Mühendislik Haberleri*, Rüzgarlı Matbaa, Ankara, Agu. 1955, p.18.

According to the data given in February 1957 TMH (Feb. 1957, p.5), there were 8821 engineers and architects in Turkey, and 2695 of them were in Ankara while 2519 of them were in Istanbul. Among them, 797 of the ones practicing in Ankara and 861 in Istanbul were civil engineers. 224 of the technical class were women and 381 were PhDs. 2542 were working in private sector while 6379 of them were under state. However, by increasing

[27] Since 1972, the Chamber of Turkish Civil Engineers has been publishing a journal named "Teknik Güç-Technical Force".

external financial sources and construction works in Menderes era, the problem of technical personnel deficit persisted, deepening further each day since the early years of the republic. In 1962, High Committee of Planning met with the representatives of state institutions related with construction works to delineate the problems in realization of projects. They regurgitated the priority of need for technical personnel in every level of construction in their meetings (TMH, Feb. 1963, pp.14-16). In the second development plan for five years, the projected increase in deficit for engineers was 370% in ten years period. Moreover, in the decade between 1955 and 1965, the increase in number of technicians, engineers, and artisans was not proportional and by the end of the decade, the balance started change (Fig 2.5). The qualitative and quantitative deficit in the sector was compensated with increasing number of foreign engineers by increasing activity of foreign firms in tenders. And even there are news about arrested fake engineers(Fig 2.6) (TMH, Aug., 1958, p.15).



Sahte Bir Mühendis Daha Yakalandı

Antalya Belediyesi Fen İşleri Müdürlüğünü yapmakta iken sahtekârlığının meydana çıkması üzerine yakalanan bir mimardan daha evvel bahsetmiştik. Bu defa da gene sahte bir diploma ile devlet dairelerinden vazife alan ve oldukça mühim bir vazifede uzun zaman çalışıp nihayet sahtekârlığı meydana çıkarılan sahte bir makine mühendisi yakalanmıştır.

Figure 2.6 "Another Fake Engineer Captured: We had already mentioned the architect captured while he was working in the Municipality of Antalya as Director of Science Affairs. This time forgery of a fake mechanical engineer who had been working in an important position under public service for a long time with a fake diploma was finally revealled and captured", Source: *Türkiye Mühendislik Haberleri,* Rüzgarlı Matbaa, Ankara, Nov. 1955, p.18.

In spite of being a problem of quantity, the crisis of Turkish engineering was also a qualitative problem. Since 1950s, engineering education had been criticized for not being contemporary. In June 1950, students protested the technical university by organizing an "education meeting" (TMH, Nov. 1957, p.90). Subsequent to foundation of KGM and DSI, professional specialization became another urgent need. The state initiated establishment of two new technical universities in 1956, however this was not enough to fulfill the needs. Under these circumstances, the private engineering schools were multiplied rapidly. The engineering school of Robert Collage was the first private school established in 1912. Since then no other study for foundation of private academies until 1961, except for an inconclusive attempt of TED Collage in 1955 (TMH, July 1955(a), p.3). In 1961 constitution article 21 it is stated that "everybody have the right to learn and teach" although "the universities are founded only by state on special laws." Therefore, due to legal constraints, the status of the established private schools could not called university but high school. The chamber was not in favor of private engineering schools. During 1960s, the subject was discussed from various aspects. Most important were the risk of losing quality because of commercialization of education, and being against the social state principle. The oppositions brought an action against Ministry of Education in State Council in appeal for annulment and concluded in nationalization of private universities finally in 1972 (Köknel, May 1965, pp.12-13; Gürdamar, May 1955, pp.11-13).

Besides the quality problems of engineering education, private engineering schools and foreign engineers, the most important problems were narrowing down the business area of building contractors and the employee rights of the engineers working in private sector and in state. The private building contractors were competing on one side with foreign firms, while on the other with the companies established by state institutions. Depending on their experiences by *"emaneten yapım usulü"* (force account work method) and widening machinery pool, the state economic enterprises started to prefer founding their own construction firms such as Emek Construction Co., Tümaş Co., Metag Co. Bimaş Co. Ray-Nimens Co. etc. by the end of 1950s (Nejat, TMH, Aug. 1960, p.3; TMH, July 1960, p.1; TMH, Dec. 1961, p.1). In almost all of these companies, the state was shareholder with private foreign firms. Although these construction firms achieved many important engineering projects in Turkey, they were accused of being an obstacle for Turkish construction sector those days. These state enterprises could commission the firms of its own body directly with no tender. Hence, it caused unfair competition on construction of big scale infrastructure projects, which would develop technical knowledge of private construction firms. The situation was criticized sharply as "apart/aside from encouraging the private engineering offices; even their developing activity area was taken from their hands [by state]" (Kunt, Oct. 1960, p.20) because "It [was] impossible [for national engineering offices] to compete with these foreign originated, monopolist companies such as Tümaş, Bimaş etc." (Özkol, Jan. 1971, pp.9-10). The business area of private engineering offices was limited with construction of small-scale buildings of individuals, which would not develop technical know-how; while this area was also preoccupied by uneducated building contractors because of unplanned investments on urbanism (TMH, May 1963, p.26). The unplanned investments over technical capacity of the sector led to deterioration in quality of construction work because of lack of legal control mechanisms.

BİLDİRİ

MEMUR MÜHENDİSLERİN DİKKATİNE

Devlet memurları kanununun 226 - 229 maddelerinde yazılı "meslek birlikleri" yetkilerine dayanarak memur üyelerimizin haklarını aramak ve korumak için sendika kurulmasında fayda ve hattâ zaruret görülmektedir. Başka ihtisas kollarındaki mühendisler bu sendikaları kurmaya başlamışlardır.

Teşebbüs heyetlerine gimek isteyen Sayın üyelerimizin 14 Ekim 1965 perşembe günü saat 17.30 da Odamızda toplanmalarını tavsiye ederiz.

YÖNETİM KURULU

Figure 2.7 "For the attention of engineers working under public service! ". Announcement about establishment of a union of engineers working under public service. Source: *Türkiye Mühendislik Haberleri,* Doğuş Ltd. Şti. Matbaası, Ankara, Oct. 1966, p.10.

On the other hand, engineers were fighting for their employee rights (Fig 2.7). In the era of consciousness after 1961-constitution adopted the rights of strike and collective bargaining, the engineers also became sensitive on their rights and liberties. In 1963, TMMOB prepared a report on "the Problems of Technical Personnel in Turkey". In this detailed report, which was published in October 1963 volume of TMH, gives a detailed view of working conditions in state. The report begins with the statements of "engineers in every level of the "Technical Force", from technicians to PhDs, are as good as foreign colleagues; even better". And finishes, "...after all these sacrifice, unfortunately, [our] high ability and adequate knowledge was exploited in this old and degenerated system". According to it, the educated engineers, which were sent abroad for training or chosen for working with foreign consultants, were wasted in the system. It is because the existing system could not turn educated minds to good account by not employing them in their specialties because of politic reasons and by overloading them with bureaucratic paperwork. Thus, "[our valuable] technical force had been dissipated" (TMH, Oct. 1963, pp.52-56).

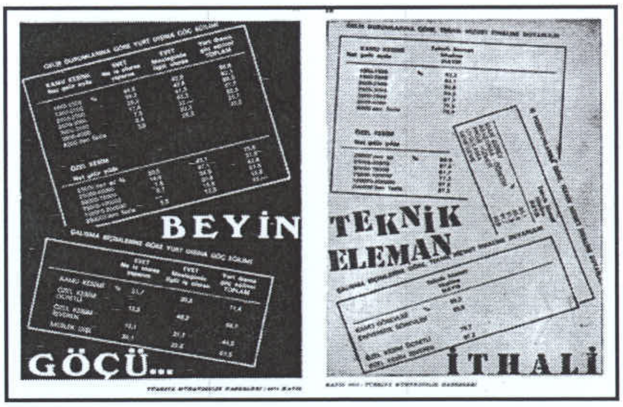


Figure 2.8 Two contradicting problems at the same time "Brain Drain" (left) and "Importation of Technical Personnel" (right), Source: *Türkiye Mühendislik Haberleri,* Rüzgarlı Matbaa, Ankara, May 1973, pp.11,18.

Another topic was the proposal for new law on civil servants. According to the proposal, which rearranges the organizational structure of construction works, it was planned to authorize the governors for administration of construction works. However, non-technical managers would administrate technical personnel. In their writings protesting the proposal, for the first time, engineers advocated the technocracy, which had already become an actual situation. The proposal edited by intense lobby activities of the chamber and became law in 1965 (TMH, Jan. 1958, pp.3,15; Köknel, TMH, 1965, pp.16-17; TMH, 1965(a), p1; TMH, 1965(b), pp.4-10). This was the first victory of engineers as professional group. However, they were not been able to affect the other articles about the employee rights of engineers. The status of engineers working in state organizations had not determined yet in that time. They were neither employee nor officer; hence, they did not have the rights of either of them. The same proposal for the Law No. 657, was not clarifying this uncertainty (TMH, 1966(a), p.1; TMH, 1966(b), p.3; TMH, 1966(c), pp.17-19). To defend their rights, engineers founded Turkish Engineers Union in 1966 (TMH, March 1966(d), p.30). In 1970s, the bad conditions of employment in state and in private sector led to the problem of brain drain in engineering (Fig. 2.8). Turkey while on one side was importing foreign engineers, was on the other side losing its own. During the studies of 3rd Development Plan for five years, Vedat Önsal the Deputy Chairman of the Group of Democrat Party stated "if not to prevent migration of educated technical personnel and qualified labor to foreign countries, non-fixable problems will emerge in the future"[28] (TMH, Oct. 1972, pp.12-13)

Besides all the problems, 1950s and 1960s were golden times for Turkish engineers even if not for Turkish engineering. The planning experience helped engineering ideology to accede and popularize, so did engineers. They got important positions both in government and in opposition circles had been closely involved in the decisions for long years while being a part of social opposition by professional organizations. The social opposition gathered around the chambers of engineers and architects hosted rich discussions on technology, science, planning, and social and political role of technocrats. Consequently, among other duties, engineers and architects defined themselves as agents of civilization commissioned for development.

2.3 Concluding Remarks

Technology as a powerful innovative force had been a topic of discussion even in the lands of its origins. As discussed in the first chapter, unlike western countries that share similar cultures, adaptation of technology had also met with resistance as an ecdemic innovative force. During the 17th and 18th century, conservative groups of Ottomans rejected technology and its products as parts of unsolicited western culture. Hence, opposition to westernization impeded the development of engineering and caused breaks and returns in the history of Turkish engineering education. On the other hand, this also gave the profession its heroic character on behalf of modernization, and development. Therefore, from the very beginning, Turkish engineers have taken their place on the side of modern elites as the representatives of rationality and implementers of modernization. Nonetheless, their natural relationship with positivism and modernity had leaded them rise by the rising westernization in early republican period. Later by the changing global sources of influence, engineers as implementers would be the first in keeping abreast of changing paradigm shift in models of modernization.

[28] "...yetişmiş teknik elemanların ve kalifiye iş gücünün dış ülkelere göçünü önleyecek tedbirler süratle alınmadığı takdirde ileride telafisi mümkün olmayacak aksaklıklar doğacaktır". Source: "Teknik Eleman Göçünü Önleyici Tedbir İstendi", Olaylar ve Notlar, *Türkiye Mühendislik Haberleri*, Rüzgarlı Matbaa, Ankara, Oct 1972, pp.12-13.

In addition to changes in the concept of *"muasır medeniyet"*, the changes in economy politics is the second dominant factor in development of engineering and engineering ideology in Turkey. Transformation of major financial sources from external to internal resources and economic systems from statist to liberalist models have changed the basis of national engineering ideology from Saint Simonist to Veblenist and Veblenist to Taylorist principles. Engineers had embraced politically inactive but vitally important implementer role of modernism position in the early republican period under patronage of the state. In spite of the continuing patronage of the state, engineers started actively taking part in social problems by the increasing importance of the planning and scientific management concepts in state system in 1950s. In this new area while still being politically inactive, engineers started to be transformed from implementer-bureaucrats to planner-technocrats. In following decades, they would have undertaken political roles both in governmental and oppositional circles. After 1960s, the engineer-bourgeoisie who accumulated capital and know-how would started embracing Taylorist principles in their big scale enterprises.

CHAPTER 3

AGENTS AND ACTORS OF "BAYINDIR ÜLKE"

Due to underdeveloped economy of the country, role sharing of the agents in construction works in Turkey depends more than all factors on the economical ones. In the first half of 20^{th} century, financial inadequacy of the individuals necessitated the state to involve. This situation together with the characteristics of engineering and construction works, prevented emergence of engineer as subject besides the raising individuality in modern times. Even in the world, except for few names such as Thomas Telford (1757-1834), John A. Roebling (1806-1869), Gustave Eiffel (1832-1923), Robert Maillart (1872-1940), Eugene Freyssinet (1979-1962) etc., states and/or private corporations had loomed large in construction works instead of individuals until the second of 20^{th} century, due to the need for technical and financial cooperation under 1900s' circumstances.

Especially in late-industrializing countries such like Turkey, there were problems of lack of national bourgeoisie, knowledge, and experience. Therefore, state and its related institutions had to organize not only finance but also design and production processes of most of the construction projects within a strong corporate identity under *"bayındır ülke"* ideal. Under these circumstances, engineers who were not able to appear as heroes of technology and engineering came into prominence as politic personalities equipped by the power of positive sciences and the power of technocracy.

Rather than ideologies or artifacts, this part of the chapter explores the human dimension of modernity, the actor and/or the group of actors behind the modern physical and technological environment. The agents who imported know-how, adopted new technologies, invented new methods are the first ones come to mind. Nevertheless, the ones who decided the investment politics, who designed the projects, who prepared the tenders, who controlled the constructions, were all part of the process. Because of previously mentioned anonymous nature of Turkish engineering, especially under public service, the sources did not give much information about personalities. In such cases, it was focused on the works done by these nameless agents in the sources.

We deal in turn with, state actors: the ministry and general directorates, semi-state/semi-public actors: municipalities and state economic enterprises, non-state actors: private firms and chambers, and lastly with global actors including foreign firms and foreign consultants.

3.1 State Actors

In the catalogue of the exhibition titled "the Actors of Architecture in Turkey: 1900-2000", it is stated that although architect-cum-bureaucrats (so do engineer-cum-bureaucrats) built almost all of the public buildings in the periods, we know little about their identities. Tanyeli (2005) asserts that, because "the esprit de corps was so binding that it eradicated the change to exist individuality at the outset…[this] group, which regarded itself as the protagonist of modernization, came in last in constructing a modern subject identity"

The ascertainment can actually be re-read by shifting engineer with architect; even can be generalized for almost all the technical bureaucrats of the early republic. Whatever the technological, technical, and/or ideological greatness of the works done, technical bureaucrats rarely seemed to carry a real subject identity. They kept themselves so modest and faceless that their invisibility amazes the ones who study this subject when compared with the prominence of the works they had done. As mentioned in previous chapter, a kind of Saint Simonian way of thinking prevented engineers to keep themselves in the foreground instead of the works they have done, although there is no evident connection demonstrating a deliberate relationship with Saint Simonianism. They preferred low political profile and low individuality but rather acted as a professional community under state institutions. Hence, as opposed to weak individuality, strong corporate identity was the characteristic of engineer-cum-bureaucrats in Turkey. The Ministry of Public Works and later its related general directorates were main corporate identities (state actor/s) under which engineer-cum-bureaucrats were united.

According to Kılıçbay (1985, pp.13-15), the Turkish state has been responsible for establishment of socio-economic infrastructure ever since its foundation, hence, this responsibility became a traditional factor in identifying the model of Turkish economy. The broadness of national understanding of the concept of "public works" as well as the doubts about technological, organizational, and fiscal capacities of private enterprises defined the areas that the state directly involved. These areas were chosen for providing a basis for other sectors such as finance, production of raw materials and construction of physical infrastructure. Under economical conditions, the state has a dual role in construction works: regulation, and application. By making laws and regulations state as an actor, that standardizes the construction works. It defines qualifications of construction works and contractors, and prepares laws on tenders, regulations on production of building materials and on construction standards etc. Second role is about applications: planning, financing and supervision of the construction works. Moreover, it has also undertaken the construction of physical infrastructure and has directly involved in construction works by employing *emaneten yapım usulü*. The state intended to apply a liberal economic model in the very first stages. However, the inadequacy of technological and economical conditions of the private sector and the vital requirements of nation-wide infrastructure projects for public interest forced the state to involve. Besides, construction of infrastructure was not only pure public work. Due to ideological and political reasons, the iconized infrastructural projects – dams, bridges, roads, and factories- became both apparatus and at the same time showcase of modernity and the new regime.

Figure 3.1 Ali Çetinkaya, during his ministry between 1934 and 1939. He prefered to pose his hand on book, which is symbol of science in the photograph. It is quite meaningful when his position as head of a ministry related with technology and science was considered. Source: Available on 10.10.2008 at www.gittigidiyor.com

Since 1848, when it was first established, the Ministry of Public Works has been the only authority in planning, designing, financing and controlling the construction works in the name of the state. It was also one of eleven ministries of the first government in 1920. However, under wartime circumstances, the whole ministry, which was consisted of the minister, an undersecretary, and three engineers and a few other secretaries, was stuck in a room of governor's office (Mutlu, 1989, p.23).

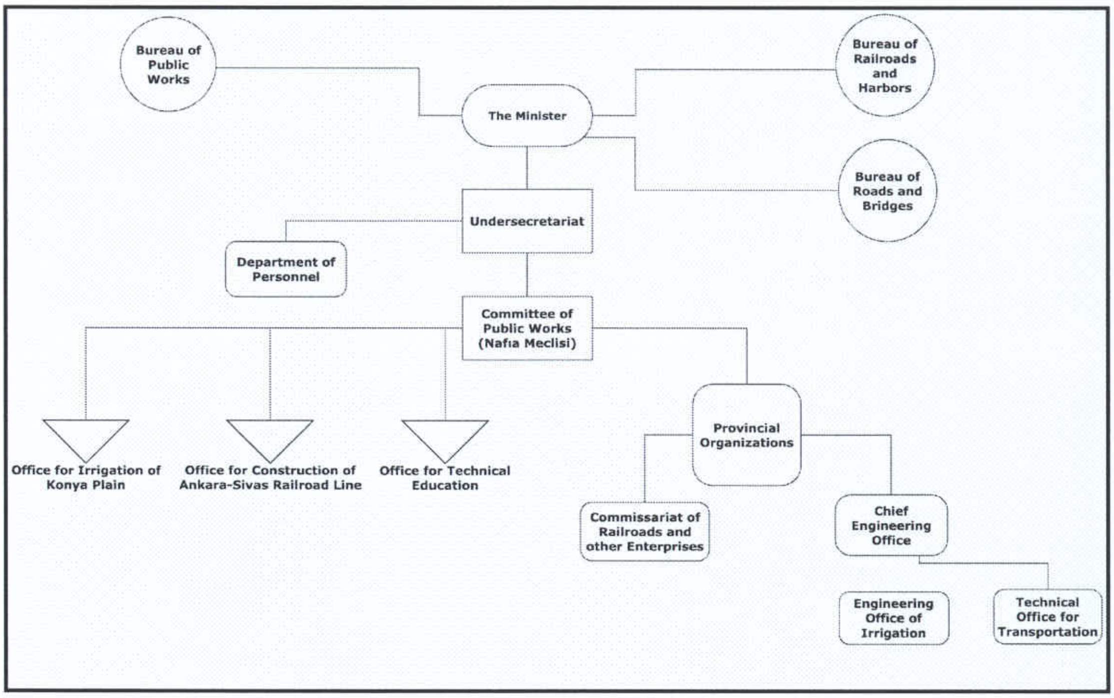
After proclamation of the Republic, the duties and works of the ministry vastly enlarged in spite of limited increase in sources. However, along with increasing works, the problems of deficiency in technical staff and experience in construction sector emerged together with the problems of finance. These problems obligated interference of state as main source of finance, technical knowledge, and engineering experience. In most of the cases, the ministry had to carry out the projects, which were uncompleted or not undertaken by private contractors because of low profit margins, by itself through employing force account work method. Embracement of such a method shows us both the poor conditions of Turkish construction sector and governmental skepticism in capacity of private sector in 1920's. The ministry defends the method in 1935 Nafıa İşleri Dergisi as follows:

> "Great things are achieved by accumulation of power into one point. State is the organization that collects and regulates the power sources of country. Therefore, when individuals are not adequate, the most rational way to succeed is the state taking control. The important part of this is not about who has achieved this success, whether it is the state or the individual; but forming the required organizations for the development and prosperity of the country. Eventually, are not the ones who involve in these governmental organizations, already the people of this country?"

Nafıa İşleri Dergisi, 1935(e), v.5, pp.5-15[29]

[29] "Büyük işler kuvvetlerin bir noktada toplanması, tekasüfü ile görülür. Devlet yurdun kudretlerini toplayan onu lüzumu olan yerde lüzumu veçhile kullanan bir teşekküldür. Şu halde büyük işleri başarabilmek için ferdlerin kafi derecede mücehhez olmadığı yerlerde bu gibi işlere devletin girmesi ve karışması en makul yoldur. Burada asıl olan, yurdun ilerlemesi ve refahı için icab eden teşebbüslerin meydana getirilmesidir. Yoksa bunların ferd veya devlet tarafından yapılmış olması değildir. Bunda da o gibi teşebbüsler ve teşekküllerde çalışanlar memleketin ferdleri değil midir? Bir farkla ki bu ferdlere bu çalışma sahasını veren birkaç kişi yerine devletin şahsiyeti maneviyesidir" Source: "Nakliyecilik ve Yurtta İnkişaf", *Nafıa İşleri Dergisi, 1935,* v.5, pp.5-15.

Table 3.1 Flowchart showing the structural organization of the Ministry of Public Works in 1920. (Produced by the author on the data from Mutlu, Y. N., "Bayındırlık Bakanlığı Tarihi 1920–1988: Nafia Vekaleti, Bayındırlık Bakanlığı, Bayındırlık ve İskan Bakanlığı", Bayındırlık ve İskan Bakanlığı Matbaası, Ankara, 1989.)

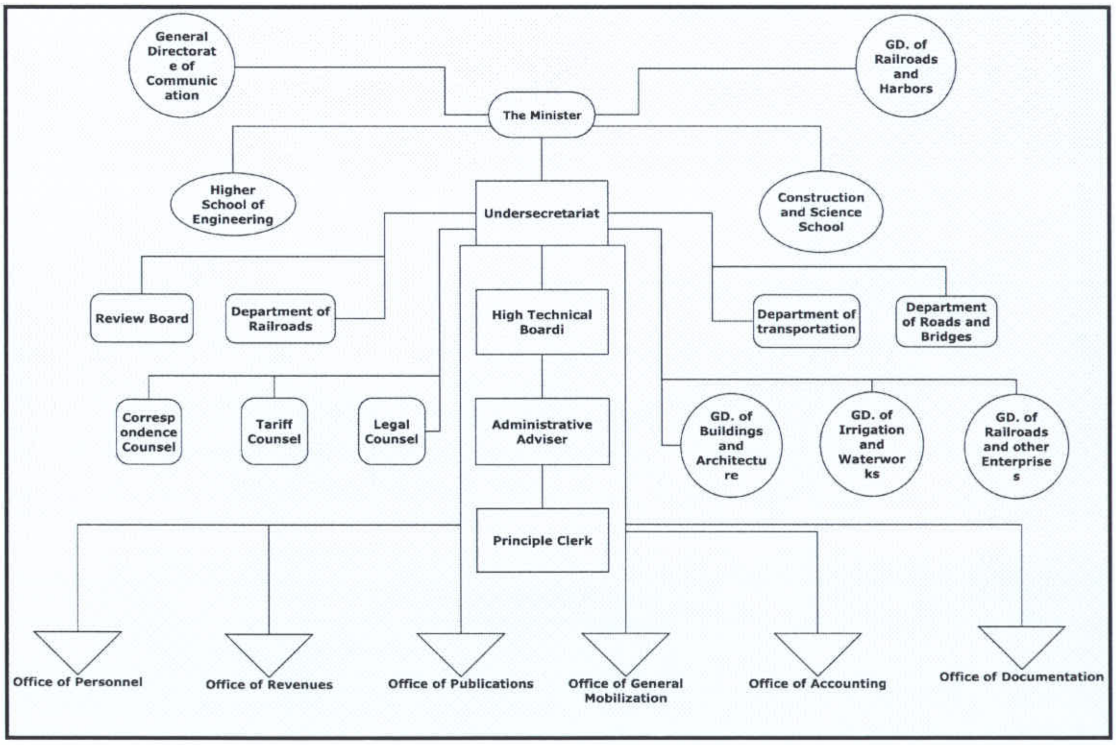


During 1920s and 1930's, the ministry was almost the single operative actor of the *"Bayındır Ülke"*. It was the only society for engineers and architects who want to involve big scale projects rather than construction of single-family houses or apartments. Besides, the Law No.3467 had already obligated a public service on the graduates of *Mühendishâne*. The situation was more limited for engineers compared with architects who can part in architectural competitions. They could rather be engineer-cum-bureaucrats or subcontractors work for the ministry. Besides, in the ministry they had the chance to work actively in every level of construction from planning to building, financing to controlling. The ministry was like a school for engineers, which gave them not only the chance to work in big scale projects but also to work with foreign experts and to be trained in foreign countries. Akkaya (1989, p.34) tells in his memoirs that Hungarian engineer Balaj trained him to in his first months in the ministry. These young and idealist young graduates, who could not able to get a change to collaborate with a capital owner, would prefer to employ their professional experiences under public service "as a capacity to start a building construction business"

(Tekeli and İlkin, 2004, p.466). Hence, the ministry acted like a training step for all of the future building contractors of the period.

In the early years of its establishment, the structure of the ministry was so complicated because of the diversity of the responsibilities. It was organized under three main bureaus – the Department of Public Works, the Department of Railroads and Harbors, and the Department of Roads and Bridges-, a Commissariat for Railroads and Other Firms, and several other subsections concerning irrigation, communication, and technical education etc. under head of a minister, an undersecretary, and a commission called "*Nafıa Meclisi*". As the legal infrastructure, the early organizational structure of the ministry was continuation of Ottoman period. (Mutlu, 1989, pp.22-23).

Table 3.2 Flowchart showing the structural organization of the Ministry of Public Works in 1935. Reproduced by the author from the chart published in Nafıa İşleri Dergisi, v.5, 1935(d), p.5.



In 1935, the number of bureaus increased and new department established concerning waterworks, transportation, communication, architecture and new sub-departments established responsible of publications, properties etc. Thereafter, the ministry had been responsible in various topics from construction of harbors to education of technical staff and determining the architectural style of the public buildings to managing the postal business and its structure got more complicated. The ministry had continued the structure that was aligned with statism since the end of single party era, nevertheless; it had to narrow down the field and specialized on limited areas by changing local and global conditions. Department of PTT and administration of *Yüksek Mühendis Mektebi* had been the first ones parted in 1939 and 1941. Later, other departments separated out of the ministry's body and became autonomous or semi-autonomous institutions. Finally, the ministry turned into a pure administrative body that plans, finances and controls the construction works.

Among the parted departments, most significant ones are the General Directorate of State Hydraulic Works (DSI) and the General Directorate of Highways (KGM). Both of them were established by means of US technical and financial support for post-WWII Europe. In American geo-politic plan for postwar Europe, every country had a pre-defined role in an economically united whole. Turkey's role was agricultural; hence, the projects focused on agricultural irrigation and establishment of highway networks both for military and commercial transportation[30]. According to Marshall Plan, this road system would also be a part of broader network, which connects democratic and independent European countries socio-economically. In order to construct these projects firstly, directorship of roads and bridges transformed into KGM by the Law No.5539 on February 11, 1950 and later DSI established by the Law No.6200 on December 18, 1953.

Although these two institutions have been subdiaries under the Ministry of Public Works, they are incorporate bodies that act in administrative autonomy. Besides, they had their own budgets directly sourced from foreign funds such as Marshall Plan and NATO. In 1950s, DSI and KGM had the biggest share in investments. Between 1948 and 1957, 52% of total investment budget spent on highway projects while 28% of it on agriculture, 7% industry

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[30] Turkey proposed an industrial plan for 1947-Marshall negotiations in Paris. However, this first plan was rejected and a second one prepared at the instigation of American experts. The second proposal was focused on transportation, irrigation, and energy projects aiming development of agricultural production. For further information see: Tekeli, İ., and İlkin, S., "Savaş Sonrası Ortamında 1947 Türkiye İktisadi Kalkınma Planı", Ankara, ODTÜ İktisat Tarihi Serisi, 1974, pp. 6, 10, 16.

and 13% on other public works. KGM and DSI were the wealthiest institutions of the state. They had American supported wide machinery park including latest heavy construction equipments. The American assist to these two corporations was not limited with financial aid. Besides, what makes two institutions most desired state institutions for an engineer was their contemporary institutional structure established on American based organization models and innovative work environment enriched by strong transatlantic technology transfer by foreign cooperation. Due to bilateral agreements, they provide the opportunity to broaden their knowledge through vocational trainings and fellowships in American organizations. According to Demir (2006, p.93), in forty years period three thousand engineers were sent to America only by DSI. These engineers sent for vocational training would later play important roles in the history of engineering. Under these circumstances, both institutions constructed very strong corporate identities, which still remains today.

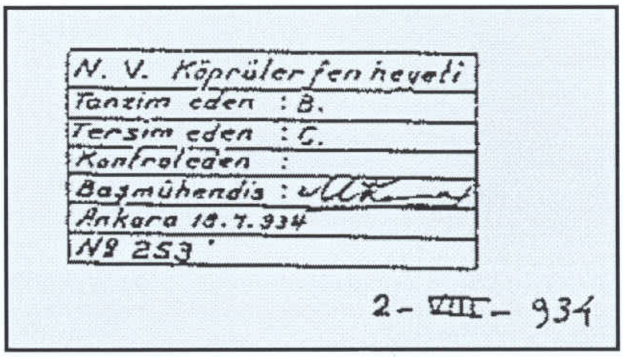
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Figure 3.2 The project label showing no engineer-bureaucrat's name responsible for design, static design or inspection, but rather the name of the group responsible for construction of the bridges. The empty spaces were just signed with initials. Source: "Karabekir Köprüsü", *Nafıa İşleri Dergisi,* v. 2, Bayındırlık Bakanlığı Matbaası, Ankara, 1935(c), pp. 85-89.

In the ministry where the corporate identity was also so strong that subjects hardly ever stand out with their individual identities; the projects were generally signed in the name of the group responsible for construction. As in the project label of Karabekir Bridge in figure 3.2 except for the initials, the project label showing no individual name responsible for design, structural design, or inspection. The innovative structures of new directorates established in post WWII period were quite different. Unlike the former organizational system of the ministry promoting anonymity, KGM and DSI based on American models encouraged engineers to stand out with their technocratic identities along with the strong corporate identity. In the systematic transatlantic technology transfer politics of America, individuals were given special importance as the ones who adopt, use and demand technological developments. As Schipper (2007, p.211-228) conveyed, "...successful transfer required adaptation to local circumstances, making both senders and receivers active participants in the process". Technology transfer in this process not only applied by senders -foreign construction companies, scholars and experts- but also by receivers -the civil servants invited to vocational trainings to American public institutions and students given scholarships to study abroad-. For a broad based technology transfer, a social transformation was intended.

In this way, this highly educated new generation of engineers, which were given wide economical means, had change to design and realize many vital nationwide projects. Eventually, these engineers came into prominence as technocratic-heroes and became one with the institutions they had worked. The most famous one is Süleyman Demirel who became a public figure while he was the General Manager of State Hydraulic Works. He gained reputation as a technocrat while he was working in DSI and had been politically active thereafter. During 1960s and 1970s, his political career had been flourished in parallel with the growing technocracy. Turgut Özal, another graduate of Istanbul Technical University, gained his reputation in planned development era in 1960s while he was working in *Devlet Planlama Teşkilatı* (State Planning Organization-DPT). His popular technocrat identity led to a successful politic career, too.

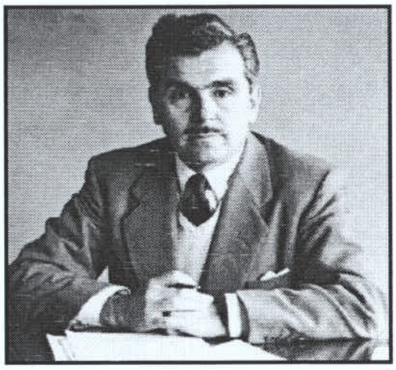

Figure 3.3 Vecdi Diker, the first General Manager of Directorate of Highways, Source: Available at www.kgm.gov.tr on 05.03.2009

Vecdi Diker[31] was also a well-known engineer-hero of 1950s. He heavily influenced the change in Turkish transportation politics (Fig. 3.3). He wrote several papers on economical road construction in the journal of the Ministry until 1945 when he and Vehbi Ekesan were sent to conduct a research on American highway systems. They were sent to Colorado State where has very similar topography with Turkey (Tekeli and İlkin, 2004, p.395). Later on, he was promoted to manager position of the Department of Roads and Bridges. Concurrently with the developing Americanism in foreign policy, his leading efforts in construction of highways resulted in establishment of the General Directorate of Highways where he had been the first general manager. He is also an important character for Turkish engineering history not only by his efforts on establishment of national highway system but also on development of technical education. His strong cooperation with American technocrats also led to the establishment of METU (Fenmen, 2006, pp.7-10). As mentioned above several hundred young Turkish engineers were sent by the government each year to America to take up advanced study in all technical fields. Besides this "transatlantic technology transfer" was not limited with Turkey.

3.2 Semi-State Actors

As mentioned above, delegation of the authority and composition of the agents in construction sector depends mostly on economical factors in Turkey. This is not surprising for a sector like construction, which is strongly connected with financial conditions. Accumulation of sources on state made it the main actor in early periods of the Republic. Therefore, the statism in the early years should be understood as an obligatory condition of the economic circumstances. According to Ellis (1970, pp.45-64) the statism in the early republic has nothing in common with the Soviet Russian model that the term is allocated; hence, instead of state socialism, it can rather be named as "state capitalism". Whether it is named as "state capitalism" or "mixed economy model", this semi-liberal/semi-statist economic structure produced various types of enterprises while transforming into more liberal formats called state economic enterprises (SEEs).

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[31] Vecdi Diker founder and first general manager of Turkish Directorate of Highways. After his graduation from Robert College, he went to America to study road engineering. He got his bachelor from University of Missouri Engineering Faculty in 1936. He also contributed foundation of METU. Source: Şen, L., "Türkiye'de Demiryolları ve Karayollarının Gelişim Süreci", TESAV Yayınları, Ankara, 2003, pp.155-167.

Actually, the notion of state owned enterprise is a pre-modern concept, and it was believed to be replaced with market economy after industrial revolution. However, in the following years of WWI, the capitalist system underwent a deep crisis that affected the whole world. The 1929 crisis had opened the way to skepticism on market economy rules and private enterprise. Besides, in the aftermath of WWI, nationalization of private enterprises was believed to help the socio-political unification of the nations. Thus, state interventions for nationalizing and/or stimulating economic recovery was fostered in all over the world. Nevertheless, beyond Europe, the age of public enterprise and nationalization began especially after WWII and continued its effect until mid-1970s. (Toninelli, 2000, pp.3-24).

The very first public enterprises in Ottoman Empire was initiated in late 19th century by establishment of some factories and credit enterprises, called "*memleket sandıkları*" and "*menâfi sandıklan*", which would be left to the republic as the only economical infrastructure. In the first years of the Turkish republic, the government intended to apply liberal economic principles. However, the inadequacy of private enterprise and the pessimistic mood of 1929 crisis led to a change in politics. Thereafter, active state intervention started in order to improve the national welfare and prosperity. In practice, statism entailed the promotion of industrialization by means of import substitution, subvention of industrialization, five-year industrialization plans, and establishment of state economic enterprises (SEEs). During the industrialization campaign of the 1930s, the government established many SEEs in the sectors (1) considered to be of national importance, (2) which produce materials for private sector, (3) where private investors have hesitated to invest because capital requirements are too great in light of expected returns, or the sectors (4) which private investors were in adequate in organizational and technological capacity. In 1938, the Law No. 3460 was enacted to define a legal framework for public economic enterprises and their organizational and operational structure. Although establishment of SEEs was geared down under wartime economics, it continued to dominate many sectors in 1940s. In 1950 elections, Democrat Party came to power with more democratic structure and liberal economy promises. Despite their criticism on SEEs and statist economy politics of Inonu Governments, the Democrats who advocated private enterprise and liberal economy, continued same politics with a rising effort. Hence, in 1950s, SEEs increased in number and enlarged their activity areas. In addition to two classical types of SEEs *"İktisadi Devlet Teşekkülü (İDT)"* and *"Kamu İktisadi Kuruluşu (KİK)"* which are fully owned by the government, new kinds of partnerships produced depending on the proportion that state owns such as *"Bağlı Ortaklık"* (Government Linked Company) and *"İştirak"* (Government Affiliated Company). The level of state intervention also changes the policies and the legal controlling mechanisms of the enterprises. KİKs have public policy objectives. They are non-profit governmental enterprises producing items on monopoly status, while İDTs have distinct legal form that they are established to operate in market economy rules. *Bağlı ortaklık* (GLCs) are enterprises that government owns an effective controlling interest (more than 50%) while in *iştirak* (GACs) government owns share between 50% and 15% hence they are autonomous and treated by national laws and regulations as all other private companies (BYDK, 2000).

Construction sector is not one of the most active investment areas of SEEs. However, the first SEEs were established in building materials sector as parallel with "the traditional infrastructure responsibility" of Turkish economy (Kılıçbay, 1985, p.13). Firstly, "Karabük Iron and Steel factory" was implemented in 1939 and followed by "Turkish Cement Industry and Trade Co. Inc." in 1953 (IITIA, 1973, pp.118-120), "Çelik Limited Co." in 1957, "Ereğli Iron and Steel Industry" in 1960 and "Seydişehir Aluminium Factory" in 1965. All of them founded with foreign technological and financial support in different levels. Technology transfer is one of the significant missions of SEEs. In some of these enterprises, foreign support was in form of financial and technical assistance while in others it was in form of partnership. For instance, Turkish Cement Industry is a GLC and Ereğli Iron and Steel Industry is a GAC while Karabük and Seydişehir factories were totally owned by the state.

According to Köksal and İlkin (1973, p.74) 52% of cement and 56% of the total iron production was produced in SEEs in 1967. While being dominant in building materials sector, the state had aspired for roles in construction sector other than financing, planning, and control. The first, direct involvement of a state enterprise into construction was the establishment of *Emlakbank Yapı Limited Şti. Emlak ve Eytam Bank* was actually founded in 1926 to finance for the construction sector in need for capital. It was the first bank giving credit on land property. When contractors went bankrupt one by one after the great depression, the bank decided to establish a construction firm in 1937. Thereafter, the company started to compete with other firms in the sector on this uneven ground and had grown rapidly. As being "the most privileged company[32]", it undertook many important constructions such as Saracoğlu Neighborhood, Etimesgut Aircrafts Factory, Dolmabahçe Stadium, Keçiören Sanatorium etc. In 1946, the company established a partnership with the Municipality of Istanbul and founded *İstanbul İmar Limited Şti.* The company carried out the construction Levent Neighborhood, one of the most important housing projects of 1950s (Güvenç and Işık, 1999). In addition, their facilities in building construction the also participate in bridge tenders such as the construction of wooden bridge on Menderes in 1944 (The State National Archives, Ministry of Public Works Fund, Binder no: 1879).

As mentioned in previous chapter, the Ministry of Public Works had also involved in construction processes as state actor by employing *"emaneten yapım usülü"* since the very first years of the Republic. In consequence, engineer-bureaucrats gained much more experience than did the practicing engineers in private sector. In the meantime, the big scale projects with complex organizations and contemporary techniques were still required foreign consultancies or contractors. In addition to imported building machinery, and materials, a considerable part of the national construction budget spent on foreign construction firms and consultants.

On the strength of their widening experiences, machinery pool, and technical staff, who were already excited for practice, the state started to consider founding own construction firms as an option within the internationalizing DP politics and increasing need for big scale construction projects in the country. Starting from newly establishing relations with US in the early DP era, the state actors started collaborating with foreign construction companies and established big scale construction firms such as Emek Construction Co., Tümaş Co., Metag Co. Bimaş Co. Ray-Nimens Co. etc. by the end of 1950s (TMH, July 1960, p.1; TMH, Dec. 1961, p.1).

Establishment of Emek Construction Co. is the first of these foreign partnerships. In 1950, Turkish delegation met with Conrad Hilton in an assembly in NY and invited him to open a hotel in Turkey. After a couple of meetings, in April 1951, Hilton International and Turkish government announced their agreement to construct a new hotel in Istanbul. According to

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[32] The title of the part narrating the company is significant. It is: "En fazla müsaadeye mazhar müteaahitlik firması (the most priviledged construction company)". Source: Batmaz, op. cit. pp.75-78.

Wharton (2004, pp.30-35) this was not an ordinary business investment for Hilton. After WWII, Conrad Hilton as a devoted American capitalist consciously preferred to invest in countries, which were believed to be the fortresses of America against communism. In this perspective, choice of Turkey was not a coincidence. The hotel was financially supported by both Turkish and American governments. The aim of American government was economically supporting a strategic partner, which is already militarily supported against communist countries; while the aim of Turkish government was to transfer know-how and initiate new sectors such as tourism by the help of Hilton Hotels. Thus, Turkish government stipulated collaboration with local sources as the only condition of the contract. In the context of this article, Hilton trained Turkish personnel in America, collaborated with Sedad Hakkı Eldem as local Architect, and ordered Turkish carpets and classical Kütahya tiles for decoration[33]. Moreover, a substantial part of all furniture was produced under the direction of the design office by the teacher's technical college in Ankara. This is a government-sponsored project to help advance of the technical industries throughout the country by training technical teachers (Wharton, 2004, p.29). As for the construction of such a big scale building, two German construction firms Julius Berger Co. and Dyckerhoff und Widmann Co. were chosen (Emek, 2001(a), p.17). First was one of the foreign railroad contractors in the early republic while Dyckerhoff und Widmann, proposed a reinforced concrete bridge project for Bosporus in 1950s. The Turkish government in the guise of the Turkish Pension Fund for Civil Servants provided the land, the construction costs, and later the maintenance costs of the hotel. The collaboration between Dyckerhoff und Widmann and Turkish Pension Fund in construction of Hilton Hotel in 1955 continued with subsequent hotel constructions. As the Nuri Kınık, the General Manager of Turkish Pension Fund of the period, conveyed there was an urgent need for a firm, which will exploit the savings and make construction in various cities of the country. With the increasing interest in real estate, the Pension Fund decided to establish a construction firm and offered Dykerhoff und Widmann a partnership (Emek, 2001(b), p.20). In 1958, Emek Construction Company was established as the partnership of Turkish Pension Fund, Dykerhoff und Widmann Komandit Co. Ankara İmar

[33] Wharton states that Conrad Hilton later boasted in an interview that the Hilton reinvented the Turkish art of tile-making: "Generations ago the Turks had been famous tile-makers but the art had largely died out. Evidence of their handwork, however, abounded in the old Sultan's Palace. When we wanted to use similar tiles, a local architect searched out a few old men who could teach the younger ones and today, long after the completion of the hotel, tile-making is again a thriving business". Source: Wharton, A., J., "Building the Cold War: Hilton International Hotels and Modern Architecture", University of Chicago Press, Chicago, 2004, p.26.

ve Emlak İşletme Co., Tutum Bank and Dr. M. Raif Gürün. One of the most significant aims of the company is to import contemporary building technologies and to reach the Turkish construction sector to the level of contemporary countries. As stated in its establishment contract, the company is authorized to set partnerships with local and foreign companies (Official Gazette, 1958).

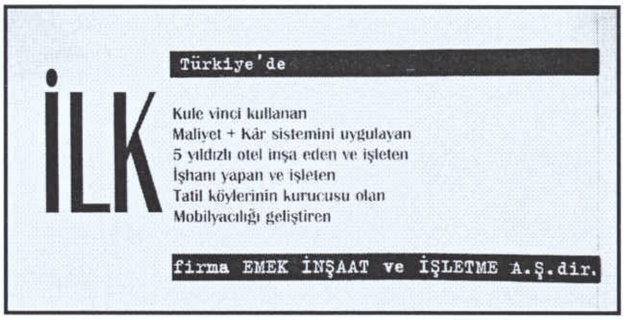

Figure 3.4 Depending on their contributions to development of Turkish building sector the company adopted the slogan: "Türkiye'nin imarında Emek var!" (There is Emek (labor) in development of Turkey!) Source: "Başarının Tarihçesi, 43. Yıl", Emek İnşaat ve İşletme AŞ. Ankara: 2001, p.36

In its very establishment, Dykerhoff und Widmann Komandit and Pension Fund had equal share of 49% while rest was distributed to other local partners. Hence, Turkish partners had control on the management. In fact, German partner would attempt to break the bargain after a dispute and had to assign its shares in 1961. From then on Emek Construction Co. has continued with local partners. After the partnership with Dyckerhoff und Widmann, Emek Construction Co. has continued its innovative position and has been a leading company in modern Turkish construction sector. It had been the first company employed tower cranes, used high-strength concrete, and build high-rise buildings (Fig. 3.4).

Emek was followed by establishment of METAG in 1967 and TÜMAŞ (*Türk Mühendislik, Müşavirlik ve Müteahhitlik Anonim Şirketi*) in 1969 etc. Starting from Emek, these firms accomplished many important infrastructural projects, imported building technologies and accordingly realized desired technology transfer, trained qualified engineers, and executives, and helped development of professional working principles and modern organizational structures. However, they were also criticized harshly as being an obstacle for development of private Turkish construction sector. Besides their wide machinery park and strong financial support of state, these firms were taking advantage of being GACs as business opportunities and were causing unfair competition. As Özkol (TMH, 1971, pp.33-34) stated in "It [was] impossible [for private engineering firms] to compete with these foreign originated, monopolist [state-owned] companies etc."

Another semi-state actor in construction sector, the municipality, came out in urban area in the second half of 19th century. Unlike the countries with deep-rooted municipal traditions coming from their city-state pasts like Italy (Bocquet, 2007, pp.227-240), Ottoman Empire was governed by central authority for many centuries and official local governmental system had very limited liability especially on construction works. First local administration in modern sense established within Ottoman territory by the law enacted in 1877, *"Dersaadet Belediye Kanunu"* (Law on Municipality of Capital City). Thereafter, technical urban agents emerged by the evolution of the role of the state and by the growing need for urban planning and urban infrastructures. Accordingly, municipal architects and engineers became a part of an alternative definition of bureaucracy.

The newly establishing state enacted in 1930 *"Umumi Hıfzıssıhha Kanunu"* (Law on General Hygiene) No.1593, and *"Belediye Kanunu"* (Law on Municipalities) No.1580, in 1933 *"Belediye Yapı ve Yollar Kanunu"* (Law on Municipality Buildings and Roads) No.2290., in 1934 *"Belediyeler İstimlak Kanunu"* (Law on Municipal Condemnation) No.2497, and in 1935 *Belediyeler İmar Heyeti Kuruluş Kanunu"* (Law on Establishment of Municipal Development Committee) No.2763. Additionally, a special bank was established in 1933 to finance the public works projects of municipalities by the Law No.2311. These laws generally focused on the ideal of modern and hygienic city and set out duties and responsibilities of local administrations in detail. They remained in affect until the 2000s.

Although urban agents and central administration always have close relations in between, local governmental bodies are supposed to have their own authority for urban planning and practice. Besides, the local governance was not actually decentralized in contemporary sense, rather administrated by an appointed governor rather than an elected mayor. The 1921 constitution gave broad responsibilities to local governmental bodies in sanitary, infrastructure and economic affairs, and in improving the social welfare of cities. In theory, almost all the responsibilities of construction and maintenance of local public works were taken on by municipalities. However, municipal revenues, technical staff, and machinery were very limited in post-war conditions. As in the cases of construction of bridges in Gençlik Parkı or Gazi Bridge on Golden Horn, most of the in-city *bayındırlık faaliyetleri* (construction facilities) were held by the Ministry of Public works although financed from the budget of local governance. Accordingly, under the problematic socio-economic circumstances of the early republican period, the decentralized structure could not be achieved the desired contemporary environment and homogeneous level of development and finally most of these rights had to be centralized and not restored again (Özcan, 2000, pp.199-278).

Figure 3.5 Prime Minister Menderes in expropriation site in Istanbul. Source: Doğusan, N., "Istanbul'un İmarı 1956-1960", Master Thesis, İTU, 2004

Despite DP's criticism on the problem, the local governance structure did not change and they remained economically weak institutions during 1950s. Especially in the period, local administrations acted most like affiliated governmental bodies. In cases of construction of landmarks or complex planning and construction practices, municipalities had to receive financial support and get technical assistance from state organizations. Nevertheless, to the extent that the state supported local projects, it actively involved the decision processes. In consequence, central authorities had undertaken planning powers while municipal architects and engineers were narrowed with realization of the modern and hygienic city model and carried out implementation of laws. Except for the singular interventions of the central government in urban space, such as allocation of prime locations overlooking the cities to modern urban landmarks, for instance Hilton Hotel in 1951 and Kocatepe Mosque in 1956 personally by the interest Prime Minister Menderes, the most comprehensive example of this kind of involvement was the 1956 operations in Istanbul (Fig. 3.5 and 3.6).

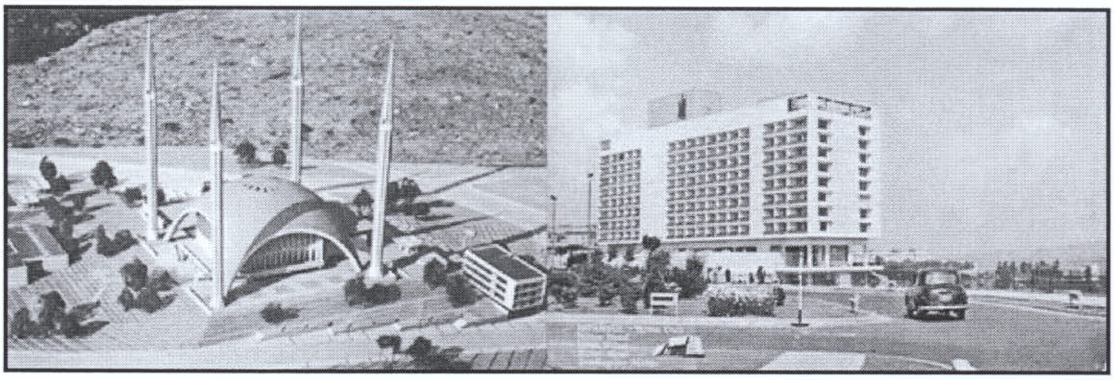

Figure 3.6 Two landmarks of 1950s in international style. Left: Model photograph of Dalokay's unbuilt competition project of Kocatepe Mosque. Right: SOM and Eldem's Hilton Istanbul. Sources: "Ankara Kocatepe Camii, 1967-1987", Brochure by Diyanet Vakfı, Available on 20.8.2009 at http://www.diyanetvakfi.org.tr/eserler/kocatepecamii/kocatepe_camii.pdf; Postcard-Istanbul Hilton circa 1950s, Available on 20.8.2009 at www.anilarayolculuk.blogspot.com

In the second half of 1950s, DP government started losing ground inside and outside the country within the changing socio-economic conjecture. Prime Minister Menderes decided to restore his popularity by employing the capabilities of nation-wide famous thriving state actor, the General Directorate of Highways (KGM), in a prestigious project and focused on development of Istanbul. In the period, Istanbul, which was politically peripheral in the early years of the republic, was gaining ground. The projects such as Hilton Hotel and Bosporus Bridge were personally supervised by the central government. Within this context, Adnan Menderes intended to achieve political support by solving the traffic problem that affected the daily life of Istanbul (Tekeli, 1994, p.34). Actually, the operations were not a planning in scientific sense; rather it was spontaneous operations formed by existing opportunities, daily influences, and intuition; the plan had been revised several times during the operations. Due to the report of Vecdi Diker Study Group (2001), the operations led to many misapplications and problems because KGM was not experienced in design and construction of in-city avenues and boulevards. During the years of the operations, numerous historical buildings removed or displaced and some of them, got lost as in the case of Karaköy Mescidi because of lack of planning. Hence, the operations caused irreversible damages in historical heritage and gained an urbicide-like character[34].

3.3 Non-State Actors

According to Tekeli and İlkin (2004, p.452), understanding the development of building contracting business is vital for understanding the development of capitalism in Turkey because the share of construction is 70% of the total investments in a capitalizing and urbanizing country.

Figure 3.7 Refik Fenmen first director of the School of Engineering (1909-1913) Source: Fenmen, N. "Refik Fenmen: Mühendisliği ve eğitimciliği ile örnek bir fen adamı", Mühendislik-Mimarlık Öyküleri-2, TMMOB, pp.50-55.

Early efforts for establishment of national contacting sector were made in the late Ottoman period as urbanization was initiated. Refik Fenmen, first director of the *Mühendis Mekteb-i Alisi*, was the first one encouraged students for private enterprise (Fig. 3.7). Before, students were educated to work under military or public service. During his period, students

[34] Urbicide means the destruction of physical environment especially architectural and urban landmarks in order to clear the cultural traces of an age, a society or a nation under war tactics or sometimes in favor or urban development. The term was first used by Bergman to define the destruction of Bronx but especially after demolitions in Sarajevo, and Palestine gained the meaning of "violence specifically directed to the destruction of an urban area". Source: Available on 2.1.2010 at http://en.wikipedia.org/wiki/Urbicide , for further information see: Coward, M., "Urbicide: The Politics of Urban Destruction", Routledge, London, 2008.

established an association named *"Mühendis Mektebi İktisat Cemiyeti"* (Economic Association of the School of Engineering-1911) to collect money among its members and found an anonym company (Okay, 2004, pp.33-49 and Batmaz et al, 2006, p.342). Another attempt for incorporation which seems to be the most practical method for collecting the required capital for construction works was by *"Cemiyet-i Müteşebbise"* (Association of Entrepreneurs') (Batmaz etal, 2006, p.43)[35]. Apart from these, there were particular attempts compiled from different sources such as establishment of Ottoman contracting firms by Fuat (1898), Süleyman (1898), Latif (1900), Reşit (Soruşbay-1902), Haydar (İmre-1904), Hüseyin Hüsnü (1904), Ahmet Muhtar (1904), Ahmet (1905), Celal (1905), Abdullah (1905), Ziya (Kocainan-1906), Emin Avni (1907), İsmail Hakkı (1908), Selahattin (Buge-1909), Nazif (Kortan-1913), and an engineering office by Hulusi (1889). Unfortunately, neither the incorporation attempts nor the singular enterprises could get ahead. (Demir, 2006, p.25; Batmaz et al, 2006, p.43)

Although this first generation of contractors was multiplied in number by the proclamation of the republic, they had to compete with foreign originated construction companies for a decade. In 1933, the state changed finance politics and started to employ internal finance for nationwide construction projects. Accordingly, competitiveness of Turkish building contractors increased under economic sovereignty. In 1934, Turkish SİMERYOL consortium became the preferred bidder among foreign companies for Sivas-Malatya-Erzurum railroad line. Thereafter, the superiority of foreign firms over national contractors had ended. The Turkish contracting firms working in railroad constructions between 1925 and 1948 were *Nuri Demirağ, Cumhuriyet İnşaat Turk Anonim Şirketi, Simeryol Türk İnşaat Şirketi, Ata-Emin-Avni-Abdurrahman Naci, Aral İnşaat Şirketi,* and *Haymil Şirketi*. Some of these mentioned firms were partnership of an engineer and a capital owner as in cases of merchant Nuri Demirağ with his engineer brother Abdurrahman Naci, and Emin Sazak, a wealth landowner and deputy of Eskişehir, with his engineer brother-in-law Hazık Ziyal in *Cumhuriyet İnşaat Turk Anonim Şirketi.* They gave share to engineers to set the capital-technical knowledge cooperation as a common policy of first generation contracting firms. On the other hand, some construction firms were collaboration of group of engineers such as

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[35] "Anonym companies especially based on partnership with foreign capital were the basic actor of construction works in late Ottoman Period. 74 among 309 anonym companies, established between 1849 and 1918, were involved in construction business." Source: Batmaz et al, op. cit., p.47.

Ata-Emin-Avni-Abdurrahman Naci partnership and Haydar Emre ve Cemil Arıduru in Haymil Şti. (Koç, 1983, p.47; Tekeli and İlkin, 2004, pp.288-292; Batmaz, 2006, p.55-56).

Nuri Demirağ was a merchant making cigarette paper trade (Fig. 3.8). In the early years of the republic, he invested his capital into construction business and established a firm with his engineer brother Abdurrahman Naci. They became famous with the construction of Sivas-Erzurum railroad line, the first big scale project realized by national sources (including finance, technical assistance and labor). As told by his daughter Erdinç, they had problems in supplying the required labor force during the construction. However, in 1930s construction works were mainly based of human force in the absence of machinery. So, he promoted consumption as Ford did and obtained and sold goods like fabrics and trinkets from Halep, hence motivated the local public for working in the construction (İnceöz, 1996, pp.15-17). Except for railroad constructions, they realized many important projects such as construction of Karabük Iron and Steel factory, Merinos Textile factory, Sivas Cement factory etc. After a while, they dissolve partnership, Abdurrahman Naci continued with other engineers and Nuri Demirağ invested in aviation industry. He established an aviation school and aircrafts factory. In 1940s, he organized a political party called *Milli Kalkınma Partisi* (National Development Party). He also has an unrealized project for bridge on Bosporus (1933) design by Joseph Strauss the designer of Golden Gate Bridge. (NuD, 1957, pp.15-18; Şakir, 1947, pp.48-54; TMH, Jan. 2000, pp.23-27)

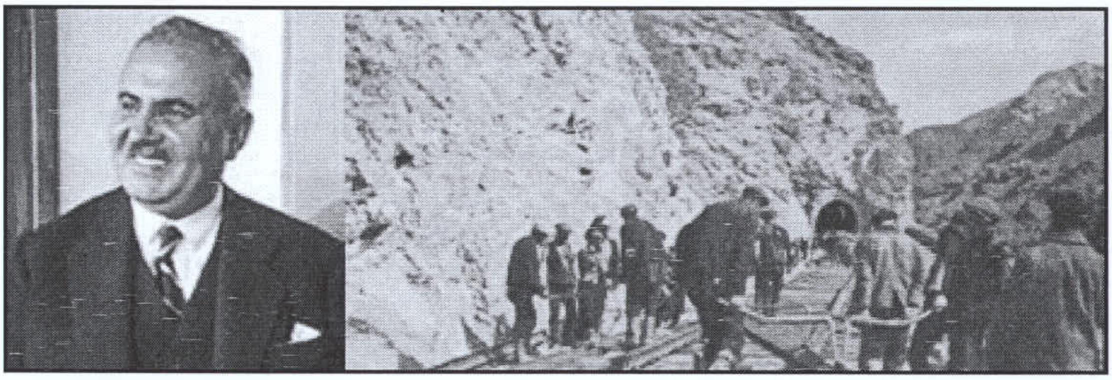

Figure 3.8 Nuri Demirağ and construction of Sivas-Erzurum railroad line in 1933-1937. Source: 50 yılda 50 eser, TMMOB, Ankara, 2007, pp.142-146.

Another important firm of the period was *Cumhuriyet İnşaat Turk Anonim Şirketi*. It was established by Emin Sazak and Hazık Ziyal on 500.000 TL capitals in 1925. The company built 240km railroads and numerous bridges in various span on Ankara-Kayseri line and various buildings in the capital. Moreover, Sazak established two sawmills in Bafra and Beylikahır and he was the founder and member of the board of Eskişehir Bank. After the building, bridge, and roadway projects, he edged towards irrigation projects and became a well-known contractor in the area. Unfortunately, he bankrupted because of a problem during construction of Porsuk Dam. In 1960s, Hazık Ziyal and engineers sons of Emin Sazak would establish a partnership. However, it would not take long, and Sazak brothers would establish Yüksel Construction Co.

Haymil Şti. was established by two engineers Haydar Emre ve Cemil Arıduru. Its capital was 200.000 TL. In spite of their modest capital, they had achieved many important projects such as Gazi Terbiye Enstitüsü, Dil, Tarih, Coğrafya Fakültesi etc. Although, it was a well-ordered firm unlike its contemporaries, under wavy economic conditions where larger contractors like Demirağ and Ziyal bankrupt, *Haymil* also had very hard days (Koç, 1983, p.48). Ayduk Koray, the founder of Koray Construction Co., had worked in Haymil until he established his firm in 1956.

Foreign activity in the area of highway bridge construction was limited with steel bridges and few early reinforced concrete bridges. Among one ninety-nine bridges, which we have the information about their contractors, only nine of them were built by foreign companies. Rests were constructed by Turkish firms listed in the table (See. App. C2 and C3). Among them most significant contractors were *Çankırılı Hacıbayramoğlu Mustafa Bayram Bey* (1931-1936), *Ankara İnşaat İdare-i Fenniyesi* (A partnership between Mehmet Galip ve Fescizade İbrahim Galip Şirketi and Erzurumlu Nafiz) (1933-1935), *Müh. Muhtar Arbatlı ve şeriki Müh. Samets Bey* (1934-1940), *Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)* (1934-1940), *Müt. Mehmet Hotamış* (1936), *Müh. Raşit Börekçi* (1936-1937), *Müh. Mahmud Hüseyin ve Mustafa Reşit Beyler* (1937), *Müh.-Mim. Salim Derin Bey* (1935-1937), *Aral İnşaat Şirketi* (1939), *Müt. Salih Sabri Taşlıcalı* (1941-1947), *Dr. Müh. David Parker* (1942-1943), *Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi* (1942-1956), *Müt. Sait Merzeci* (1944-1949), *Müh. Muhtar Arbatlı* (with Dr. Müh. Adnan Arbatlı) (1949-1951), and *Fikret Zeren ve Ahmet Durak* (1950).

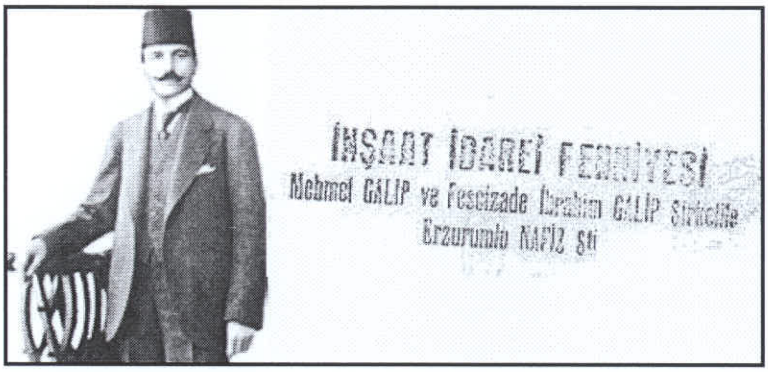

Figure 3.9 Erzurumlu Nafiz (Kortan) Bey (1885-1946) and cachet of İnşaat İdare-i Fenniyesi. Source: Available on 10.10.2009 at www.biotarih.com

Erzurumlu Nafiz (Kortan) was one of the well-known and wealthy contractors of the late Ottoman period (Fig. 3.9). He also won reputations by his generous donations to the army during WWI and the war of independence. By the first years of the republic, he moved to Ankara and established a partnership with Mehmet Galip and Fescizade İbrahim Galip. The firm was named *Ankara İnşaat-i Fenniyesi*. The firm, which was mostly involved in railroad projects, had also operated in bridge constructions. In 1930s, they successfully constructed a number of reinforced concrete arch bridges. Seyfi Arkan had worked in the company during his studenthood (Gürel and Yücel, 2007, pp.47-55).

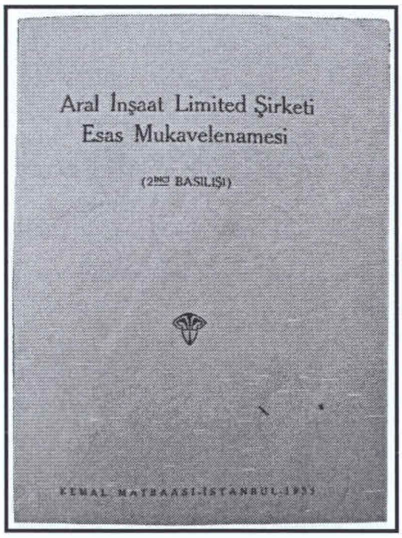

Figure 3.10 Cover of articles of incorporation of Aral Construction Co. 1935. Source: The State National Archives, Ministry of Public Works Fund, Binder no: 2320

Aral İnşaat Şti. was established in 21.9.1933 by engineer Ali Ragıp Devres and Muhaddis Zade Alim (Fig. 3.10=. The main capital was 300.000 TL. In short period of time, the young firm became one of the reliable contractors by its disciplined structure and undertook important engineering projects. Among its projects, most important were construction of Pertek, Gülüşkür and Singeç bridges. ("Aral İnşaat Limited Şirketi Esas Mukavelenamesi", Kemal Matbaası, Istanbul, 1935. The State National Archives, Ministry of Public Works Fund, Binder no: 2320)

Dr. Engineer David Parker who was representative engineer of the contractor in construction of Pertek Bridge was a Russian emigrant. While he was an engineer general under service of Czar Nikolai, he had to migrate to Istanbul October Revolution. After working as engineer and subcontractor, he stated contracting business. During 1940s, he undertook steel bridge projects, which need setting business connections with European countries, such as Kozluk and Şırzı Bridges. However, he bared loss under pre-war conditions.[36]

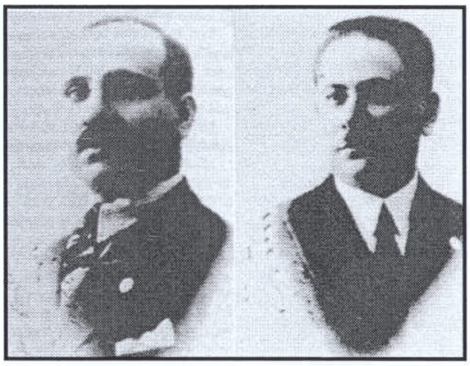

Figure 3.11 Left Sadık Diri, right Halit Köprücü, Source: Akkaya, F., "Ömrümüzün yapı taşları", Istanbul, 1989, pp.66-75

The most famous firm among highway bridge contractors was *SaFerHa*. It was established by the engineers Sadık Diri and Ferruh Atav. At the end of 1920s, they purchased a Menck patented steam engine pile driver from Germany. This was the first one in Turkey and

[36] "Huguenin Köşkü" (including an interview with Madam Eteri Pincas Parker daughter of David Parker), Available on 16.5.2009 at http://www.bostanciplatformu.com/anlatilar.asp?Sayfa=73

provided the firm a competitive advantage (Fig. 3.13). While they were formerly undertaking road constructions, they started to bid for bridge, harbor, and pier projects after the pile driver. In 1933, Halit Köprücü, their classmate from the School of Engineering, joined the partnership and the firm got its famous name "*SaFerHa*" produced from the first syllables of their names. After 1934, they built many bridges all around the country, but Ferruh Atav withdrew from the partnership in 1946. Thereafter, Sadık and Halit continued working together in *"Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi"*(Fig. 3.11).

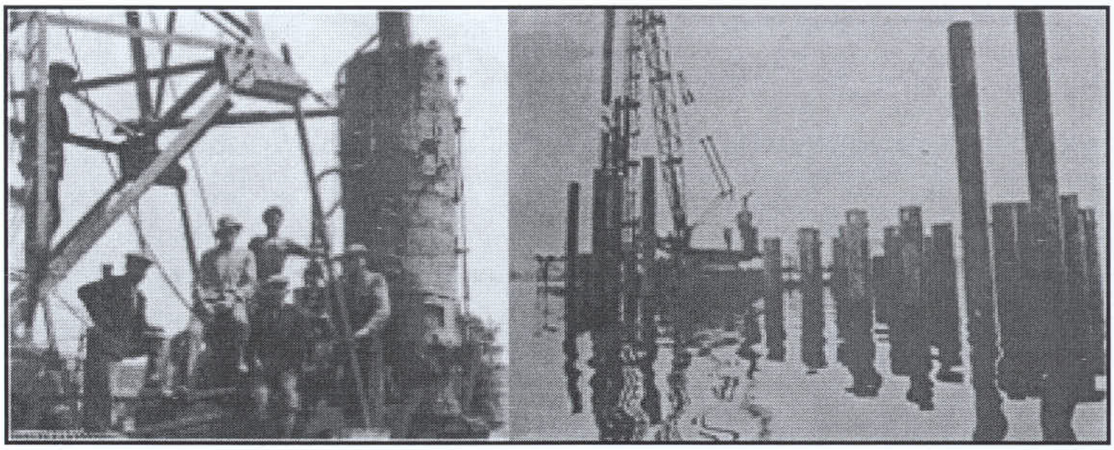

Figure 3.12 The steamed pile-driving machine of SaFerHa on piling works in construction of Gazi Bridge in 1930. Sources right to left: Erer, T., "Boğaziçi Köprüsü", Boğaziçi Yayınevi, Istanbul,1973, p.223 and Available on 10.10.2009 at www.stfa.com

Especially by practical solutions of talented engineer Halit Köprücü, the firm became number one in bridge constructions. Except for numerous constructed road bridges, they also consulted the Ministry on construction of important bridges and prepared proposals. For instance, they had prepared proposals for Kömürhan Bridge in Elazığ and Ataturk Bridge on Golden Horn. Kömürhan Bridge was built in the location and structure system they proposed; however, they even could not enter the tender because of specifications. In 1968, a project for second bridge on Golden Horn SaFerHa was the subcontractor of pile foundations of Gazi Bridge in 1940, thus knew soil conditions well. Köprücü prepared two proposals a reinforced concrete bowstring and a steel suspension type. The project would be constructed two years later in 1971 by Japanese consortium. (Köprücü, H., 1968, KGM Archives)

Halit Bey was one of the leading engineers of the country by his patented inventions on construction techniques. During the construction of Bandırma Pier project there was steel shortage all around the world under pre-war conditions. He solved the problem in a new caisson technique. In this technique, the caisson was built on wooden piles and launched by exploding all the wooden piles at the same time. His invention was published in the official magazine of the Ministry in 1941 (Fig. 3.13). Ali Fuat Cebesoy, the Minister of the Public Works, spook in praise of SaFerHa and Halit Köprücü in inauguration ceremony of the pier and added "nothing can get in the way of our construction works". Moreover, he invented piles in different sections for loose soil types. (BİD, 1941(b), pp.74-78; BİD, 1941(c), pp.73-79; Akkaya, 1989, p.64).

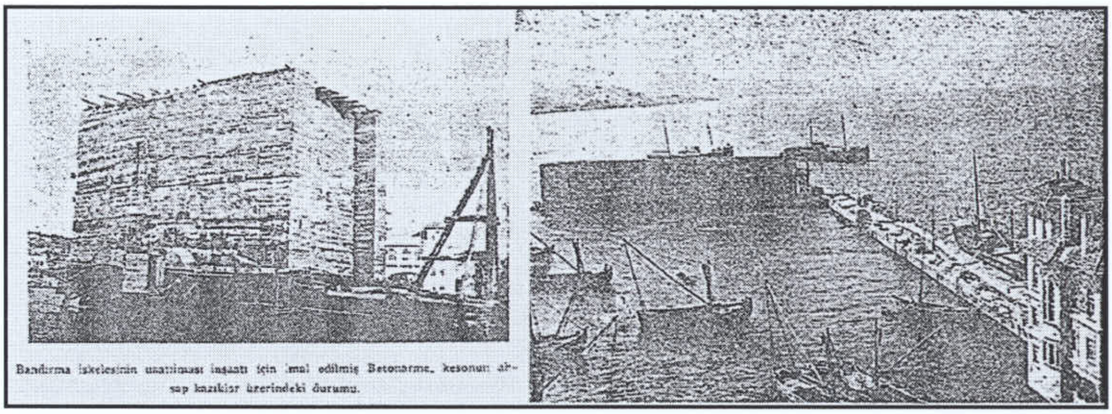

Figure 3.13 Construction of Bandırma Pier. Right, the caisson in water; left, the caisson on wooden piles. Source: "Nafıa Haberleri", *BİD*, 1941, v.8/4, pp.74-78; "Liman ve İskelelerimizdeki inşaat faaliyetlerine umumi bir bakış", *BİD,* 1941, v.8/5, pp.73-79.

Regardless of the capacity of the construction firms of this period, their organizational structures were weak. SaFerHa, which was respected as the leading companies of the period, had problems about the workers payments, insurances, taxations etc. almost in every project. In some cases, creditors levy execution on progress payments or contractors had to grant their payments on bank credits. Respectable amount of contractors bankrupted under organizational problems and instable economic conditions such as Nafiz Kortan, Nuri Demirağ, Ruhi Betoncu Sadık Diri and Halit Köprücü. Wealthy elites and landowners of the period had acted as guarantor for these young engineers who started business depending on their technical education, even though they did not have capital. Unfortunately, As Hakkı Manço the guarantor of SaFerHa and Sabiha Gökçen the guarantor of Ruhi Betoncu, they lost their savings as contractors were bankrupted. On the other hand, the contractors also lost all their savings, and even went behind the bars. Consequently, many projects left unfinished and they had to be put in tender again. (Akkaya, 1989, pp.66-75; Demir, 2006, pp.78-79,101).

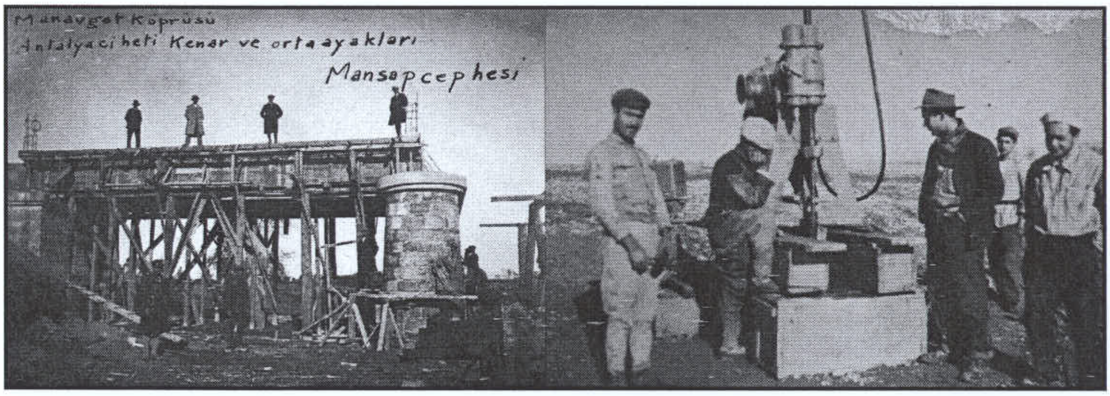

Figure 3.14 While they were working under poor conditions in remotest corners of the country, engineers had never abandonded their modernist world-view. One can easily distinguish the engineer/s in the photographs with their posture and style (especially with fedora wearing which was popular among engineers of the period. Even in 60s, it would become symbol of the first engineer prime minister, Süleyman Demirel). Photographs from construction of Birecik Bridge (right) and Manavgat Bridge (left). Source: KGM Archives

Another common characteristic of this generation of engineers was their devotion to their profession. They put their hard and soul, and realized very important projects under very harsh conditions at remotest corners of the country. Nevertheless, in spite of the circumstances they workd, engineers had never abandonded their modernist world-view (Fig. 3.14). They had become so identified with their profession that many of them had their surnames related to their expertise such as Nuri Demirağ, Şevki Niyazi Dağdelen, Halit Köprücü and Ruhi Betoncu.[37]

[37] Demirağ, Dağdelen, Köprücü and Betoncu can roughly be translated as Ironweb, Mountaindigger, Bridgebuilder, Concretemason (author's translation)

3.4 Global Actors

In spite of the harsh criticism on their existence, it is undeniable that foreign actors have affected the development of Turkish construction sector broadly. They played vital roles in technology transfer in every level of the sector –vary from education to construction, production to control mechanisms-. However, their act is strongly tied with relations in international arena.

In Turkish development politics, technology transfer took much more active part than technology production. As conveyed in chapter two, this is a continual policy since the very first phases of the Turkish modernity project. However, it is not systematized but rather shaped randomly by the changing equilibriums in foreign affairs. For this reason, the source countries have generally been the ones, which we are in the strategic partnerships, and loose their effectiveness when the partnership is over. Nevertheless, despite changing sources and diversity in actors and ecolés, the notion of technology transfer have been continued.

For instance, France was the chief source of technology transfer in early phases of Ottoman reform. As a part of long history of Franco-Ottoman alliance, she effectively supported Ottoman reforms in 18th century in order to maintain a strategic balance in Europe. After the first French experts, Rocheford and Compte de Bonneval, the stream in French-Turkish technological transfer was accelerated by the Ottoman-Russian conflict on Crimea. In Louis XVI era, great number of technical experts and officers were sent to the Ottoman Empire to train the army in naval warfare and fortification building. Among them, most important ones were Lafitte-Clavé, Monnier, Antoine Shabo, Monic, Grapen, Obert, Lorca, Durest, Aleksi, Betolen, Saint Remy, and Le Roy who gave lectures in *Mühendishâne*. However, most of these experts and officers left Istanbul as the result of the alliance between Russia and France. Few years later, France lost her position as being the primary source of technology transfer after the end of alliance between two countries by napoleon's invasion of Egypt in 1795, but the interaction never stopped totally. French companies were operating vital railroad lines Salonika-Constantinople and Smyrna-Casaba, chief harbors located in Constantinople, Smyrna, Beirut, and Salonika, coal mines of the Black Sea shores and supplying gas for Beirut and water for Constantinople (Fulton, 1996, pp.137-164). Her commercial activities and politic interests always kept the connection alive; even in the first decades of 20th century her presence in socio-cultural sphere had been still felt.

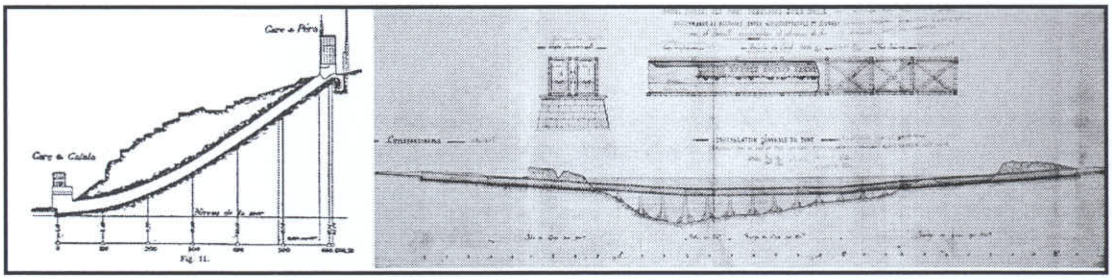

Figure 3.15 Section drawings of (left) Gavand's Chemin de fer Métropolitain de Constantinople project also known as "tunnel", and (right) S. Fréault's Pont Tubulaire Sous Marin – Treversant le Bosphore entre Constrantinople et Scutari Sources: Available on 24.8.2009 at http://en.wikipedia.org/wiki/File:Gavand-Tunel-Fig11.jpg and The State National Archives, Ministry of Public Works Fund, Binder no: 230-95-40-2

In the meantime, the migration of foreign experts from various different countries of Europe and America to Ottoman land in drive of high positions under state service had kept on. Some of these experts François Baron de Tott, Jachmund, Forcheimer and later Terzaghi, and Von der Goltz are reputed engineers who contributed the development of Turkish engineering education. In addition to academics, practicing engineers came with significant engineering projects designed with latest technological knowledge in drive of high profit incomes by built-operate-transfer projects. Among them in addition to realized projects such as French engineer Eugene-Henri Gavand's *Chemin de fer Métropolitain de Constantinople* project, Linant de Bellefonds' *Suez Canal* project, there are also inbuilt projects such as Fernidan Arnoden's Bosporus Bridge, F. Storm, F.T. Lindman, and A. Hilliker's *Tünel-i Bahri* project S. Fréault's *Pont Tubulaire Sous Marin – Treversant le Bosphore entre Constrantinople et Scutari* (Fig. 3.15) etc. (Mutluçağ, 1968, pp.32-33; Dinççağ, 1973, p.61; İlter, 1973, pp.27-20; The State National Archives, Ministry of Public Works Fund, Binder no: 230-95-40-2).

By the end of the nineteenth century, only three decades after its unification, the *Kaiserreich* had become one of the most powerful states in the world- economically, technologically and militarily. Simultaneously, Germany by his rising political activity in Ottoman land rapidly filled the gap left from France. German effect on Ottoman science and technology grew steadily, highlighted by rising trade and investments. German engineers and surveyors had been quite active after 1870s, via companies interested in railroad construction. Especially in construction of two strategically vital lines, Hijaz and Anatolian-Bagdad (*Die Bagdadbahn*), German engineers practiced with Turkish colleagues. Heinrich Meissner, the chief engineer in both of the projects is the most important figure in this technology transfer. He was an experienced engineer and spoke Turkish fluently. Soon after his graduation, he settled in Istanbul, and worked in construction of many Ottoman railroad lines in Balkans and Anatolia. After completing the Hijaz line, he was awarded the title of pasha in 1904 by Abdülhamit II. Following the break up of Ottoman Empire in 1918 Meissner returned to Germany but he would be back in 1924 as adviser on building and maintenance of railroads in new republic by the invitation of Ataturk (Pick, 1990, pp.179-254).

Hijaz and Anatolian-Bagdad railroad projects laid foundations for an enduring Turco-German relationship and helped facilitate their alliance during World War I. After the alliance, Germany supplied more technical assistance, sent scholars -such as Fritz Arndt, Kunt Hoesch, Gustav Fester, Boris Zarnick, Walter Penck and Erich Leick- and even proposed the Ottoman government a German-speaking university project in 1912 (Vlahakis, 2006, pp.71-111). Nevertheless, after the defeat of WWI, the technology transfer naturally came to a stopping point but by the establishment of new republic, accelerated again.

In the early years of the Republic, due to lack of capital and technological expertise of national construction sector, foreign companies undertook almost all of the big scale construction projects such as railroads, harbors, silos, bridges etc. The names of some of these foreign companies found in various sources are the followings: German *Julius Berger Co.*, Belgian *Societe Industrielle des Travaux Co. (SİT)*, Swedish-Danish consortium *Nidquist Holm Co. (NOHAP)*, French *Régie Generalle*, American *Fox Co.* etc. (Tekeli and İlkin, 2004, pp.458-461; Yıldırım, 1999, pp.1-16; Batmaz et al, 2006, pp.49-63).

Foreign companies were also dominant in big scale bridge projects as they were in railroad construction. Especially by the expanding iron-steel, electrical equipment and artillery industries after German military and naval reconstruction program in turn of 19th century, German companies like MAN, Krupp, AEG, Siemens etc. had rapidly grown and needed new markets for their perpetuation. These benefited considerably from the armament process and construction movement in the last decades of the Ottoman Empire (Trumpener, 2005, pp.107-136) and continued their activity in early republican period. A list of the foreign companies attended the bids of big scale highway bridge projects in studied period of time is prepared among the derived data from the files studied in the Archive of General Directorate of Highways and State National Archives (See. App. C3). Due to this list, majority of the companies practiced in early republican Turkey were North European originated and from German speaking countries and some of them had been active in Anatolia since the late Ottoman period. They predominantly undertook the steel bridge projects because of the in sufficient level of national structural steel production. The number steel bridges on Turkish highway network are very few when compared with the railroads where steel is preferred for its high flexibility. Plus, majority these limited number of steel highway bridges were produced in foreign countries, transferred to building site and prefabricated bridge parts were assembled under the supervision of foreign engineers and assemblers of the firm. Since the mounting of the prefabricated parts is a semi-industrialized system and assembling process completed in short time, there had been no need for local subcontractors. Rather, these firms preferred to complete the process with small team consist of foreign workers experienced in welding, and a local co-engineer practice under supervision of a foreign chief engineer. Although, technology transfer was not very extensive in this low level of interaction, some of the Turkish co-engineers practiced in these projects would later be successful names of national construction sector. For instance, Halit Köprücü, one of the most well known names of the Turkish bridge engineering had worked for MAN A.G. in construction of Gazi (Unkapanı) Bridge in 1937.

Except for few examples in steel, majority of bridges on Turkish highway network have been constructed in reinforced concrete. Besides, local contractors took charge in construction of these reinforced concrete bridges because of the advantages of concrete construction in low-tech conditions. Construction of 109 m wide reinforced concrete Kömürhan Bridge is the only exception in 1930 by Sweden-Denmark originated firm *Nidgvist and Holm Co.* Although in the early republic, the technology transfer in reinforced concrete technology was not extensive in level of contractors, it was still active in level of individuals.

It is a well-known fact that after migration of minorities at the end of WWI, deficiency emerged in the area of qualified labor. Construction was one of the most affected sectors from this demographic change. As a result, the deficiency was supplied by foreign labor force (Fig. 3.16). In 1930s, labor permits for foreign workers were taken after the approval of the Ministry of Public Works, and the corresponding bureaucratic papers were kept in the file of the project. Among the files studied, papers of twenty-two foreign workers were found out. Most of them worked more than one project. There were no other records after 1941 because the procedures were no longer carried out by the Ministry of Public Works. According to data derived from these files in studied archives, in 1930s, there was not enough experienced labor force on especially reinforced concrete construction, which is a brand new building technology for the country. Almost all of the foreign employees worked in bridge constructions of the period had masterships on works related to reinforced concrete construction such as scaffolding and iron reinforcement. The nationalities of these workers were frequently Bulgarian and Hungarian, while engineers were mostly German. The others were from Sweden and Italy. (See App. C4).

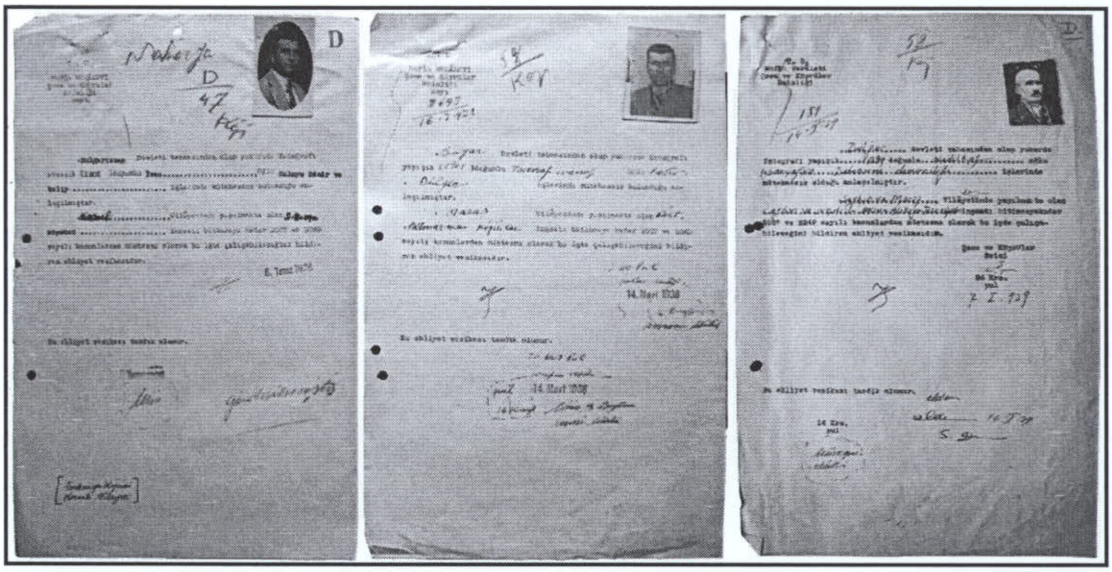

Figure 3.16 Examples from the labor permits approved by the Ministry of Public Works, circa 1930, Source: Unclassified material from the files of General Directorate of Highways, General Directorate of State Archives, Department of Republican Archives.

Along with the collaboration in technology transfer with German private sector, there was also an interaction in public service and educational area. Although foreign scholars had been transferred during 1920s, the largest migration of scholars from Europe to Turkey took place in 1933 and was closely related to the rise of National Socialism in Germany. According to Vlahakis (2006, pp.71-111) 20% of the German-Jew scholars taking refugee in European countries came to Turkey. These were nominated professors or department heads.

Swiss, French, Italian, Polish, and English scholars were also appointed but they were not that numerous. Most of them left Turkey few years after their arrival and passed to US. Among them, there were also non-academics that got a job under public service by the references of their contacts in the country. Most significant name in bridge construction was the Hungarian engineer Balaj. Balaj worked for many years as chief engineer in the Department of Roads and Bridges. He was responsible for controlling of big scale bridges that he contributed most of the bridges mentioned. He also trained many young engineers during his years in the ministry. Fevzi Akkaya was one of these engineers and he tells us about Balaj in his memoirs (1989, p.34).

3.5 Concluding Remarks

This chapter focused on the agents and actors that took part in construction of *"bayındır ülke"*. By the liberalization of the economy and development of national bourgeoisie first foreign actors then the agents of central authority had lost their active roles in construction sector unsurprisingly and limited their actions into specialized areas of action. In their places, semi state and non-state actors and agents undertook the role. Concurrently another notion developed in the process was the construction of individual and socio-professional identities instead of corporative identities under state agents.

However, this replacement was not depended merely on economical transformations, but also based on the increasing technical and organizational capabilities of the private contracting sector. The local non-state agents, who were previously subcontracting foreign companies, developed their engineering skills in time, and substituted foreign companies. Hence, the activities of foreign engineering companies were limited with sophisticated projects and/or consultant positions. Nevertheless, main impediment of early national contracting firms on their way to institutionalization was actually the lack of proper organizational structure. In spite of their adequate level of engineering skills, most of the famous contractors of the early republican period had bankrupted because of this problem. The problem was solved by the next generation of contractors through the lessons learned from the mistakes of the predecessors and experiences in collaboration with American companies in the boom years during the Marshall Plan.

CHAPTER 4

DEVELOPMENT OF ROAD NETWORKS IN 20th CENTURY

20th century denotes a drastic shift in the paradigm of transportation all over the world. The change from railroad to highway symbolizes deep transformations in social and economical spheres. Socially, highways suggest promotion of private car ownership, which was considered as a precondition for modern life, and accordingly alteration of daily practice in favor of mass consumption and private transportation. The most notable change was promotion of mass tourism by introducing the notion of travel to middle class.

Economically, the mobility of middle class helped to increase consumption[38] and emergence of new industries such as automobile and petroleum. The expansion and integration of highway systems under intercity, international, and intercontinental networks conjoined various markets by global capitalism and constituted the infrastructure for the contemporary civilization of 20th century.

Moreover, the rise of highways led to transformations in physical environment and brand new urban paterns such as suburban. The question of modern urban structure under new transportation systems had been studied by many avant-garde architects such as Le Corbusier and Wright[39].

4.1 Development of Highways in the World

Early organizational structures on construction and maintenance of roads were held in France in 16th century so that the very first engineering school *"Ecole de Pont et Chaussees"*

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[38] For further information of the revolutionary invention of Henry Ford see: Batchelor, R., "Henry Ford, Mass Production, Modernism, and Design", Martin's Press, NY, 1994.

[39] See Le Corbusier's La Ville Radieuse and Wright's Broadacre City.

was founded upon the need. Following developments were around Europe especially England, in 18th and 19th century such as invention of turnpike systems, new road covers etc. (Tekeli and İlkin, 2006, pp.325-367). In 1909, an international road group (PIARC) was founded in France by the *Corps des Ponts et Chaussees* in collaboration with automobile and touring clubs. The first PIARC congress held in the same year in Paris. The subsequent congresses were in Brussels (1920), London (1913), and Seville (1923). By 1920s, the advancement on road construction would change hands to Italy, Germany, and United States and following PIARC congresses was to held in Milan (1926), Washington (1930), and in Berlin (1934) (Lay, 1992, pp.93-121).

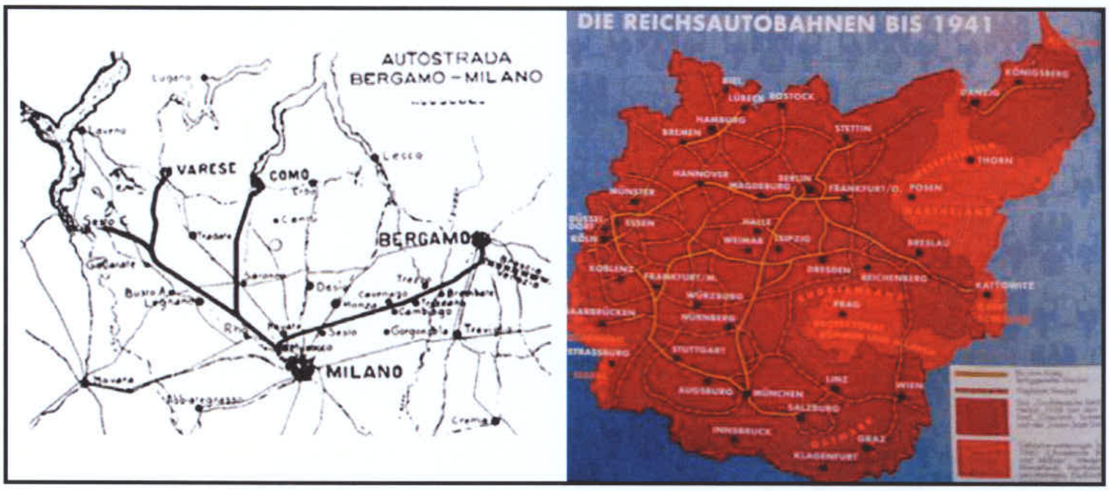

Figure 4.1 Right: The map of German highway network in 1941; Left: The map of first highway line in north Italy 1927. Source: Vahrenkamp, R., "The HAFRABA and forerunners of the German Autobahn project", Working Papers in the History of Mobility No. 9, 2006, p.21

First car races were in the last decade of 19th century on regular roads. However, by the increasing speed of developing automobile technology, racing became harder on existing roads. Under these circumstances, initial idea for high-standard roads for speed was first developed by *Automobil Verkehrs und Übungsstraβe GmbH (AVUS)*. The AVUS racetrack, constructed in 1912, was the first junction-free motor race circuit. A decade after, the world's first high standard road covered with tar-macadam[40] was built as a race route in near Berlin in 1921(Mom, 2005, pp.745-772).

Shortly after, the proposal of high standard and joint-free road was utilized in public life in northern Italy. The industry in north of Italy was developed through warfare production during WWI. Especially Turin was advanced on automobile industry. Therefore, car ownership rates were higher in northern provinces so was the need for a high standard road network. First *autostrada* (motorway) was built as an intercity toll road between Milan-Como-Varese in 1924. It was a private enterprise by Puricelli a wealthy local building contractor in Milan. Until WWII, the road constructions would be carried on and offer a quick solution to unemployment in post-war Italy under Mussolini rule. Nevertheless, Italian case would continue to be constructed by individual entrepreneurs. As per Vahrenkamp (2006, pp.16-22), the Italian highways in 1930s remained disjointed and could not let to broader social transformations as a result of the lack of central planning and overall state strategy (Fig. 4.1).

The following developments in high-standard highway construction had kept on arising around Germany. In 1924, an association was found in Germany called *HaFraBa (Association for the Planning of the Hanseatic Cities-Frankfurt-Basel)* for construction of the first highway network of 22.500 km (Fig. 4.1). Nevertheless, only small part could be realized, and the project would be halted under harsh economic conditions of the great depression. The word *"autobahn"* which resembles motorway was first used as the title of the organization's official magazine (Vahrenkamp, 2001, pp.57-59).

As Mom (2005, p.748) conveyed, Hitler had embraced the project enthusiastically "as part of a national motorization fantasy" when he came to power in 1933. At first, the project was started as feeder to railroad especially for passenger transport, not as an alternative transportation system for long-range land transport. It was aiming promotion of private transportation and mass tourism for middle class. Soon after the *reichsautobahnen*, which were constructed on a robust centralized plan became an alternative way of transformation for both passengers and goods. The motorways were providing infrastructure for both social

[40] "A tar-macadam road consists of a basic macadam road with a tar-bound surface. It appears that the first tar-macadam pavement was placed outside of Nottingham (Lincoln Road) in 1848." Source: "Asphalt Pavement History", Available on 22.12.2009 at http://www.asphaltwa.com

transformation and economic recovery (Fig 4.2). Moreover, their constructions were great source of employment and perfect material for publicity. Even after the end of construction by war in early 1940s, the roads also provided mobility for the movement of German military forces in WWII. As stated in an article published on the official journal of the Ministry of Public Works in 1938 (1938(b), pp.31-42), by means of *reichsautobahnen,* Hitler "killed not two but three birds with one stone" and had significant success not only socially and economically but also politically[41].

Figure 4.2 From Right to Left: The cover theme of "Die Jungmadelschaft" -a journal of nazi ragime for youth training- "the Autobahn construction program" in 1936; "You must save 5 Marks a week if you want your own car." poster advertising Kdf-car (VW-Volkswagen) in 1939; cover page of "Die Autobahn" the official magazine of HaFraBa. Source: From German Propaganda Archieve, available on 22.12.2009 at www.bytwerk.com/gpa/hitleryouth.htm; Available on 22.12.2009 at http://germanhistorydocs.ghi-dc.org; and Vahrenkamp, R., "Die Autobahn als Infrastuktur und der Autobahnbau 1933-1943 in Deutscland", Working Papers in the History of Mobility No.3, 2001, p.58

Hitler was giving vital importance to the construction of visual modernity through architecture. Hence, during the decade of *autobahn* constructions, many studies were done

[41] "...bu muazzam işler, ihdas olunan kanuna göre amele taburlarına ve işsizlikten bunalan iaşe ve ibateleri mükemmel bir suretle temin edilen ve ayrıca da istidatları nisbetinde yevmiye verilen halka yaptırıldı. Bunun için muazzam teşkilatlar vücude getirildi. Bu suretle bay Hitler, siyasi, içtimai ve iktisadi olmak üzere bir taş ile iki değil üç kuş vurmuş oldu." Source: "Alman Devlet Otomobil Yolları", *T.C. Bayındırlık İşleri Dergisi*, Bayındırlık Bakanlığı Matbaası, Ankara, 1938, v.4/9, pp.31-42.

on aesthetics of highways. In this scope, the principles of the landscape and the bridge designs were considered with particular attention. According to Vahrenkamp (2006, p.6) "The bridges of the *autobahn* project were a special aspect upon which the Nazis wished to express their power and their plans for a long-lasting empire" therefore, they were handled as not only functional but also an aesthetic project. Thereby, the bridges were carefully designed by reputed engineers such as Todt and Leonhardt under artistic supervision of Bonatz.

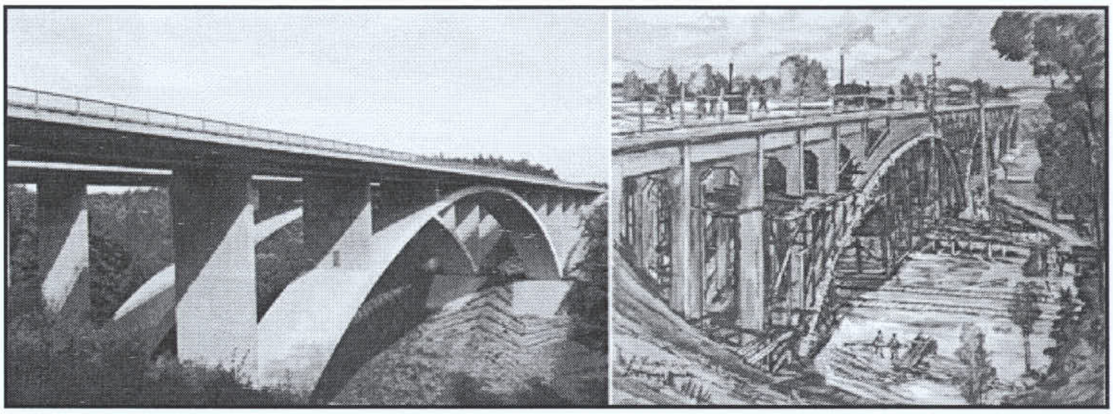

Figure 4.3 Two highway bridges on Reichsautobahnen designed by Paul Bonatz right Donaubrücke under construction (1935) in Leipheim and left, Teufelstalbrücke (1936-1938) in Thuringia. Sources: Available on 24.11.2008 at http://de.wikipedia.org/wiki/Paul_Bonatz and http://www.stmi.bayern.de

After serving as advisor of Todt for a time, Bonatz[42] involved in bridge constructions and designed more than ten long span highway bridges between 1935 and 1941 (Fig. 4.3). Later in 1943, he would come to Turkey as an advisor of Turkish Ministry of Culture in Ankara, and from 1946 to 1954, he taught at the Istanbul Technical University. In spite of his broad

[42] Albert Speer narrates commissioning of Bonatz as follows: "Hitler reacted stubbornly and jealously only when he sensed a mute opposition based on antagonistic principles. Thus Professor Bonatz, the teacher of a whole generation of architects, received no more commissions after he had criticized Troost's new buildings on Munich's Ktinigsplatz. Bonatz was in such disfavor that even Todt did not dare consult him for the building of a few bridges on the autobahn.

Only my intervening with Frau Troost brought Bonatz back into currency." why shouldn't he build bridges?, she remarked to Hitler. "He's very good on technical structures." Her word was weighty enough, and thereafter Bonatz built autobahn bridges." Source: Speer, A., "Inside the Third Reich", MacMillan Publishing Co., NY, 1970, pp.94-95.

experience on bridge building, he would not be consulted in design of road bridges. His only activity on bridges during his years in Turkey was the bridge proposals for Bosporus he studied with his students while he was a professor in the Istanbul Technical University.

When Hitler started the construction of motorway network, the car ownership was not wide spread in Germany. However, road constructions were enforced and supported by a rapid developing automobile industry in countries such as Fiat in Italy and Ford in America. In early 1934, Hitler commissioned Ferdinand Porsche to design an automobile for ordinary German family, spend less on fuel, but maintain a speed of 100 km/h on the autobahn. The car was named Kdf-wagen[43] later would be called VW-volkswagen because of its affordable price for majority of the population (Fig. 4.2). The production began in 1938 but halted in 1941 because of WWII (Price, 2003, pp.3-37).

Adversely in America, private car ownership was widespread in early 1900s and creating a demand for road network. While European engineers like McAdam were developing hard road surfaces for heavy vehicles in late 19th century, American engineers were concentrated on motor vehicles consistent to bad road conditions. In 1908, when Ford's Model-T came on to the market, it popularized rapidly because of its two important characteristics; being affordable and fitting with the bad road conditions of America.

By the increasing rate of motorization, American central authority initiated a highway program in 1916 and supplied funds and assistance for federal governments. However, the program was interrupted by WWI and could not be reinitiated until 1920s. The Bureau of Public Roads (BPR), which later would supply assistance in establishment of Turkish Directorate of Highways, was authorized 1921 to provide funding to state highway agencies for constructing a two-lane and paved network of interstate highways. As in Germany and in Italy, road projects supplied employment during great depression. Nevertheless, the constructions were interrupted by again the war in 1940s (Kaszynski, 2000, pp.24-139).

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[43] "*KdF-Kraft durch Freude* (Strength through Joy) was a large state-controlled leisure organization in the Third Reich...set up as a tool to promote the advantages of National Socialism to the people. It soon became the world's largest tourism operator of the 1930s." Source: Available on 22.10.2009 at http://en.wikipedia.org/wiki/Strength_Through_Joy ; for more information see: Baranowski, S., "Strength through Joy: Consumerism and Mass Tourism in the Third Reich", Cambridge University Press, NY, 2004.

Dünyadaki yol mikdarı ve mukayyed otomobil adedi

Sene	Dünyadaki yol mikdarı mil	1929 danberi çoğalma mikdar	Dünyadaki motörlü vasıtaları mukayese mevcudu	1929 danberi çoğalma mikdarı
1929	6 582 001	0 00	32 034 572	00
1930	7 805 620	18 6	35 127 398	9 7
1931	7 959 194	20 9	35 805 632	11 8
1932	8 994 034	36 6	35 263 397	10 1
1933	9 152 282	39 0	33 567 295	4 8
1934	9 270 052	40 8	35 352 004	10 4
1935	9 599 149	45 8	37 451 798	16 9
1936	9 900 000	50 7	39 800 000	24 2

Figure 4.4 In spite of general tendency towards railroad construction, early republican bureaucrats followed closely the developments in highways. A table showing increasing number of motorcars and motorways in the world between 1929 and 1936, from official journal of the Ministry of Public Works Source: "Dünya yol terakkiyatı", *T.C. Bayındırlık İşleri Dergisi,* Bayındırlık Bakanlığı Matbaası, Ankara, 1938, v.4/8, pp.64-76

In spite of rapid developments in highway constructions in Germany, in Italy, and in America, the countries, which were already invested in railroads, followed deliberate politics on highway centered transportation idea. Between the two world wars, the main discussion in these countries was on regulation of transportation and the balance between highways and railroads. Various countries faced the problem and applied various politics on the issue. For instance in Switzerland, railroads made loss under competition of highways while in Belgium the state had to restrict highway transportation. On the other hand, in Russia both highway and railroad transportation was naturally under state control due to communist politics. Nonetheless, even if they had fallen behind, the first highways constructions would began in England in 1937 while France's first motorway, the *Autoroute de l'Ouest*, would be able to be completed twenty years after the beginning of constructions in 1948. In the mean time, Turkey was closely following the discussions (NİD, 1934(e), pp.74-80; NİD, 1935(b), pp.39-51).

In the years just following the war, the world leadership passed into America's hands from the super-powerful industrialized countries of Europe, which were devastated by the war. America was the only one survived from WWII without physical damage by the help of its geographic farness, nevertheless, it was under the risk of economic crisis due to lack of mass purchasing power in the world. Besides, the bad memories of 1929 crisis were still alive. As all of the infrastructural projects, highway networks in Europe were ruined under severe bombings. After that, America initiated a European recovery program, "the Marshall Plan". The program was financially supporting the projects of physical infrastructure that would accelerate mass consumption. Under these circumstances, Marshall Funds supported construction of cross-European highway network. Concurrently, America in his own lands initiated a highway program as well by the Federal-Aid Highway Act of Eisenhower in 1956

4.2 Development of Highways in Turkey

The very first comprehensive plans on construction of transportation network were prepared within the scope of two development plans in 1822 and 1908. Both of them defined transportation mainly on railroads, but also considered roads as feeder connecting hinterland with the primary transportation line, the railroad. Although the road project plan of Hasan Fehmi Pasha could not be accomplished, Noradunkyan's (1908) was initiated by the finance supplied from the French Government and in return, a French company (Régie Général) undertook repair and construction of Ottoman roadways in 1909. (Ticaret ve Nafıa Nezareti, 1324 [1908]; Şen, 2003, p.76; Tekeli & İlkin, 2004, pp.123-175,175-215). Same company Régie Général would undertake the construction of Izmir touristic roads in 1938 (Şen, 2003, p.76).

According to the data given in Noradunkyan Plan, total amount of the paved, unimproved and fragmentary roads (with and without bridges) in the empire were 30.044 km at the beginning of the 20th century (Ticaret ve Nafıa Nezareti, 1324 (1908), p.18). Nevertheless, after long years of WWI and the War of Independence, the nation's remained roads were in very poor condition. The total amount of inherited roads, with the inclusion of 4450 km unimproved roads and 13995 km fragmentary roads, was 18.335 km in total (NİD, 1935(a), pp.21-27). As seen in map given in the first development plan of the Turkey, which was prepared before proclamation of the republic in 1923, neither roads nor the railroads were in form of continuous lines but just in fragments (see App. G). However, lack of accessibility of modernity to remotest corners of the country was totally depending on the problem of roads because as Ataturk conveyed, "neither health nor education could reach and access the rural if not the roads exist[44]" (Şen, 2003, p.40).

Table 4.1 Transcription of the table from 1908 development plan, showing the roads in Ottoman Empire between 1881 and 1908 (for the original table see App. E). Source: "Noradunkyan Efendi'nin Nafia Projesi", Ticaret ve Nafia Nezareti, 1324 [1908], p.18.

Date		**1297 (1881)**	**1306 (1890)**	**1314 (1898)**	**1323 (1907)**	**1324 (1908)**
Paved road	**With bridges (km)**	900	9.460	12.714	16.013	16.360
	Without bridges (km)	-	980	1.005	1.028	1.074
Unimproved road	**Completed (km)**	-	1.460	1.732	3.304	3.250
	Under construction (km)	-	1.220	1.008	1.106	1.210
Fragmentary (km)		4.100	6.840	7.581	8.593	8.150
Total (km)		5.000	19. 960	24.150	30.044	30.044

The transportation policy of the new regime was mainly based on the idea of accessibility to country's underground, overground and human resources that had been lying idle for ages. As stated in an article in 1935, the roads serve the purposes of national security, national culture, development, and modernity; moreover, they connect markets and shorten time and space for citizens, and ease giving hand in cases of natural disasters as well. Nevertheless, the article underlined the need for regulation of the relations between different means of transportation, and states "highways are the major subsidiaries of railroads" (NİD, 1935(e), pp.5-15). In 1930s, the division of labor among transportation systems was also the topic of

[44] "Efendiler! Maarif, sıhhat, iktisat mefhumları bir ilahi seda gibi gökten inmezler. Bunlar, ancak, bu ilimlere mücehhez insanlar ve vasıtalar tarafından kasabalara, köylere götürülürler. Bu insanları, vasıtaları lüzumlu yurt köşelerine göndermek için yol lazımdır. Eğer yol olmazsa, ne sıhhat, ne maarif, bilhassa buna daha çok muhtaç bulunan köylerimize gidemez ve giremez. İşte Türk cemiyetinin yıllardan beri birrinci derdi budur: Yolsuzluk..." M. K. Ataturk. Source: Şen, L.,op cit., 2003, p.40.

discourse in Europe. The early republican bureaucrats followed closely the discussions. There were many related articles published in the official journal of the Ministry of Public Works; but none of them was considering having highways as the primary transportation system. All most all the articles until 1940s were on how to ensure the highway as a feeder for railroad (NİD, 1934(e), pp.74-80; NİD, 1935(b), pp.39-51). This was a continuing attitude in Turkish transportation policies since late Ottoman period. In the transition from Ottoman to Republic, main transformation was not in the preference of railroad supremacy but in the method of its finance. The republican elite preferred national resources in finance of the railways while road construction projects had newer attracted foreign capital though it had been already national.

Figure 4.5 Ali Çetinkaya on one of his working trips in Anatolia circa 1930. Due to poor conditions of transportation, he was using horse carriage. Source: Available on 10.10.2009 at www.gittigidiyor.com

The new regime had not only kept using the existing Ottoman legal, financial, and administrative structure on road constructions, but also continued its main road policy and adopted the decentralized approach into road management and construction until 1940s. For this reason, the responsibility of construction of roads was on the provinces that collect the road taxes. They prepared annual plans for road and bridge constructions (Fig. 4.6), and after approval, the projects were constructed under the supervision of engineers of the Ministry (BİD, 1943(a), pp.343-388).

Figure 4.6 Maps of roads and bridges of provinces in 1928. From annual plans of the provinces (left to right) Kayseri, Muğla, and Çankırı . *Source: KGM Archives*

The Department of Roads and Bridges had enforced a centralized plan for the road network; however, the decentralized and fragmented responsibility was giving rise to unconnected segments rather than an entire network. Since the road taxes were collected by provincial governments, they transferred these sources to local necessities rather than intercity roads. Consequently, each province had not participated in programmed road constructions in equal weight and the ministry was not able to realize the establishment of a nationwide network (BİD, 1936(c), pp.41-52).

Another practice remained from Ottoman was *yol mükellefiyeti* (the road tax system) which was paid as compulsory labor or in cash. According to this, the ones who were unable to pay in cash –like farmers- pay it by working in closest road construction. However, the system caused faulty workmanship and loss of great amount of agricultural labor. Besides, it had caused displeasure throughout the people and criticized frequently (BİD, 1937, pp.45-46). Nevertheless, the government could not relieve the people off the tax since the road constructions were totally depending on manpower in the absence of machinery. The increasing amount of road taxes during the WWII years was one of the main reasons of the defeat of the Republican People's Party (RPP) in 1950 elections. In the same period, the government had also utilized military troops in road constructions under the name of *Nafıa birlikleri*[45]. These troops had worked in road constructions under command of an engineer

[45] "..bu birlikler müteahhitlerin amelesizlik yüzünden acze düştükleri su, şimendifer, şose inşaatında yardımcı vaziyetine sokularak hem milli hizmetler ifa edilmiş hem milli sermayeler mahvolmaktan kurtarılmıştır. Halen muhtelif çimentofabrikalarının istihsalatını korumak için bu fabrikalar yardıma başlanmış ve milli işlerin en çok muhtaç olduğu çimento istihsalatını da sulh randımanından

army officer and the contractor (BİD, 1945, pp.27-32; BİD, 1942(c), pp.65-66; BİD, 1942(e), pp.309-315).

Figure 4.7 An aphorism of Ataturk in 1934. Image from an article on the official Journal of The Ministry of Public Works. The entire saying is as follows: "Everywhere, farmers and citizens have reminded me of the work program with these two words: Roads – schools. Since they said: Roads are the wings of farmers, it is obvious that they consider roads more important than anything. Indeed, all economy is in the first, and everything is in the second word" (Sevim, A. et al, "Atatürk'ün Söylev ve Demeçleri II", Ankara, 2006, p.193*)*. Source: "Milli şoseler", *T.C. Bayındırlık İşleri Dergisi,* Bayındırlık Bakanlığı Matbaası, Ankara, 1944, y11, s2, pp.115-130.

The road politics of the republic until 1947 could be evaluated as pragmatic in a retrospective view. Except for the maintenance and repair of the existing roads, the few newly constructed lines were on topographically problematic or strategically important areas. These were İzmir touristic, Hopa-Borçka, Edirne-Istanbul, Çanakkale-Balıkesir, and Trabzon-Erzurum-Karaköse lines (Çetinkaya, 1935, pp.6-12; BİD, 1936(b), pp.3-6). Among them most significant was the construction of Trabzon-Iran transit road (BİD, 1938(c), pp.70-84). During his visit in 1934, Shah Pehlevi had also traveled through the new transit road to Trabzon (Özgiray, 1995).

The wartime circumstances underlined two main topics of discussion on road construction; first was the alternative types and building techniques in road construction and the other was the mechanization. In spite of the published articles on advanced road pavements (BİD, 1938(d), pp.85-88; Ulusan, BİD, 1942(b), pp.69-74; BİD, 1942-1943, pp.37-58), the roads

düşürmemek imkanı bulmuştur." Source: "Nafıa Takımları", *T.C. Bayındırlık İşleri Dergisi,* Bayındırlık Bakanlığı Matbaası, Ankara, 1942, v.9/5-6, pp.309-315.

built in Turkey in 1930's were based on macadam and tar-macadam techniques that were developed in 19^{th} century. However, these kinds of pavements were expensive and inconvenient under 1930s local conditions of Turkey where horse-drawn carriages with iron wheels were still in use (BİD, 1936(c), pp.41-50). Vecdi Diker, who was a road engineer graduated from Missouri University raised the construction of different types of roads depending on the density of traffic He was proposing stabilized road construction especially on low-density roads (BİD, 1938(e), pp.67-95; Diker, BİD, 1942(a), pp.28-42; Şen, 2003, pp.84-86).

Together with the stabilized road, Diker also brought up the American model to the agenda of road construction[46]. Hence, he set up a base for the future discussions, which would be held during the establishment of KGM in scope of Marshall Funds. Besides, it was the time when American experts were preparing reports on Turkish economy.

By 1947, Turkey was concentrated on fitting within the new world order in foreign affairs, while in interior, on finding the ways of quick economic recovery to raise again the modernity project that was decelerating and losing ground. However, the country was still experiencing accessibility problems. Railroads were far behind meeting the requirement of the wide national territory; and the road network, which had to feed them, could not be extended due to lack of resources. According to Hilts Report, the road facilities between 1933 and 1947 were not in form of construction of new ones but maintenance and repair of the old; hence, there was no increase in total amount. In 1947, the total amount of roads was 43.743 km. Although it seems quite an increase when compared with Ottoman period, in reality, only quarter of them were serviceable in four seasons. Accordingly, the deficiency in transportation was affecting the prices. For instance, the cost of rice imported from China was less than transported from Samsun to Istanbul in 1938 (Şen, 2003, pp.112-113).

[46] Thereafter many articles and dossiers published in the official journal of the Ministry. Some of them are: "T.C. Bayındırlık Bakanlığı Bayındırlık İşleri Dergisine Ek No:6-Onbeş Memlekette Yolların idaresi ve Finanse Edilmesi", *T.C. Bayındırlık İşleri Dergisi,* 1938, v.5/3, ek no:6; "T.C. Bayındırlık Bakanlığı Bayındırlık İşleri Dergisine Ek No:11-Onbeş Memlekette Yolların idaresi ve Finanse Edilmesi (devam)", *T.C. Bayındırlık İşleri Dergisi,* 1939, v.5/10, ek no:11; "T.C. Bayındırlık Bakanlığı Bayındırlık İşleri Dergisine Ek No:12-Onbeş Memlekette Yolların idaresi ve Finanse Edilmesi", *T.C. Bayındırlık İşleri Dergisi,* 1939, v.5/11, ek no:12; "Yollar Milli Müdafanın Anahtarıdır. Amerika'da Harp ve Sulh Zamanlarında Karayolları", *T.C. Bayındırlık İşleri Dergisi,* 1942, v.8/12, pp.20-45.

The primary attempts for development of a wider road network were in the early 1940s. Later in 1945, the government prepared a comprehensive program for 44.000 km road network. It was the first time the need for technical and financial American support was verbalized. Concurrently, America was developing his containment policy against the communist treat. As the first move, America gave aid to Greece and Turkey in 1947 for both political and military reasons. This is known as Truman Doctrine. As Şen (2003, pp.117-122) narrated from Diker, although the aid was mainly reserved for military purposes, Vecdi Diker, then-director of the Department of Roads and Bridges, prevailed upon Turkish and American officers to use a small amount for mechanization of road construction. In contrast to common belief, America had not imposed on construction of highways in the first place; on the contrary, the only emphasis in Truman Aid related with transportation was on the need for renovation of railroad technology. The American government changed their idea on the persistent demand of Turkish lobby. Nevertheless, it would not take too long for America to utilize the subject which is very profitable for American commerce, especially for automotive and petroleum industries.

Figure 4.8 Various mottos under the heading of the bulletin of Highways, Source: *The bulletin of Highways,* 1951 and 1952.

In February 1948, Harold Hilts, the deputy commissioner of the US Bureau of Public Roads, prepared a detailed report on Turkish transportation system. In his report, Hilts was clearly suggesting the preference of highways over railroads and establishment of a semi-autonomous department specifically concerning construction of roads. His report was followed by two other American reports prepared in 1949 and 1951. First report was prepared by Max Weston Thornburg, who was an engineer in American Standard Oil Co. and senior petroleum advisor of US while second by James M. Barker from International Bank for Reconstruction and Development. Both reports were supporting construction of a transportation system based on highways and opposing railway constructions as well (Thornburg, 1949; Barker, 1951). Shortly after, the Truman Doctrine was followed by the Marshall Plan and the foundation of NATO in 1949. Subsequent to a close cooperation with America, a program for construction of national system of highways of 23.000 km of all-weather stabilized roads in nine years was approved, and former Department of Roads and Bridges had been officially organized as a general directorate having juridical power (Cündübeyoğlu, KGM Bulletin, 1954, pp.5-10). The nine-year program was divided into three periods of three years. In the first period (1949–51) total investment of foreign and governmental resources amounted to $58 million. In the second period, the amount of governmental support was increased to 10% of total budget, which was almost twice of the other countries (Tan, KGM Bulletin, 1952, pp.1-2). By the end of program in 1960, total of the roads constructed were about 60.000 km (KGM, 2007, p.9).

Actually American aid was not just a financial credit, rather a comprehensive and systematic technology transfer. Within this context, The American Bureau of Public Roads offered a bidirectional training program on road engineering by sending road experts and providing vocational training scholarships for Turkish engineers (Schipper, 2007, pp.211-228). Moreover, the Turkish government purchased heavy road equipments from the United States and the number of road equipments increased from 1127 in 1948 to 3812 in 1951 and 9466 in 1958 (KGM Bulletin, 1958(b), pp.6-13; Şen, 2003, p.120). As a result, the mechanized road construction desired for long a time had finally been accomplished through Marshall Plan; and "the advantages of [contemporary] civilization had been transferred from cities to towns, towns to country and to rural areas by means of the highways" (KGM Bulletin, 1958(b), pp.6-13). While the nationwide road constructions were glorified as "the victory of democracy" on the daily media (KGM Bulletin, 1950, pp.2-3); the engineers working in road constructions under harsh conditions devotedly were praised as *"imar akıncıları"* (raiders of development) (KGM Bulletin, 1951, pp.2-3)[47].

The Turkish bureaucrats and engineers believed that road constructions were without doubt a *"milli dava"* (national cause). However from the very beginning, America had a voice on the project through the prepared reports, consulted experts and the road equipments usage of which was under supervision of America. Hence, American military and economic interests affected the plan of Turkish "national highway system". Most obvious sign of this effect is read on the influence of railroads on the design of highway network. Even though the existing railroads had been taken into account as the primary means of transportation in the first highway plans in early 1940s, their existence were totally ignored after Hilts report. The change in transportation politics on American effect can be best visualized in the new road lines parallel with the old railroads (Fig. 4.9). Hence, the railroads built before 1947 had become idle.

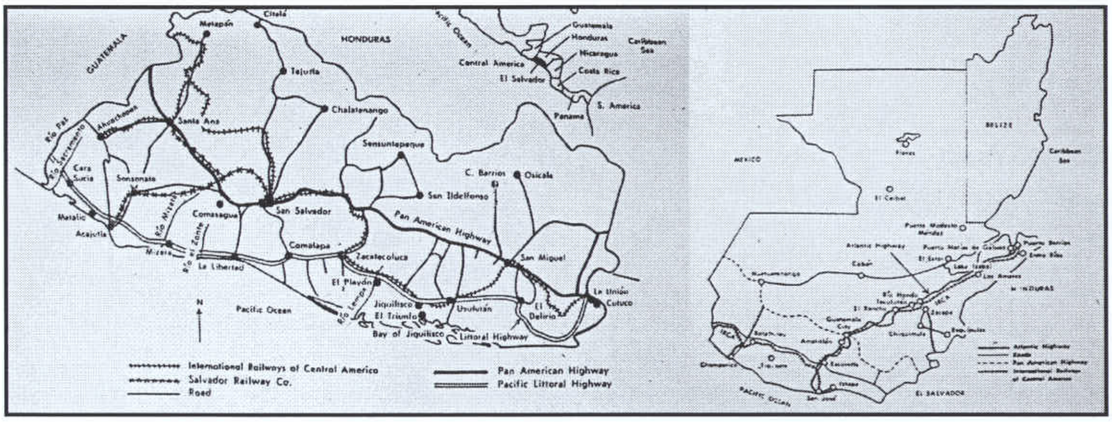

Figure 4.9 Highway lines built parallel with the railroads. Right, Guatemala; Left, El Salvador. Source: Güven, S., "1950'li yıllarda Türk Ekonomisi üzerinde Amerikan Kalkınma Reçeteleri", Ezgi Kitapevi Yayınları, Bursa, 1998, pp.9-23

[47] Sinan Korel-Vatan Newspaper:

"...bu seyahat sayesinde türk mühendislerinin çalışmalarını yakından görebildim. Bu imar akıncılarının ne feragatle ve ne müşkil şartlar içinde uğraştıklarına şahit oldum. Var olun adsız kahramanlar." Source: "Gazetecilerimizin Seyahat Intibaları", *Karayolları Bülteni*, v.1/9, July 1951, pp.2-3.

Prior to 1947, the general principle of transportation policy was establishment of an integrated transportation system that all means of transportation supported each other. This was defined as railroad dominated transportation system, in which highways and sea transport undertook the feeder role. However, under poor economic conditions, there were not enough resources to finance both. Besides, the low level of motorization especially in individual level meant not enough user-pay taxes to cover maintenance costs. Under these circumstances, the state had to give preference to railroad. However, the incomplete transportation network consist of scattered fragments was a problem on integration of national markets and slowed down the economic growth. On the other hand, the unintegrated system had "serve[d] as a natural barrier against exploitation by the capitalist countries" (Tekeli and İlkin, 2006, pp.372) as it was in Ottoman period.

However in few years, the situation shifted quickly by the new highway program. Except for the construction of some militarily important lines such as the road from the port of Mersin to Kars, which was a border with the Soviet Union, the main attention was given to construction of lines that would ease the utilization of large deposits of agricultural products and strategic raw materials, such as wheat and chrome. In return, the country became an opened market (Güven, 1998, pp.3-57). In consequence, American Aid, which was started as a military support, transformed into an economic routing.

Table 4.2 Increase in motorization between 1923 and 1958, Sources: "Milli Sanayi Sergisinde Karayolları", *Karayolları Bülteni*, 1958(a), v.4-5, p.5 and Karacan, Ö., "Atatürk Döneminde Yapılan Karayolları, Barajlar ve Limanlar (1923-1938)", Master Thesis, Ankara University, Ankara, 2005.

Year	Automobile	Truck	Bus	Motorcycle	Total
1923	-	-	-	-	1500
1929	-	-	-	-	7800
1938	-	-	-	-	9500
1949	8012	11403	2622	2281	24318
1957	33377	35070	7914	9743	86104
1958	33968	37507	8247	8303	88625

Although American aid in highway construction was Turkish Government's demand in the first place, supporting highway constructions in developing countries in order create new markets for its industry was an American strategy, which had been implemented in South America since 1943. During 1950s, this capitalist strategy was also implemented in various other developing countries such as El Salvador, Bolivia, Colombia, Nicaragua, Guatemala, and Venezuela by American/International development agents. As Güven (1998, pp.9-23) mentioned constructed highways in all these countries were parallel to existing railroad lines.

The Turkish proposal actually provided America an opportunity to check the possibility of implementing the same policy in the continent. Thereafter, the American consultants heavily promoted construction of a larger network of highways within Europe. Hence, although the Marshall Plan was an economic recovery program, it had mainly affected socio-cultural structure. The deep American influence had altered mobility patterns and initiated mass motorization all around Europe during 1950s. In spite of rapid increase in numbers, motorization of Turkey remained weak when compared to Europe. The mass motorization in Turkey was realized after 1970s.

4.3 Road Bridges in Turkey

Roadways had been the major infrastructure of transportation in Anatolia for ages until the construction of railways in the second half of the 20th century. Therefore, there had been a rooted tradition in construction of road bridges. However, the road bridges built in Turkey in the covered period of the thesis were built discretely from this traditional context. Nevertheless, these modern bridges were neither the product of the context in which the road bridges were reproduced as result of non-intersecting highway concept in early 20th century. Hence, the studied bridges were not technically highway bridges.

However, the republican road bridges in the absence of a modern road system were constructed with the latest technology of the time. The insistence on advanced technology was because of their representetational meaning as icons of technical progress and modernity. Thus, the bridges were not only served public use as functional but also socio-cultural and economy-political products of modernity project.

4.3.1 Construction Techniques and Materials

During their long sovereignty, Turks built many bridges in Anatolia for land transport. In addition to militarily and strategically important bridges built by the central authority, regional governments also built bridges. Especially for the regions where trade routes pass, caravan trade meant various revenues. Faroqhi (1984, p.69) conveys that taxes and tolls were collected from those who used roads and bridges and part of these revenues were used for construction and maintenance of them. According to early republican sources, among the massive stone arch bridge heritage nearly sixty bridges from Ottoman, twenty four in north-east of Anatolia from Russian occupation and forty from other civilizations remained to republican times (NİD, 1934(c), pp.26-39; BİD, 1936(d), p.57; BİD, 1943(b), pp.389-434)[48]. Among them Uzunköprü Bridge is the longest in total length while Malabadi and Hasankeyf bridges are the longest spans.

By the increasing railroad constructions following the first railroad concession that was given to England in 1856, new building technologies and materials were started to be used in Anatolia. Thereafter, a new bridge type, steel truss bridge, became wide spread in Ottoman land. The foreign companies who got the concessions to operate the lines also undertook the construction of the line and the bridges. In addition, they often prefer steel bridges on masonry piers. There are several reasons for this preference; first of all, as mentioned in chapter five, steel is much expedient for high dynamic loads of railroad vehicles because of its elasticity. Secondly, by semi-industrialized construction techniques, it is fast to assemble, and have a standard level of quality. Lastly, foreign construction companies preferred to import materials form their countries, so they maximize their earnings by contributing their gross national product. Besides, the production of pig iron and steel was insignificant and existing manufacturers were charged for production of war materials in pre-war Ottoman Empire (Pamuk, 2005, pp. 113-136).

Nevertheless, steel bridges have never been popular as road bridges not favored in road network except for few examples probably because of high costs that could not be covered.

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[48] On the other hand, a recent study find out more than two hundred stone arch bridges in Anatolia that were from medieval to the end of Ottoman Empire. Source: Doğangün A. and Ural A., "Characteristics of Anatolian Stone Arch Bridges and a Case Study for Malabadi Bridge", ARCH'07-5th International Conference on Arch Bridges, Madeira, Portugal, 12-14 September, pp.179-186.

The first examples of steel road bridges in late Ottoman period were generally preferred in foreign originated constructions. Sometimes these were directly parts of a road construction concession, and sometimes related with a railroad concession.

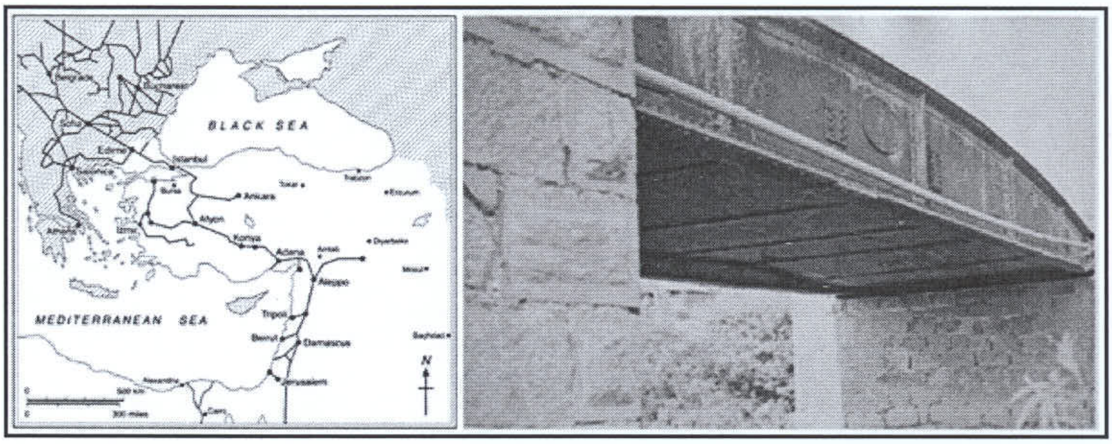


Figure 4.10 Left: Railroads in Ottoman Empire circa 1914, and former European possessions. Right: Murataǧa Bridge on Tersakan stream in Muǧla. With an identification disk on the main beam, written "Cowans Sheldon & Carlisle England – Patent No: 215". Source: Quataert, D., "The Ottoman Empire 1700-1922", Cambridge University Press, NY, 2000, p. 121.; KGM Archives, off-track bridge files, region 13.

The railroad lines helped the financer countries to create their own regional spheres of influence in the neighborhood of the railroad lines (Fig. 4.10) such as the British zone of influence in western Anatolia created by both İzmir-Aydın and İzmir-Kasaba lines. Following to the construction of the lines, British activities had rapid increase in areas such as trade, agriculture, mining, and even in public service (Özyüksel, 1988, p.12). Within this context, Murataǧa Bridge can be mentioned as an example of British activity in public sphere. This old road bridge from late Ottoman period is in steel girder type and has an identification disk welded on the main beam, showing the name of the constructor firm and the patent number. According to the disk, a British company "Cowans Sheldon & Carlisle - England" produced the bridge. The bridge is today abandoned and out of the road network but still existing.

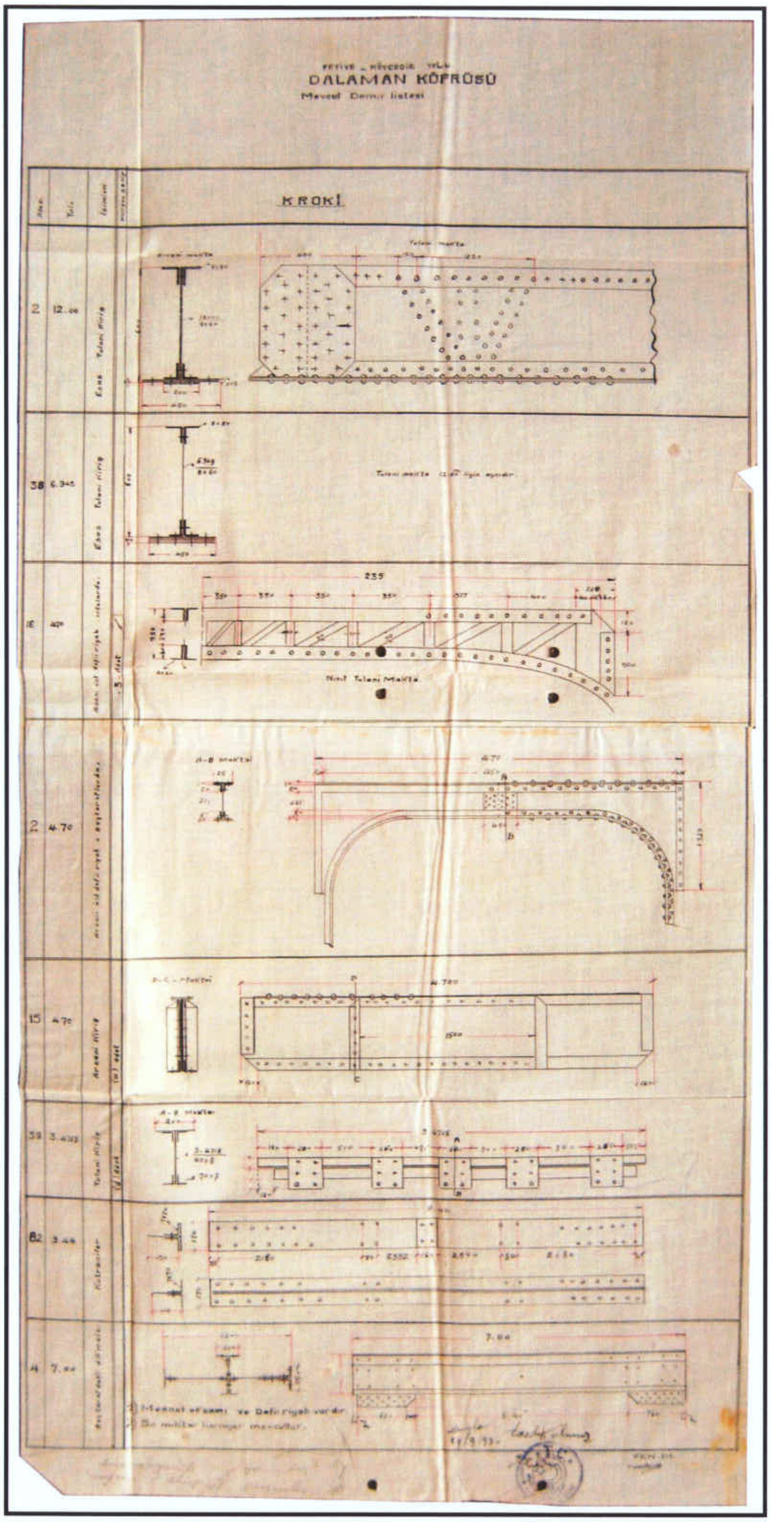


Figure 4.11 List of the steel elements remained. From the inventory list produced in 1930s for construction of 70 m span steel town lattice truss type Dalaman Bridge. Source: Unclassified document from the State National Archives-Republican Archives, KGM Fund, Binder no. 2203

We also find few examples ordered by individuals to foreign countries for bridging a stream on their own land. For instance, as we learn from the documents, last Khedive of Egypt, Abbas Hilmi Pasha ordered a steel truss bridge for his property in İzmir. Together with other buildings ordered, the structural elements produced in France and shipped. However, although the piers are constructed, the bridge could not be assembled for an unknown reason. Later in republican times, the steel parts would be assembled in construction of Dalaman Bridge in 1934 (Fig. 4.11) (Unclassified documents from State National Archives-Republican Archives, KGM Fund, Binder no: 2203).

Last example of steel in Ottoman period was constructed by a French company, the *Régie Général*, which gained the concession of repair and construction of Ottoman roadways in 1909. The *Régie Général* is one of "the chief representatives of French capitalism in the Ottoman Empire" (Fulton, 1996, p.137-164) and was active in railroad and roadway construction in both late Ottoman and early republican periods. Its activities were closely linked between French finance on Ottoman infrastructural projects. The part about nationwide road construction in 1908 development plan prepared by the Minister Noradunkyan required two million golden franks. This amount was supplied by the French government and in return, the Régie got the concession of roadways (Ticaret ve Nafıa Nezareti, 1324 (1908); Şen, 2003, p.76; Tekeli & İlkin, 2004, pp.175-215). Within the scope of this construction, Régie constructed many road bridges, which today we know little about, all around Anatolia until the Balkan wars. Depending on the documents on Dalamaçay Bridge in Aydın, which was one of these bridges, we learn that Régie also preferred importing steel truss bridges. The bridges were produced in France, shipped to Anatolia, and assembled in site. However, as in case of Dalamaçay Bridge, the constructions were interrupted by the war and the steel elements of some bridges left unassembled. According to the documents, the Municipality of Çine used some of the U-shaped steel elements of Dalamaçay Bridge in irrigation lines thereafter. (Unclassified documents, KGM Fund, Binder no: 1870 from the State National Archives-Republican Archives)

The only remaining example, which should also be mentioned is the Yahşihan Bridge. It was built in 1905 in Kırıkkale and today still in good condition. According to the official journal of the Ministry, it is the first steel road bridge in Anatolia; nevertheless, no further confirming document could be found (BİD, 1941(a), p.13-27).

By the late 19th century in Ottoman Empire, concrete had been a popularizing co-material in composite structural systems in architecture. Especially foreign companies were importing cement for the constructions they had undertaken. In order to fulfill the demand, first cement factory was opened in 1910. Along with its contemporaries, introduction of reinforced concrete frame buildings was realized in the first decades of the 20th century[49]. However, the material was treated more prudently in engineering structures. Even the books on bridges published by *Yüksek Mühendis Mektebi Matbaası-YMMM* (Higher School for Engineering Press) were *Ahşap köprüler* in 1330 (Wooden Bridges-1911), and *Demir Köprüler* in 1331 (Iron Bridges-1912) by Mehmet Fikri Bey (Santur) while first book on reinforced concrete bridges, *Betonarme Köprüler ve Hesabatı*, was in 1928 by Ahmet İhsan Bey (Fig. 4.12). As far as we learn from the existing literature, there is no document found on the existence of a reinforced concrete bridge in late Ottoman era, despite the developing reinforced concrete arch bridge technology in Europe.

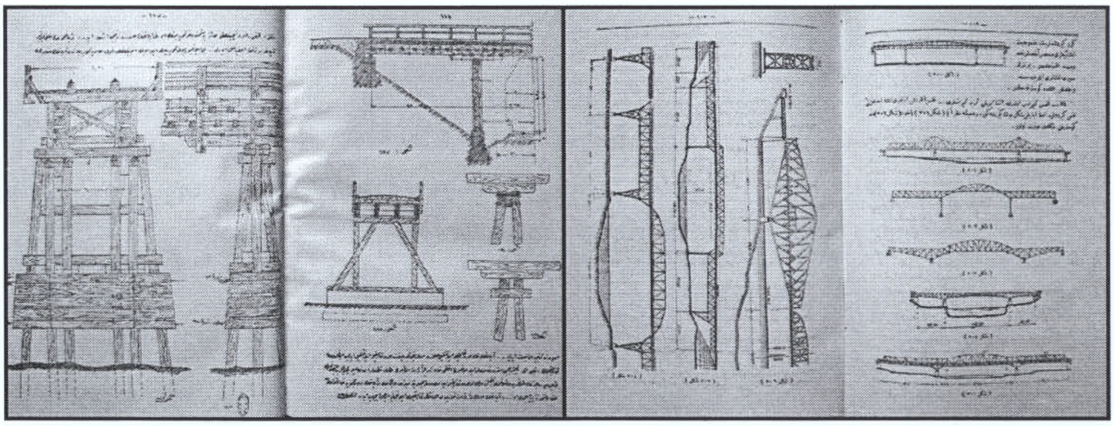


Figure 4.12 Pages from (right) "Demir Köprüler" and (left) "Ahşap Köprüler" by Mehmet Fikri (Santur) Bey. Source: Santur, M. F., "Demir Köprüler", YMM Matbaası,1331 (1912) and Santur, M. F., "Ahşap köprüler", YMM Matbaaası, 1330 (1911).

[49] As far as we learn from various sources first RC frame buildings are Harikzade apartments (1919), Sütlüce slaughterhouse (1919), Seyr-ü Sefain agency (1916), Mes'adet Han (1915), Muradiye Han (1914), Docs and Entrepots of Istanbul (1914), Cinema in Bursa (1912) and piers on Topkapı-Azapkapı and Sirkeci-Unkapanı coasts (1907). Sources: Batur, A., "M. Vedad Tek: Kimliğinin İzinde Bir Mimar", Yapı Kredi Yayınları , Istanbul, 2002; Sey, Y., "Türkiye Çimento Tarihi", Türkiye Ekonomik ve Toplumsal Tarih Vakfı ve TÇMB Yayınları, Istanbul, 2004; Yavuz, Y., "Mimar Kemalettin ve Birinci Ulusal Mimarlık Dönemi", ODTÜ Mimarlık Fakültesi Basım Işliği, Ankara, 1981; State National Archives-Republican Archives, Ministry of Public Works Fund, Binder no: 230-69.7.1

According to the official journal of the Ministry of Public Works (1938, p.296) the first bridge built in republican era was Garzan Bridge in masonry stone arch type. The constructions began on Diyarbakır-Bitlis road just after the reclamation of the Republic and finished in 1924. Construction of 36m single span arch bridge in such a remote corner of the country where the roads had not reached yet was interpreted as "clear evidence of devotedness of the government and importance attached to construction of bridges" (BİD, 1938, p.296). Unfortunately, this very first bridge was not survived and collapsed in 1940s.

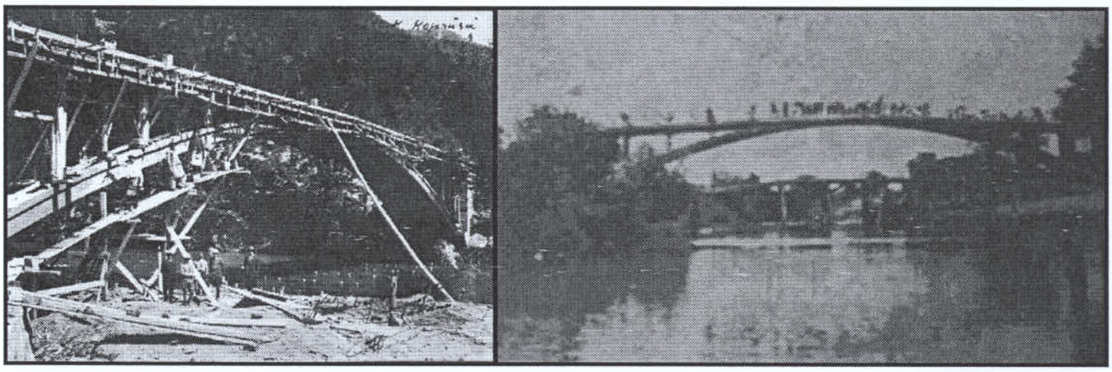


Figure 4.13 Right, Riva Bridge (1925) and left Kirazlık Bridge (1928) under construction. Source: KGM Archives

A year after the Garzan Bridge in Bitlis and almost a quarter century after Wildegg Bridge (the first reinforced concrete bridge) in Switzerland, reinforced concrete was employed in bridge construction in Anatolia for the first time. This was time when foreign engineering firms were active and trusted in such kind of innovative engineering projects. Besides, courses on reinforced concrete construction would not be entered the curriculum of the engineering faculty until the change in program in 1928 (NİD, 1934(d), pp.49-50). Under these circumstances, the first reinforced concrete bridge of Turkey was put out on tender in 1924 (Fig. 4.13).

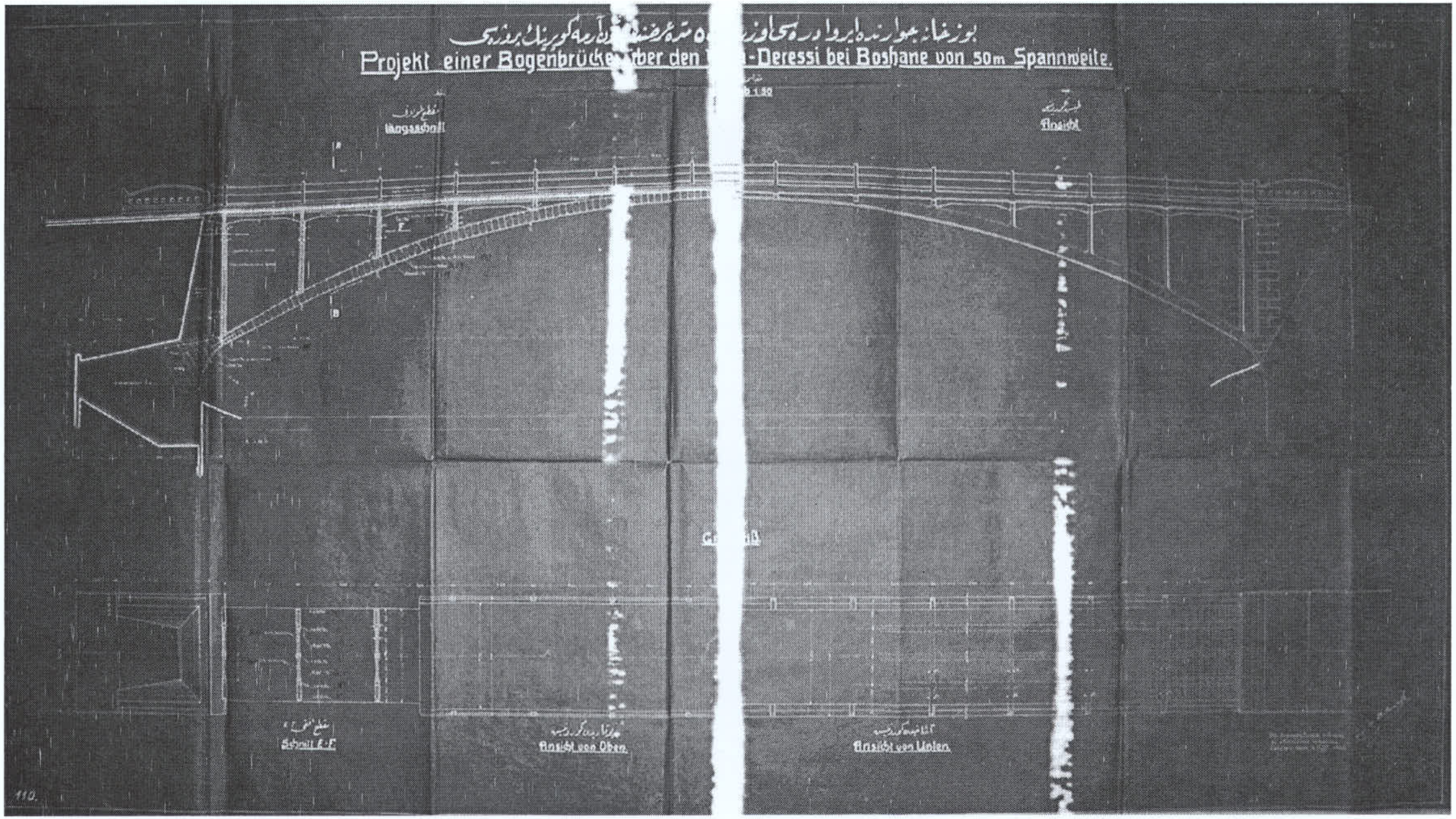


Figure 4.14 Elevation of the Riva Bridge, 1925 by "Sociéte Anonyme Turque d'Etudes et d'Entreprises Urbaines Constantinople".
Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2092

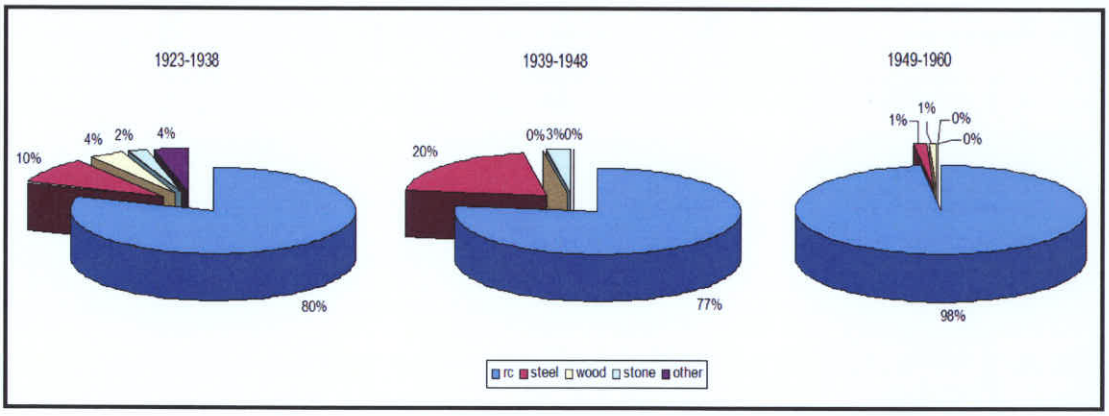
The name of the first reinforced concrete bridge is Riva Bridge on Riva waterway and it is located in Istanbul on the Beykoz-Ömerli-Bozhane road (Fig. 4.14). As a very first example, it has a daring design with a single span of 48m reinforced concrete arch type. Although the drawings were signed by *"Sociéte Anonyme Turque d'Etudes et d'Entreprises Urbaines Constantinople"* in 9.4.1925, the contractor of the Riva Bridge was written on its original files as *"İnşaat Turk Anonim Şirketi"*. According to list of construction firms in Batmaz's study (2006, p.64) and in Ökçün's study (1997, p.50-51,88) there were five anonym companies on construction in Turkey between 1920 and 1930. These were *"Türk İnşaat Evi (Türk İnşaat Anonim Şti.)"*, *"Türkiye Cumhuriyeti İnşaat T.A.Ş."*, *"Rella İnşaat T.A.Ş."*, *"Adana Türk İnşaat ve İltizamat-ı Fenniye ve Sınai T.A.Ş."*, and *"Keşfiyat ve İnşaat T.A.Ş."*. The first firm was Arif Hikmet Koyunoğlu's company especially involved in construction of houses in Ankara. The second was established by Emin Sazak, a parlimenter from Eskişehir. The third was established by Dutch capital. There were three foreign engineers, Rudolf Heim, Paul Ludwig Rot, and Karl Sigfrid Drach, among its founders. The fourth was established entirely by local capital to undertake constructions in particular region. The last firm *"Keşfiyat and İnşaat Türk Anonim Şti."* was originated in Istanbul and had branches in İzmir and Zonguldak. The company was originally a French firm established to undertake the mapping works of Istanbul in 1910; later in 1914, by the WWI, the firm was transferred to Germans. After reclamation of the Republic, the company increased its activities, and undertook cartography and planning of Ankara and some regions of Istanbul. The most known work is the first development plan of Ankara in 1924 by Lörcher one of company's German architects (Cengizkan, 2003, p.153 and Uluiş, 2009, pp.73-82). Meanwhile the firm became known as *"Keşfiyat ve İnşaat Türk Anonim Şti."* but continued using its original French name on official papers *"Sociéte Anonyme Turque d'Etudes et d'Entreprises Urbaines Constantinople"* along with its new Turkish name. Finally, in 1928 a Turkish engineer İbrahim Rahmi Arı took over the company with a few cartography machinery and German engineers. Thereafter, the firm had prepared maps of many cities such as Istanbul and Rize (Kural, 1966, pp.16-20).

The construction of Riva Bridge took a year and estimated cost of the bridge was 34.160 TL. In early proposals, the bridge was designed for spanning 50m however, but it was changed because of an unknown reason and final construction spanned 48m. In addition to usual drawings such as elevations and plan, the company also presented additional drawings such as influence line diagrams showing the moment and shear forces in various sections (Fig.

6.5). Three years later, an identical second bridge, Kirazlık Bridge, was built on the same plan in Bartın (NİD, 1934(a), pp.90-91). At present Kirazlık Bridge is abounded because of the changes in road network, while Riva Bridge, the oldest reinforced concrete bridge of Anatolia, has still been actively serving a heavy traffic.

In the following years after the construction of Riva, reinforced concrete had popularized in bridge constructions and became a new tradition of republican bridge building as counterpart of Ottoman stone bridges. This was also the period, when reinforced concrete was favored over stone and steel in all kinds of constructions especially in and around Ankara. According to the data derived from the archives, among fifty bridges built between 1923 and 1938 and spanning more than twenty meters, fourty of them were reinforced concrete. This was 80% of whole production. In years between 1938 and 1948, the state had to look for alternative solutions in building materials. The shortage of iron rods under pre-war conditions led the state building with local building materials especially wood. Due to dimensional constraints of wood, the road bridges spanning more than twenty meters were decreased dramatically in number. However, still 77% of these big scale road bridges were constructed with reinforced concrete. After the end of WWII, Turkey had started experiencing new financing politics. Under these new politics, the number of bridges spanning more than twenty meters was multiplied and the ratio of reinforced concrete bridges reached to approximately 98% between 1949 and 1960.

Table 4.3 Graphs showing the percentage of materials used in road bridges spanning more than twenty meters, between 1923 and 1960



Almost all the reinforced concrete bridges in the covered period were built by local contractors who took advantage of concrete construction under low-tech conditions. Among them, only two exceptions undertaken by foreign construction firms were in early republican period. These were the Riva Bridge (1926), which is the first reinforced concrete bridge, in Turkey and the Kömürhan Bridge, which was challenging one of wildest rivers of Anatolia, the river Fırat (Euphrates), and having one of the few widest spans bridged by reinforeced concrete (109m) in the world in 1930s.

The River Fırat is one of the largest rivers of western Asia. Therefore, ever since the ancient times it has been a symbol of the immense power of nature. It had been considered as a borderline between east and west. Because of the depth and high flow of the river that eventually overthrows the bridges erected, it had been unable to build up a permanent connection between two banks for many centuries. Moreover, the wild nature of the river caused severe loss of life and property in the region. Along with the emergence of the concept "imar", crossing Fırat was counted among the most urgent projects.

The second development plan of Noradunkyan (1908) referred to four bridge projects that had to be built. These are Meriç Bridge in Edirne province, two bridges in on Fırat river in Halep province Zor region, and another bridge on Fırat River in *Mamuretü'l Aziz* (Elazığ) province in İzoğlu region (Noradunkyan, 1324, pp.25-27)[50]., Among them, the bridge in İzoğlu was particularly proposed to be built in suspension type. Nevertheless, the suspension bridge project could not be realized, but instead a wooden bridge was constructed in order to provide crossing during WWI.

According to "Osmanlı Yer Adları Sözlüğü" (Akbayar, 2002) İzoğlu is the old name of the region, which today called İzoli where Kömürhan Bridge was built. On this location, the span is wide and the flow of the River Fırat is high, and reinforced concrete arch technology was unknown, hence, it is quite comprehensible why the structure was especially mentioned as suspension type at first hand. In 1929, the existing wooden bridge was collapsed because

[50] "İcrası mukarrer ameliyat meyanında [*yerine getirilmesi kararlaştırılmış işler arasında*] Edirne vilâyetinde vaki [*bulunan*] Meriç Köprüsü'nün ikmali [*tamamlanması*], Halep vilâyetiyle Zor sancağında Fırat Nehri üzerinde iki köprü ve Mamuretü'l-aziz [*Elazığ*] vilâyetinde İzoğlu mevkiinde kezalik [*aynı şekilde*] Fırat Nehri üzerinde bir asma köprü inşası gibi birkaç cesim [büyük] köprü tesisi dâhil bulunmaktadır." Source: "Noradunkyan Efendi'nin Nafia Projesi", Nafia Nezareti, 1324 [1908], pp. 25-27.

of extreme rose of the river level. A year later, construction of a permanent crossingover became urgent after the collapse of only bridge left on Fırat and the transformation started to be done on rafts. Bridging the node was quite important for not only national security and economy, but also for transportation of materials for construction of Fevzipaşa-Diyarbakır railroad line.

In fact, preliminary works for a permanent bridge in İzoli was started long before the collapse of existing wooden bridge. During the feasibility works of Diyarbakır railroad line in 1923, engineers from the expert committee, such as Abbas Bey and Osman Bey, investigated the region also for a possible location for a future road bridge. In 1928, SaFerHa was asked to prepare a review on location and structural type of a permanent bridge in İzoli. It was one of the few experienced construction firms of the country in bridge building and participated in the very first examinations in 1923. In their letter to the Ministry, dated 28.8.1928, SaFerHa suggested four potential locations (Fig. 4.15). The first was the place of existing wooden bridge where it was possible for pile foundation but width of the river was approximately 600 meters. The estimated cost of a bridge in this site would be 700.000 TL.

The second site was 450 meters wide and relatively narrower, however the soil resistance was low, hence it was not suitable for construction. If constructed, the estimated cost would be at least 800.000 TL because of high cost of soil problems. Third option was the strait at Kömürhan region. This site was much narrower with 128 meters width while the depth and the flow of the river was the highest. It was impossible to build a footing in water that the bridge had to be a single span more than 100 meters. In this case, main problem about the construction would be the type of centering. According to the letter, this span could be achieved by latest building technology in long span bridge construction, the suspension centering. SaFerHa exemplified their proposal with *Pont de la Caille* the widest spanning bridge of the world in 1920s (Fig. 4.16).

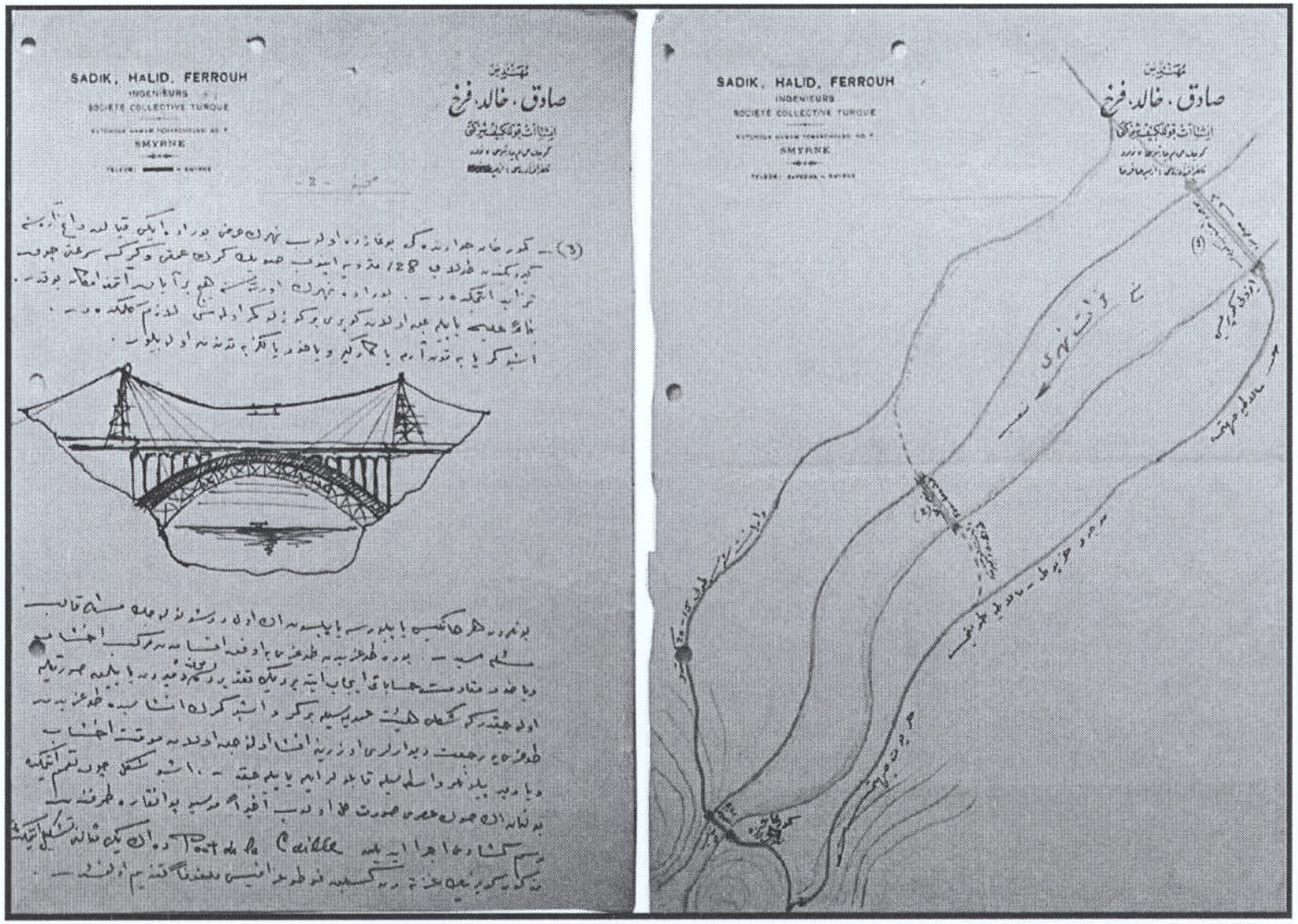


Figure 4.15 Pages from letter from SaFerHa to Nadir Bey, the Director of the Roads and Bridges Department, on 28.8.1928. Right: showing three possible locations, Left: sketch about the possible centering system for an RC arch bridge. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 16041

The Bridge, which was designed by Albert Caquot and constructed by *Compagnie Lyonnaise d'Entreprises,* was built in a deep valley quite similar with the Kömürhan Bridge. In the letter, it is conveyed that the centering could be built as in case of this bridge. During the preliminary work in 1923, the cost for construction of such kind of bridge was presumed as 350.000 TL.; and with the cost of additional road that had to be built because of the change in location, total cost was estimated as 600.000 TL. It is also mentioned that by having an easy to defense location, the proposed site has also military advantages for such kind of strategic bridge. Although the fourth site was narrower than the third one, it was far and hard to access because of sharp rocky topography. In this case, the construction of extension roads would cost extremely high. After a quick comparison among the options, the letter was concluded with a suggestion of building a bridge in the third site (Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no:3304).

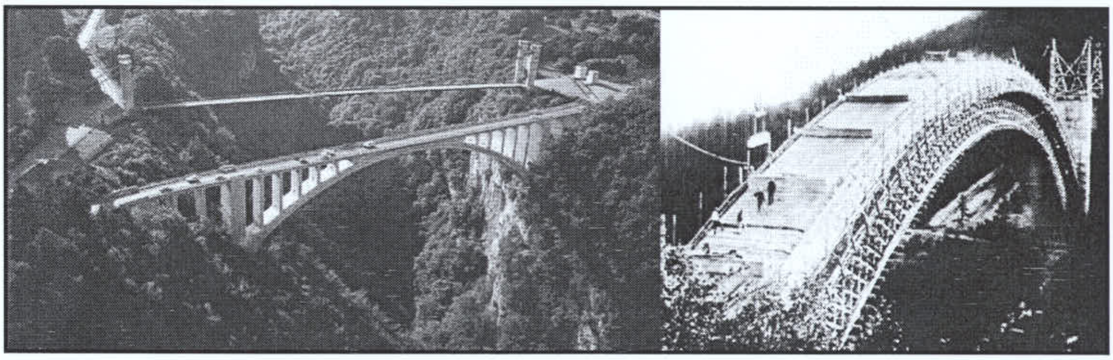


Figure 4.16 Pont de la Caille by Albert Caquot, 140m span. Source: Available on 1.10.2009 at http://www.annales.org/archives/x/caquot.html

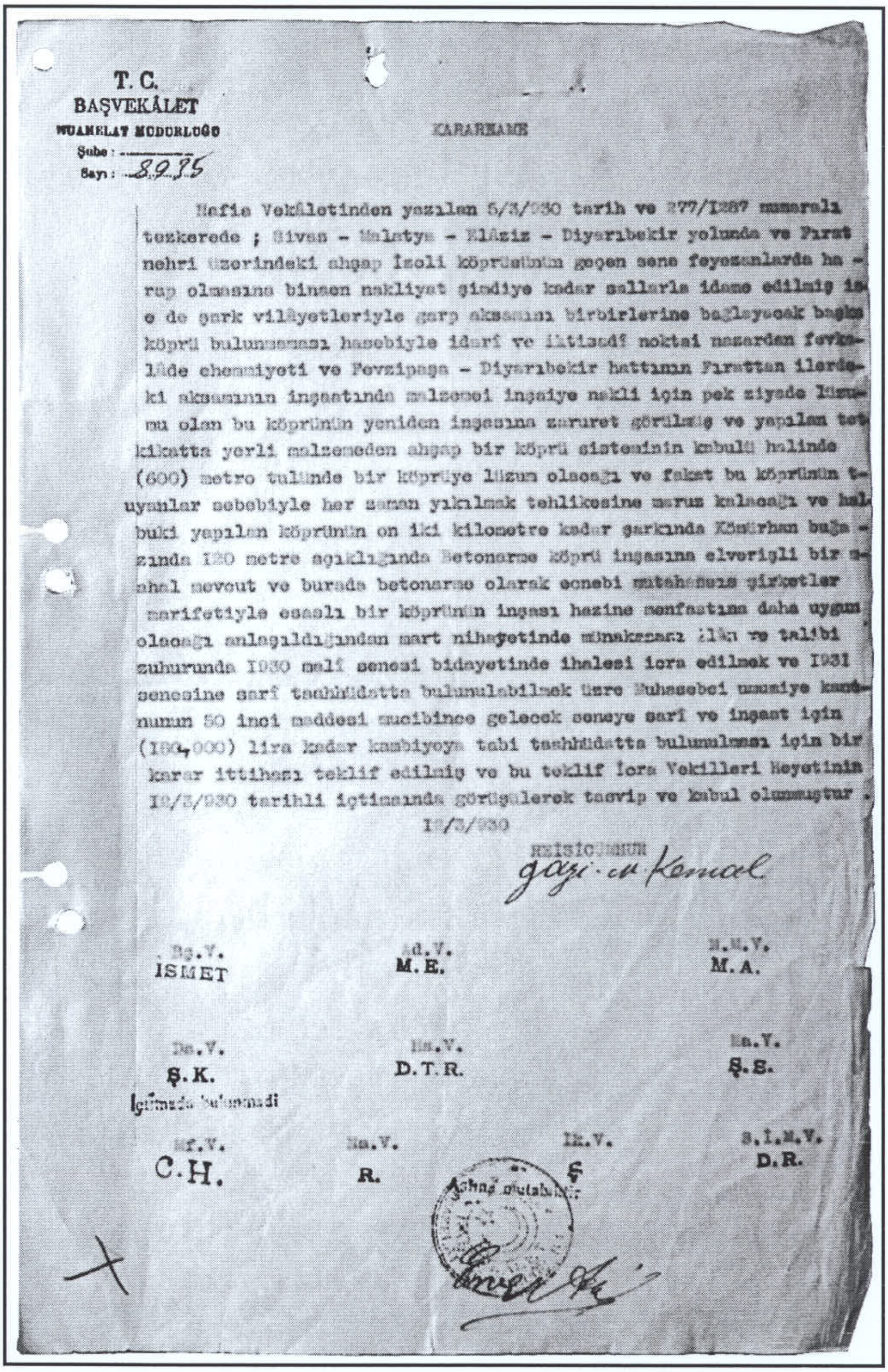
After the feasibility works, the strait near Kömürhan village was selected as the most suitable site for a reinforced concrete arch bridge. The span between the two sides of the river at the site was 120 meters, which was a challenging distance to pass at that time not only for a country like Turkey but also for many European countries. Besides, the construction of such kind of long span reinforced concrete bridges was enabled only after production of supercement in 1920s (Fig. 4.17). Therefore, it was quite an advanced technology for the construction date. This was the time when first reinforced concrete bridge lectures where taught in *Mühendishâne* (the Engineering School). In 1920s, there were only six reinforced concrete bridges spanning over hundred meters. These were Freyssinet's St. Pierre du Vauvray, Cappelen's Franklin Avenue Bridge in Minneapolis, Caquot's Pont de la Caille, Freyssinet's Elorn Bridge in Plougastel, Hundwliertol, and Ammer bridges. Among them, three were in France, two in US, one in Switzerland and one in Germany (Son Posta, 15.8.1932, p.9) (Kann, NID, 1935(g), pp.32-49)

Büyük açıklıklı kemerli massif köprülerin inkişafı

	İnşa edildiği sene	Açıklık	f/l	K	r_o
1 — Fransada St. Pierre du Vauvray	1923	131,80 m	1: 5,2	685	86
2 — Minneapolis de Cappelen	1023	121,90 m	1: 4,5	548	69
3 = İsviçrede Hundwiiertol	1925	105, 0 m	1: 2,8	288	36
4 — Gruseilles de Caille	1928	139, 8 m	1: 5,2	725	91
5 — Plougastel de Elorn	1929	3.180 m	1: 6,5	(1180)	148
6 — Echelsbach da Ammer	1929-1930	130, m	1: 4,1	531	66
7 — Elâzizde İsmet paşa	1929	108, m	1: 4,7	570	64
8 — İsveçte Tranebergsund	1932	181, 0 m	1: 6,9	(1250)	156
9 — Castelmoron de Lot	1933	120, m	1: 6,7	800	100
10 — Koblenz de Mosel	1933	118, 6 m	1:13,2	(1410)	176
		105, 0 m	1:11,3	(1073)	134
		100, 0 m	1:10,8	968	121

Figure 4.17 List of big span arch bridges in 1920s and 1930s. Source: Kann, F. "Büyük açıklıklı bilhassa kemerli masif köprülerin projelerinin tanziminde nazarı dikkate alınacak umumi kaideler", *BİD,* 1935(g), v.2/8, p.42.

After the preparation of the proposal by the Ministry, the bidding decision of the bridge was taken in the Council of Ministers and signed by President Mustafa Kemal, Prime Minister İsmet and nine other ministers on March 12, 1930. It was specially noted in the decision that "...because construction of the bridge by foreign companies experienced in bridge construction would better suit with the national interests..." foreign currency transaction for 180.000 liras was ordered (Fig. 4.18) (Cabinet decision no: 8935 on 12.03.1930, Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no:3451)



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Şube : ....
Sayı : 8935

KARARNAME

Nafia Vekâletinden yazılan 5/3/930 tarih ve 277/1287 numaralı tezkerede ; Sivas - Malatya - Elâziz - Diyarıbekir yolunda ve Fırat nehri üzerindeki ahşap İsoli köprüsünün geçen sene feyezanlarda harap olmasına binaen nakliyat şimdiye kadar sallarla idame edilmiş ise de şark vilâyetleriyle garp aksamını birbirlerine bağlayacak başka köprü bulunmaması hasebiyle idarî ve iktisadî noktai nazardan fevkalâde ehemmiyeti ve Fevzipaşa - Diyarıbekir hattının Fırattan ilerideki aksamının inşaatında malzemei inşaiye nakli için pek ziyade lüzumu olan bu köprünün yeniden inşasına zaruret görülmüş ve yapılan tetkikatta yerli malzemeden ahşap bir köprü sisteminin kabulü halinde (600) metro tulünde bir köprüye lüzum olacağı ve fakat bu köprünün tuyanlar sebebiyle her zaman yıkılmak tehlikesine maruz kalacağı ve halbuki yapılan köprünün on iki kilometre kadar şarkında Kömürhan boğazında 120 metre açıklığında Betonarme köprü inşasına elverişli bir mahal mevcut ve burada betonarme olarak ecnebi mütehassıs şirketler marifetiyle esaslı bir köprünün inşası hazine menfaatına daha uygun olacağı anlaşıldığından mart nihayetinde münakasası ilân ve talibi zuhurunda 1930 malî senesi bidayetinde ihalesi icra edilmek ve 1931 senesine sarf taahhüdatta bulunulabilmek üzre Muhasebei umumiye kanununun 50 inci maddesi mucibince gelecek seneye sarf ve inşaat için (180,000) lira kadar kambiyoya tabi taahhüdatta bulunulması için bir karar ittihazı teklif edilmiş ve bu teklif İcra Vekilleri Heyetinin 12/3/930 tarihli içtimaında görüşülerek tasvip ve kabul olunmuştur.

12/3/930

REISICUMHUR
Gazi M. Kemal

Bş.V. İSMET	Ad.V. M.E.	M.M.V. M.A.
Da.V. Ş.K. İçtimada bulunmadı	Ha.V. D.T.R.	Ma.V. Ş.S.
Mf.V. C.H.	Na.V. R.	İk.V. Ş
		S.İ.M.V. D.R.

Ahmet Mutahir
Emin Ali

Figure 4.18 Presidential decree on construction of Kömürhan Bridge signed by Gazi Mustafa Kemal. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 16041

According to special tender specifications, the firms which had references of at least 60 meters spanning railroad bridge or highway bridge of 80 meters or more were allowed to submit their offers. The bidders were also asked to submit their preliminary designs with drawings of 1/200 plan and elevation, 1/50 sections and 1/20 details, and their rough calculations showing the values on critical nodes. The calculations were required to comply with 1925 German code. The rest of the bidding document requirements, such as submitting a letter of guarantee or effective money about 7,5% of their bidding, having an official agent or equivalent with a letter of attorney, etc. were similar as in other closed tenders. The contractor was also responsible of the design of the centering.

Not like in a regular tender, in Kömürhan Bridge bid, technical specifications were given special importance. An eleven-paged booklet was prepared for highly detailed technical specifications because of importance of the project in terms of engineering. All types of loadings, isolations, qualifications of the test beams and even the conditions for storage of cement bags were described in detail. Preparation of the concrete by concrete-mixer was one the technical conditions.

According to the report of the tender dated 5.7.1930, three firms were applied for the bidding. Among them two foreign firms, Cristiyani et Nilsen and Nidgvist et Holm, were given the certificate of proficiency, however Hatas, a Turkish construction firm, which would later undertook the construction of Sivas-Erzurum railroad line, was denied although, they declared that they would appoint German engineers to prepare the projects. Even though the Kömürhan Bridge was actually built in the proposed site and proposed type in the preliminary works of SaFerHa, the firm could not enter the bid because of the proficiency conditions.

The Danish firm *Nidgvist and Holm Co. (NOHAP)* obtained the contract. NOHAP, which was actually a rolling stock manufacturer, was in partnership with two fellow building firms: *Kampmann, Kierulff & Saxild Engineering*, and J. *Saabye & O. Lerche Engineering*. In fact, it was the contractor of the Fevzipaşa to Diyarbakır railroad line, and very experienced on the topography of the region and in bridge construction. During the construction of the line, the firm built 63 tunnels and 1830 bridges and culverts in various spans. Among them most known were Fırat and Göksu railroad bridges.

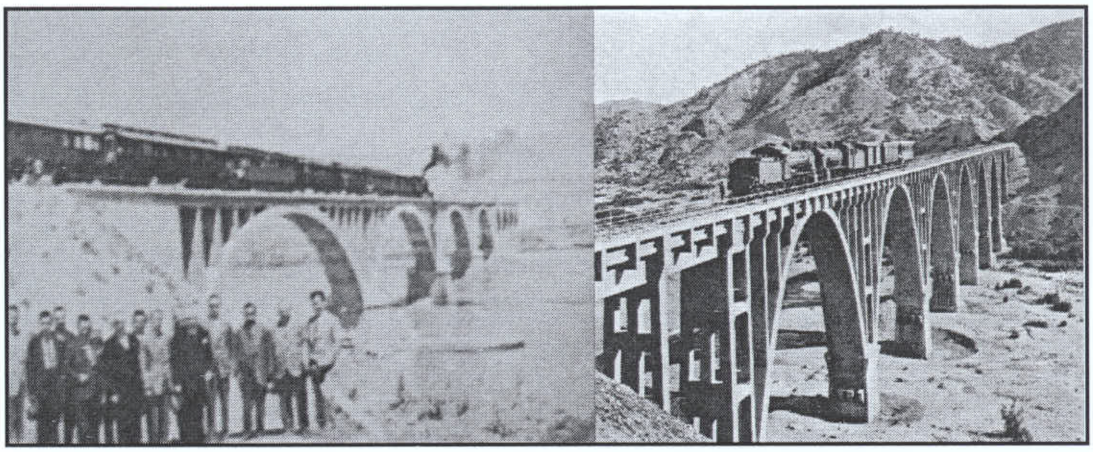
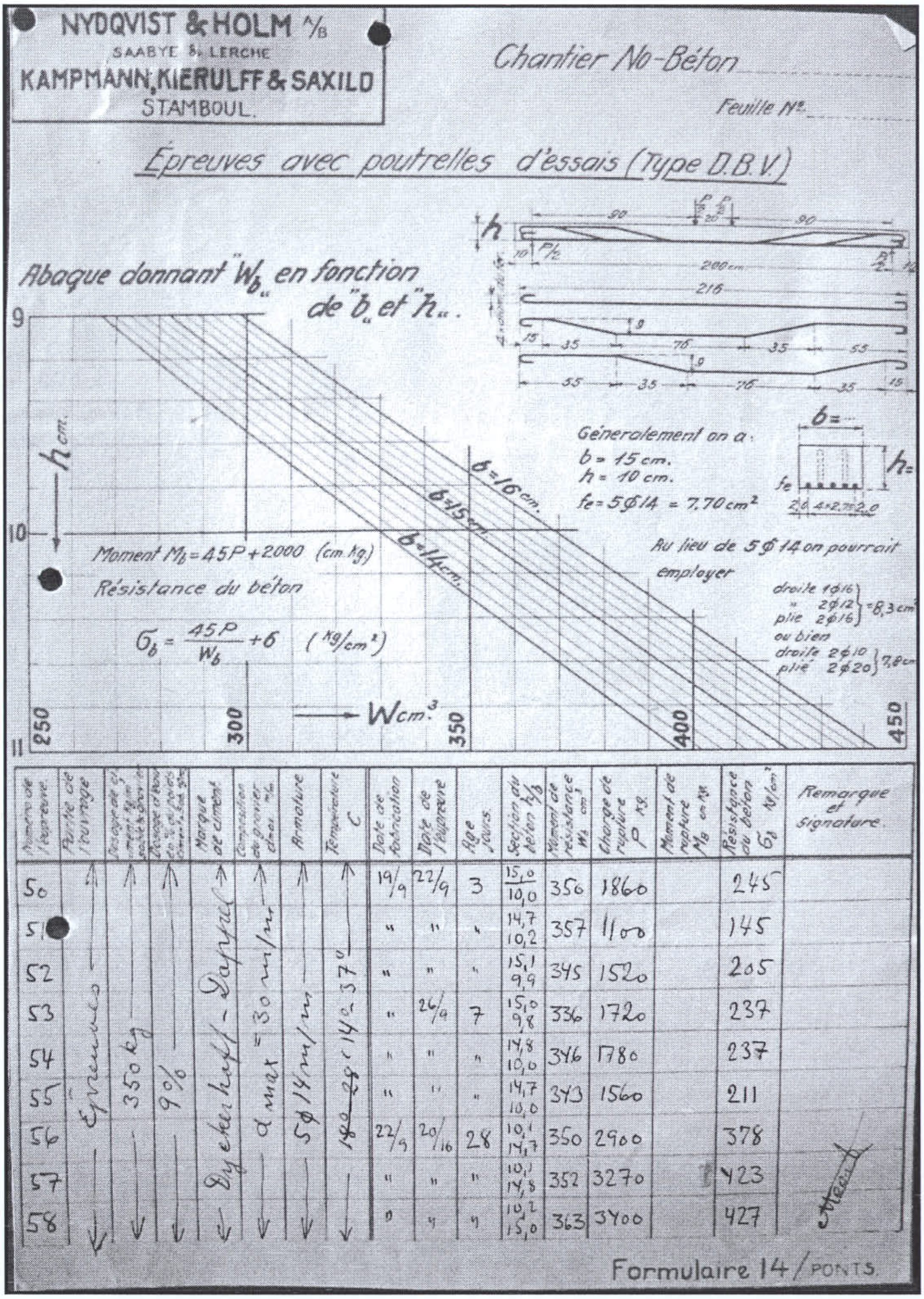


Figure 4.19 Right Göksu Bridge, left Fırat Bridge built by NOHAP. Source: "Yeni demiryollarımıza dair", *NID,* 1934(b), v.1/3, pp.35-40.

Mr. Sigürd Gjersiel signed the contract on behalf of the firm on July 26, 1930. After preparation of the project in one month period, the bridge construction had started with an expected cost of around 370 thousand Turkish Liras in September 1930. The project of the structure was prepared by Prof. Nater. He was also the engineer of the other bridges on Fevzipaşa-Diyarbakır railroad line built by NOHAP (Fig. 4.19). The main issue in construction was the design of the centering for construction of 109,6 meters main span. Because of the high flow and depth of the river, it was not possible to built conventional types. NOHAP proposed two different systems for centering to concrete (Fig. 4.20). The first was stretching type, in which centering would be anchored to both sides of the strait by tightened cables. The second was suspension type, in which the wooden centering would be supported by the temporary towers, built on both sides of the strait and anchored to the ground. In this type wooden arch was suspended segment by segments until the arch was closed; and once closed, the cables were removed (Troyano, 2003, pp.171, 290). The centering type of Caille Bridge (1928) proposed in SaFerHa's letter was built using this system, and was the largest in the world with 140 meters span at that time. Shortly after the same system was preferred and applied for Kömürhan Bridge in 1930.


NYDQVIST & HOLM A/S
SAABYE & LERCHE
KAMPMANN, KIERULFF & SAXILD
STAMBOUL.

Chantier No-Béton

Feuille Nº

Épreuves avec poutrelles d'essais (Type D.B.V.)

Numéro de l'épreuve	Partie de l'ouvrage	Dosage de gravier	Dosage d'eau	Marque de ciment	Composition du gravier	Armature	Température C	Date de fabrication	Date de l'épreuve	Age jours	Section du béton b/h	Moment de résistance W_b cm³	Charge de rupture P kg	Moment de rupture M_b cm.kg	Résistance du béton σ_b kg/cm²	Remarque et signature
50	Épreuves	350 kg	9%	Dykerhoff-Doppel	d max = 30 m/m	5φ14 m/m	~~18°-20°~~ 14°-37°	19/9	22/9	3	15,0 / 10,0	356	1860		245	
51								"	"	"	14,7 / 10,2	357	1100		145	
52								"	"	"	15,1 / 9,9	345	1520		205	
53								"	26/9	7	15,0 / 9,8	336	1720		237	
54								"	"	"	14,8 / 10,0	346	1780		237	
55								"	"	"	14,7 / 10,0	343	1560		211	
56								22/9	20/10	28	10,1 / 14,7	350	2900		378	
57								"	"	"	10,1 / 14,8	352	3270		423	
58								"	"	"	10,2 / 15,0	363	3400		427	

Formulaire 14 / PONTS.

Figure 4.21 Strength results of test beam with Dykerhoff-Doppel super cement. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 16041

The constructions were strictly controlled by the engineers from the Ministry of Public Works. Mecit Bey, the engineer responsible for controlling on behalf of the ministry, reported the constructions day by day. According to his reports, except for minor troubles there were no problems during the construction. Nevertheless, the project was finished five months later than the estimated time. The only subject of dispute was about the cement. The ministry insisted on the usage of special kind of cement called supercement in order to produce high-strength concrete for the main arch loading 68,5 kg/cm2. However, supercement was an advance technology material in 1930s and had not been produced in Turkey. Therefore, the firm avoided the importation of this expensive product and claimed that normal cement would be enough for this loading (Fig. 4.21). After serious of correspondence, Dykerhoff-Doppel brand supercement was imported. Hence, Kömürhan became the first bridge constructed with high-strength concrete. Soon after, Yunus cement factory started producing supercement and Aksu Bridge (1933) in Antalya became the first bridge built with this local production. The supercement was first tested in the labs of *Mühendishâne*, then experienced in site with test beams. Once the results were satisfactory, the construction of the main arch started and concrete was poured segment by segment.

When the construction was completed, the bridge was handovered by engineer Müller and engineer Brisyüs on April 3, 1932. The estimated finishing time was September 26, 1931, but it was delayed due to hard climatic conditions and problems about cement. Kömürhan Bridge, which was build with latest building technology, had become the sixth longest among reinforced concrete bridges in the world with 109.60 meter mid span length. With two neighboring spans -12 meters each- on both sides, it has a length of 157.60 meters in total. After fining of the delay penalties, total cost was 322.400 TL.

The extreme span was highly technological and miraculous for the local community at that time. Hence, the inauguration ceremony had attracted local attention. However, such kind of wide span cast suspicion of the public. After the harsh winter of 1933, false rumors quickly spread about fractures on the main arch and the ministry had to send engineers to check. This was an evidence of the mistrust on stability of such kind of wide opening –and accordingly on technology and engineering level of the period- among the community.

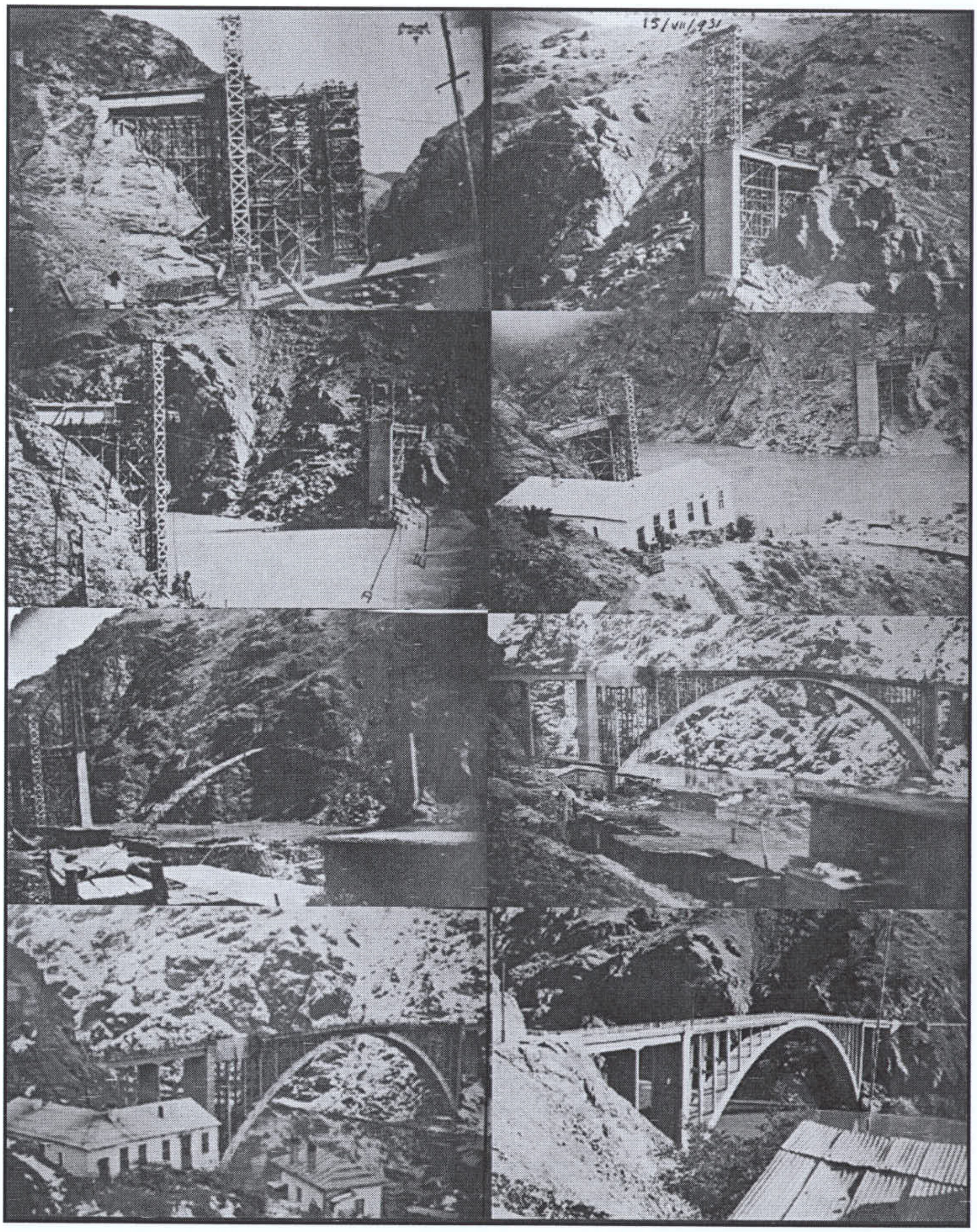


Figure 4.22 Photographs of construction process of Kömürhan Bridge between 1930 and 1932. From left to right, up to down: 1. construction of neighboring spans, 2. construction of temporary towers, 3and 4. cables between two towers, 5. suspension of the centering, 6 and 7. pouring the deck and protection of concrete against freeze, and 8. the completed bridge. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 16041

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BAŞVEKÂLET
Muamelât Müdürlüğü
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T. C.
BAŞBAKANLIK
CUMHURİYET ARŞİVİ

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Şifreyi yazan makam	Dahiliye Vekili Ş.Kaya Beyefendi	Geldiği tarih	I4-II-I93I
Şifrenin tarihi	I3-II-I93I	Açanın imzası	M. Hayri
Şifrenin numarası	I5	Dosya numarası	Kähreç :Elaziz

Ankara Başvekil Paşa Hazretlerine
Arzolunacaktır.

Trenle Furat kenarına kadar geldim.Fırsattan istifade ederek Herdi Demiryol köprüsü ile Kömür han köprüsünü mühendislerinin delâletile gördüm.Bu muazzam eserlerinizin ikmali için inşaata faaliyetle devam ediliyor.Çelikten bir iradenin memleket umranına hediye ettiği bu abideler bizim ve gelecek nesillerin daima minnetle yadedeceği eserlerdir.Hürmet ve minnetlerimi takdim ederim efendim.

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-3-

| 030 | 10 | | | 12 | 73 | 26 |

Figure 4.23 Telegraph correspondence between Şükrü Kaya the Minister of Internal Affairs and İsmet İnönü the Prime Minister on Kaya's visit to Kömürhan Bridge 13.11.1931 Source: State National Archives-Republican Archives, Binder no: 030.10.00.00.12.73.26.1 and 030.10.00.00.12.73.26.3

Fırat at this region had a very high flow during the whole year. The transportation was interrupted many times by floods and collapsing bridges and raft transportation claimed many lives for many years. Therefore, Kömürhan Bridge had been a local landmark and subject to local cultural products such as in the following folk song.

Şu Fırat'ın suyu akar serindir
Yârimi götürdü kanlı zalimdir
Daha gün görmemiş taze gelindir
Söyletmeyin beni yaram derindir

Kömürhan Köprüsü Harput'a bakar
Körolası Fırat ocaklar yıkar
Ahbaplarım gelmiş ağıtlar yakar
Söyletmeyin beni yaram derindir

(Fırat Türküsü, Anonym)[51]

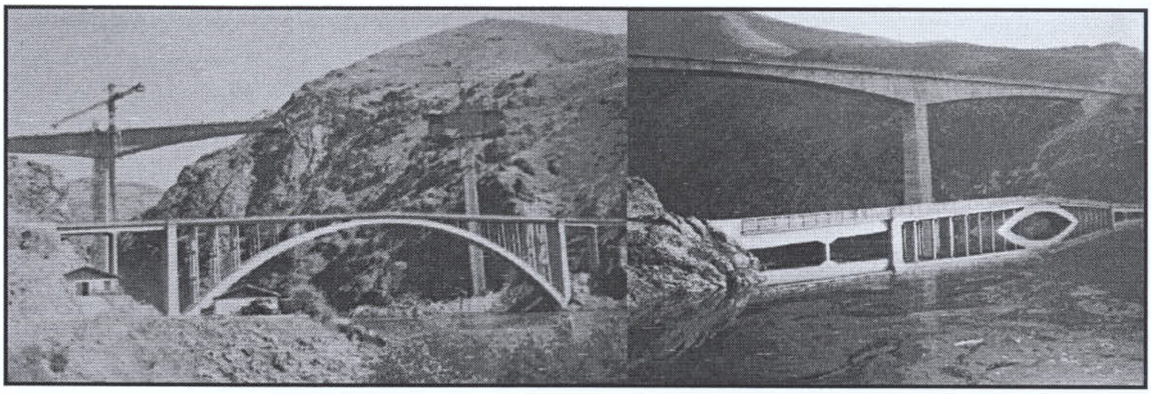


Figure 4.24 Photographs of old and new Kömürhan bridges together. Right: During construction (1984), Left: During submerging (1987). Source: KGM Archives, off-track bridge files, region 8.

After serving about sixty years, Kömürhan Bridge was submerged into the water of Karakaya Dam in 1987 within the scope of southeastern Anatolia Project (GAP). A new bridge, which is also a significant bridge of its period, was built instead in 1986 (Fig. 4.24).

Seven years later innaguration of Kömürhan, construction of a similar span was realized by a local firm in 1939. Construction of the Pertek Bridge with its 106,2m span and similar kind of centering system was a project in the same complexity with Kömürhan. Moreover, it was

[51] The flows of Fırat is cold / bloody river took my love / she was a young bride /don't make me talk, i have an open sore /Kömürhan Bridge faces Harput / Damn Fırat destroyed too many families/ friends lament for the death/ don't make me talk, i have an open sore (author's translation)

accomplished by a local firm Aral Construction Co. in two years, and by using latest technical equipments. For instance, a special mechanism consist of a horizontal hoist work on cable suspended between the towers and a freight car work on a rail laid on the falsework was built especially for pouring process of concrete (Fig. 6.33). This was quite an advanced building technology at a time when concrete mixer was assumed luxurious. Accordingly, construction of Pertek Bridge became the symbol of a great success for Turkish contractors in 1930s (Fig. 4.25).

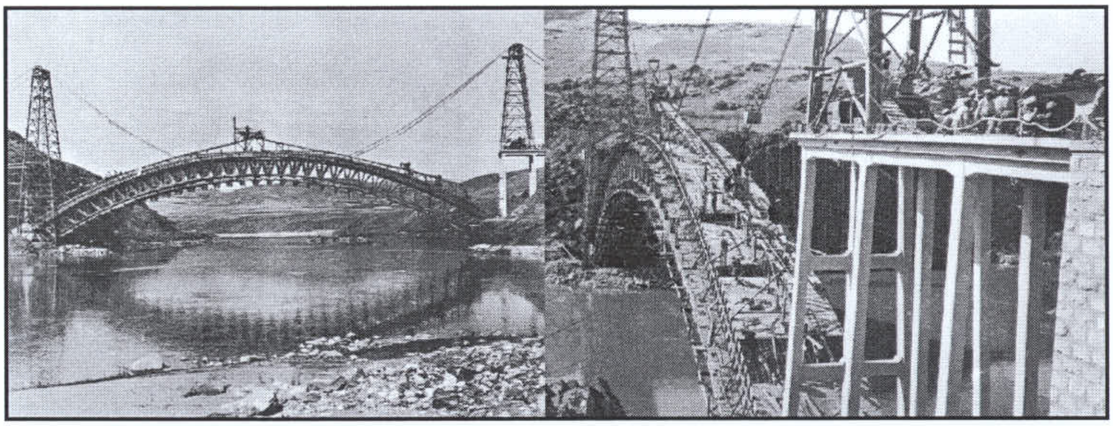
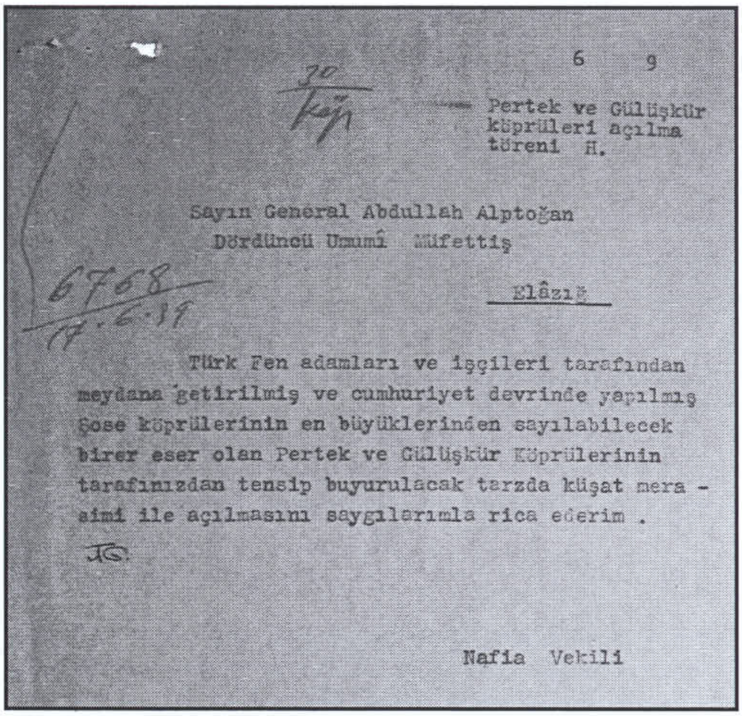


Figure 4.25 Pertek Bridge underconstruction. Photographs showing suspention type centering as in case of Kömürhan and mechnanism especially built for concrete pouring, circa 1938. Source: KGM Archieves and available on 22.2.2008 at http://wowturkey.com/forum/viewtopic.php?t=88872

Nevertheless, this was not an accomplishment achieved only by means of national resource. Many foreign engineers and masters took part in design and construction processes. The structural project was designed by a swiss engineer Prof. Dr. E. Mörsch and Dr. Eng. David Parker an imigrant from Russia was the chief engineer in charge during the construction (Fig. 4.27). Moreover, many masters from Hungary, Bulgaria and Italy experienced in reinforced concrete worked as well (See App. C4).

After 1930, foreign contractors could not make their presence felt in reinforced concrete road bridge tenders until transfer of prestressing technology in 1960s.



6 9

Pertek ve Gülüşkür
köprüleri açılma
töreni H.

Sayın General Abdullah Alptoğan
Dördüncü Umumî Müfettiş

Elâzığ

6768
17.6.39

Türk Fen adamları ve işçileri tarafından meydana getirilmiş ve cumhuriyet devrinde yapılmış şose köprülerinin en büyüklerinden sayılabilecek birer eser olan Pertek ve Gülüşkür Köprülerinin tarafınızdan tensip buyurulacak tarzda küşat merasimi ile açılmasını saygılarımla rica ederim.

Nafia Vekili

Figure 4.26 Correspondence between the Minister of Public Works and the Fourth General Inspectorship on invitation to the innaguration ceremony of the Pertek and Gülüşkür bridges 17.06.1939 Source: State National Archives-Republican Archives, Binder no: 2319

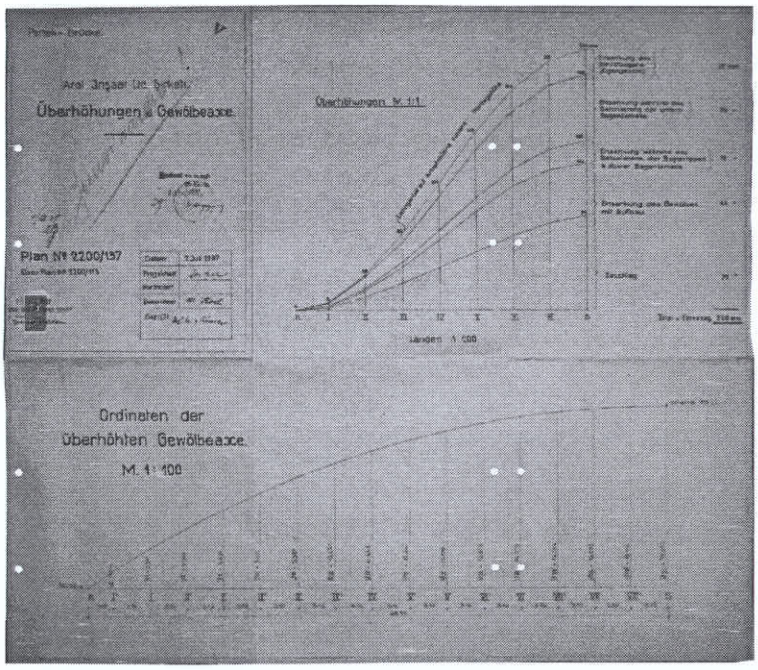
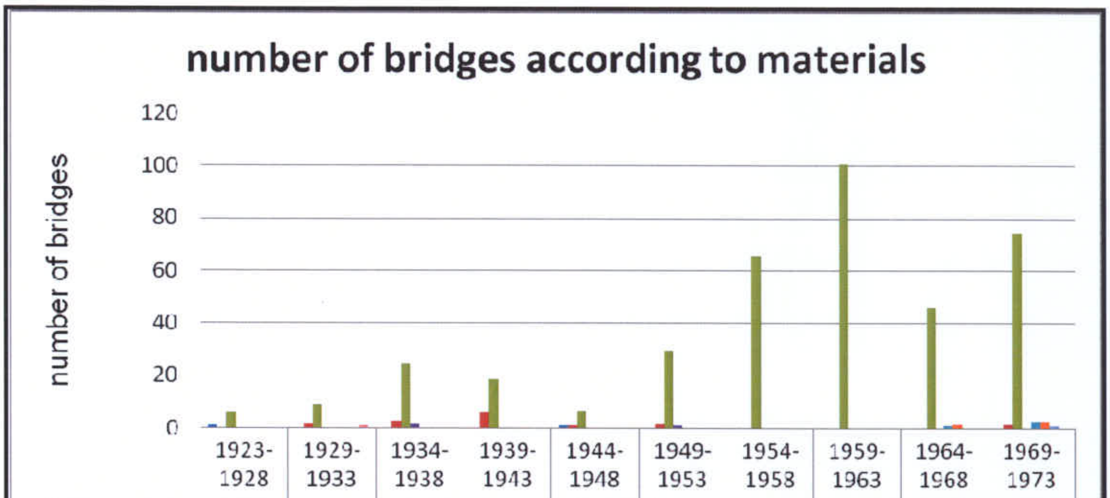


Figure 4.27 Drawings of the reinforced concrete arch of the Pertek Bridge, by Prof. Mörsch, in 7.07.1937 Source: State National Archives-Republican Archives, Binder no: 2319

Table 4.4 Table showing materials of the big scale road bridges among years. Prepared based on data gained from KGM archives and Unclassified documents from the State National Archives-Republican Archives, KGM Fund.

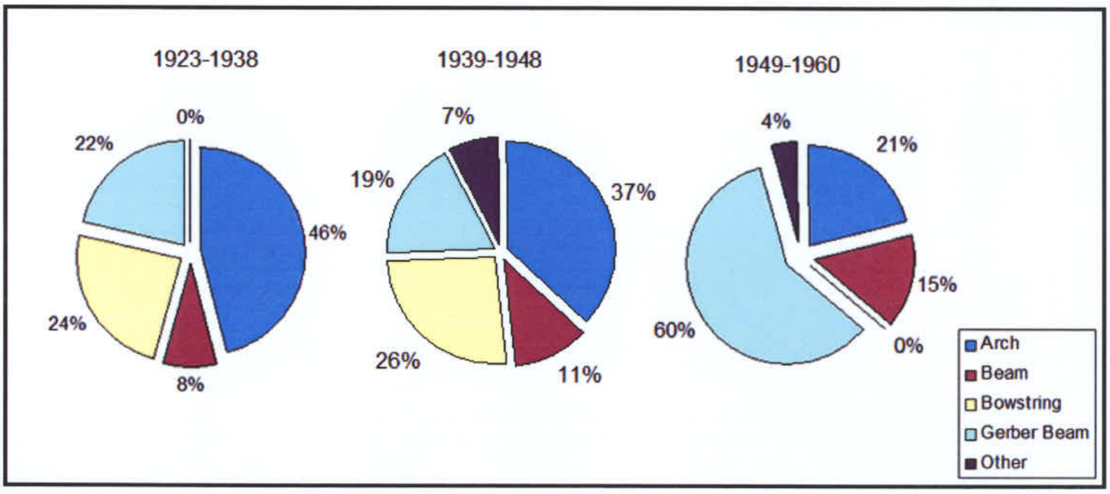


	1923-1928	1929-1933	1934-1938	1939-1943	1944-1948	1949-1953	1954-1958	1959-1963	1964-1968	1969-1973
stone	1				1					
steel		2	3	6	1	2				2
RC	6	9	25	19	7	30	66	101	46	75
wood			2			1				
pretension									1	3
posttension									2	3
composite										1
concrete		1								

Other important reinforced concrete arch bridges constructed in the first fifteen years of the republic were Paşur (50,4m-1934), Yukarı Melet (53m-1935), Bolaman, (65m-1936), and Keban Madeni (62m-1937); while Alikaya (42m-1939), Suçatı (42m-1939), Yukarıkale (43,4m-1939), Pisyar (44,4m-1940) and especially Pertek (106,2m-1939) were significant bridges in the second period between 1938 and 1948. After a break in construction of reinforced concrete arch bridges between 1941 and 1950, various types of arches such as fixed-end and hinged arches started to be constructed again in the third period. The significant arch bridges of the period were Mameki (72m-1951), Sansa (75m-1954), Güneysu (70m-1956) and Sirya (67,5m-1960). The arch type would not be preferred after 1960 except for four individual examples. The last was the Kilgen Bridge (25m-1972) in Adana.

Bowstring was another arch type significant with its elegant view. In first two periods, the type was often used in construction of wide span bridges. The first bowstring bridge built in Turkey is Orman Çiftliği Bridge, undertaken by Tahsin Bey in 1926. The following examples are Aksu (42m-1933), Akçağıl (35m-1934), Dalaman (35m-1936), Gülüşkür (36m-1939), and Çağdırış Bridge (42m-1946). By the developments in reinforced concrete technology, the bowstring type was abandoned in the world and was not used in Turkey either, after 1948.

Table 4.5 Table showing types of the big scale road bridges among years. Prepared based on data gained from KGM archives and unclassified documents from the State National Archives-Republican Archives, KGM Fund.



The gerber type structure has been used in construction of reinforced concrete road bridges since the early republican times. The first gerber bridge built in Turkey was 30m spanned Sarayköy Bridge in 1927. It was followed by Arapsun (30m-1934), Cevizdere (24m-1935), Karadere (28m-1937), and Merkiçmelen (30m-1941) bridges. Nevertheless, in the early phase gerber structures were more commonly used in neighboring spans of the bridge, such as in Aksu Bridge. However, they were not frequently preferred as main span because the length was limited in simple and continuous girders. Besides, under poor technical resources of construction sector, foundations in water were avoided. Nevertheless, increasing number of the light construction equipments after 1948 such as motor-driven pumps, and electricity generators improved the ability of the sector to construct foundations in water. Accordingly, the idea of crossing maximum distance with minimum number of span was replaced with the multi-span gerber type bridges. The preference of gerber type bridges was increased from 21% in 1923 to 60% in 1960. So that, the ministry produced ready-to-built gerber bridge plans in various spans, even for 25 meters, which was previously assumed as "big span" in early republican period (Fig. 4.28). The change in type led to morphological transformations in road bridges. New bridges had having linear forms and very long in total length. The linear forms started wide spreading during 1950s and finally became the main archetype of road bridges after 1960s.

The fifties were transition period for Turkey in terms of road bridges, in which transformation and continuity exist. By means of American aid and establishment of KGM, the period after 1948 appears as a phase that road bridges increased extremely in number. The road bridges constructed in this twelve years period, were almost 1,5 times more than constructed in former twenty-five years. Among these bridges, some of them were built as long span reinforced concrete arch bridges while others were built in new gerber type. Between them, the Birecik Bridge was noticeable not only with its length and/or with socio-economic importance but also with its mixed style. In Birecik Bridge, both linear and arch forms were used together in a hybrid design approach.

Although in republican period, majority of bridges on Turkish road network have been constructed in reinforced concrete, under various problematic conditions -such as topographic problems-, steel bridges were preferred as well. Nonexistence of steel industry in late Ottoman period had caused the importation of steel bridges even for smaller spans. Hence, later in early republican period, initiation of heavy industry was primarily handled and the factory, which was established for steam engine manufacturing in 1894 by Germans in Eskişehir, was converted to iron bridges manufactory in 1926 (Şenol, 1994, pp.55). Since then, steel bridges spanning less than twenty meters were produced and assembled locally. Naturally, steel bridge technology transferred to road bridges through railroad projects. Therefore, the Department of Roads and Bridges got assistance from the Department of State Railroads on technical and practical issues.

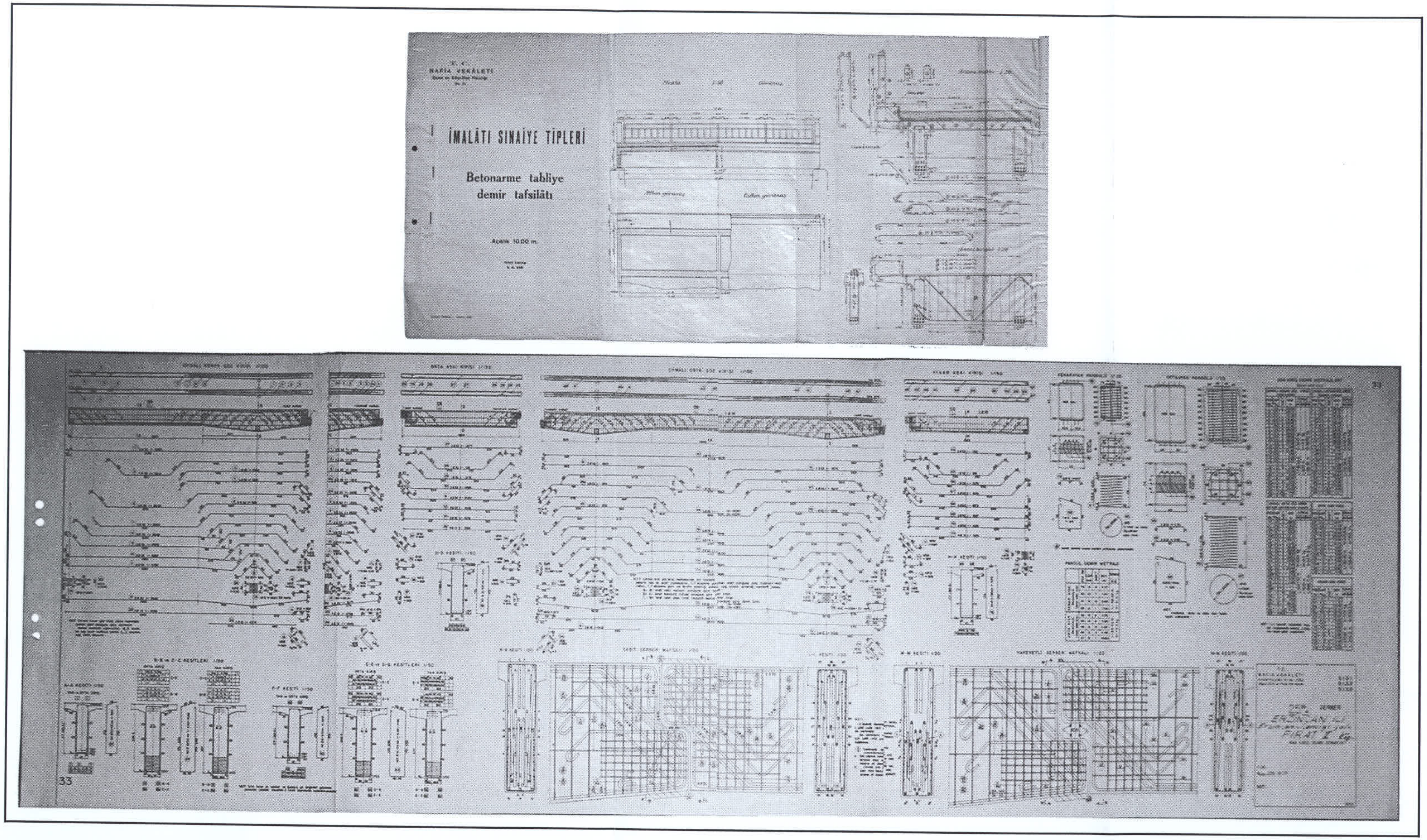


Figure 4.28 Standardization of road bridges in 1950s. Ready-to-built gerber bridge plans which were for 10 meters (above) increased to for 25 meters (below), produced by the Ministry of Public Works, applied in Fırat I and Fırat II bridges in 1957. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 8113

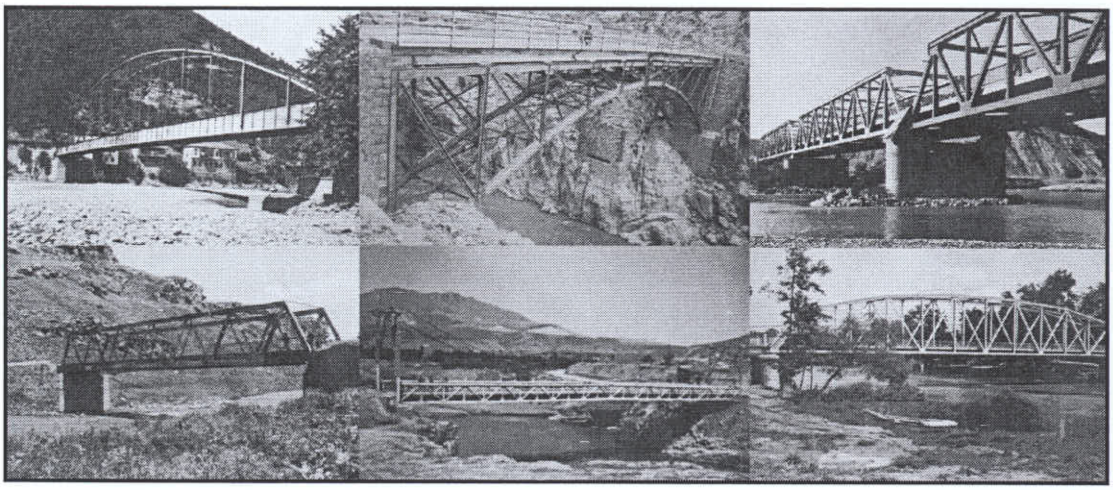


Figure 4.29 From Right to left and up to down: Borçka Bridge, Şırzi Bridge, Genç Bridge, Sahnalar Bridge, Kemah Bridge and Manavgat Bridge. Source: KGM Archives

According to the studied documents, there are twelve steel bridges found spanning more than twenty-five meters between 1923 and 1948. The names of some these steel bridges are Dalama (27,6m-1931), Manavgat (60m-1932), Borçka (113m-1935), Kemah (53,5m-1936), Ilıç (36m-1937), Sahnalar (40m-1938), Gazi (25m-1940), Şehsu (70m-1941), Şırzı (40m-1942), Ceyhan Demir (80m-1942), Kozluk (40m-1943), and Mameki Demir (56m-1947). These bridges were built generally in pratt, warren and bowstring-arch truss types (Fig 4.29)

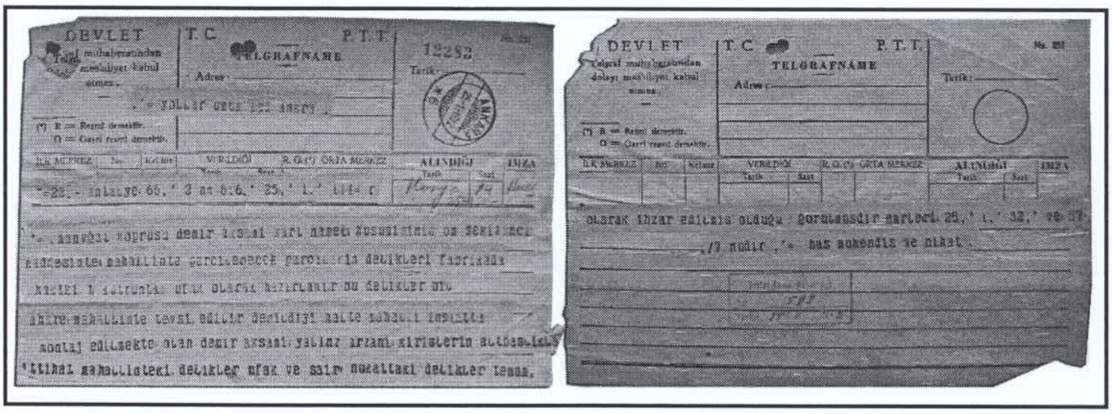
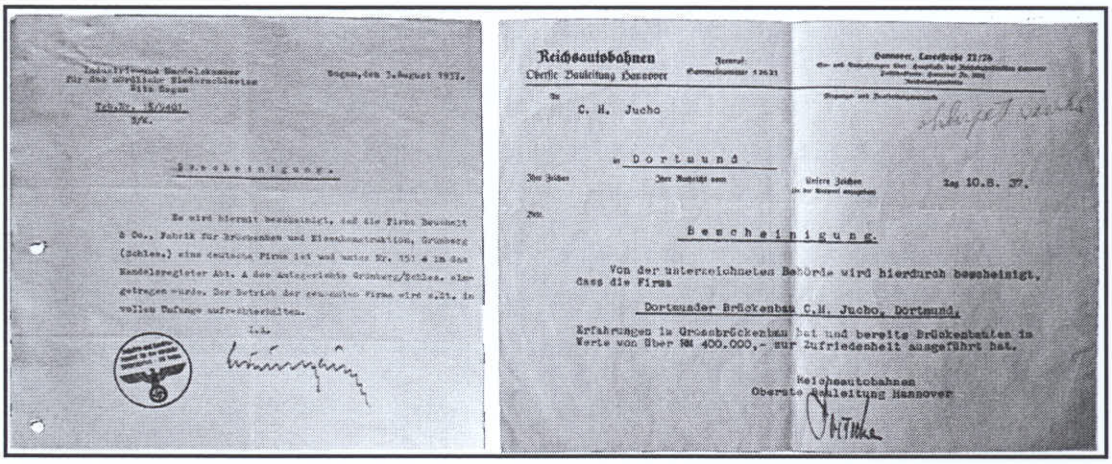

DEVLET T.C. P.T.T. TELGRAFNAME
DEVLET T.C. P.T.T. TELGRAFNAME

Figure 4.30 Telegraph reporting misfabricated rivets places on steel elements of Manavgat Bridge, from chief engineer Nihat to the Department of Roads and Bridges on 25.1.1932. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 1855



Reichsautobahnen
Oberste Bauleitung Hannover

C. H. Jucho

Dortmund

10.8. 37.

Bescheinigung.

Von der unterzeichneten Behörde wird hierdurch bescheinigt, dass die Firma

Dortmunder Brückenbau C.H. Jucho, Dortmund,

Erfahrungen im Grossbrückenbau hat und bereits Brückenbauten im Werte von über RM 400.000,- zur Zufriedenheit ausgeführt hat.

Reichsautobahnen
Oberste Bauleitung Hannover

Figure 4.31 References of two German firms B. Seibert G.M.B.H Saarbrücken-Stahlhochbau Stahlbrickenbau and Dortmunder brückenbau C. H. Jucho–Dortmund from Reichsautobahnen 1937. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2250

Although in 1931 Dalama Bridge was constructed in steel trust form, as mentioned before, it was in fact re-design and assemblage of existing building elements of an unfinished bridge from 1910s. Hence, sixty meters spanning Manavgat Bridge in 1932 can be suggested as the first big scale steel road bridge of the Republic. *Müteahhit Hayri Bey* from İzmir built its reinforced concrete piers while the steel superstructure was produced and assembled by Flander A.G. from Dusseldorf-Germany.

The other firms participated in the tender were *Fried Krupp A.G., Deutz-Humboldt Mashinenbau Anstalt,* and *Kölsch & Fölzer A.G.* were all from Germany. Because of the problems in fabrication, the need for controlling the production process was realized during former steel bridge constructions. In future constructions, the Department of State Railroads would recommend *Robert W. Hunt Co.* from England as controlling firm and it would control and test the productions of the steel elements of most of early bridges such as Borçka and Ceyhan Demir bridges on behalf of the Ministry of Public Works.

In all steel road bridges, foreign contractors undertook the superstructure while local contractors did substructure. These were from various countries such as Czechoslovakia, Italy, Belgium, England, America, Sweden, and Austria, but particularly from Germany. Most of the bids were undertaken by German companies, which were experienced in road bridges because of the nationwide highway constructions of the Third Reich. Although it was not systematic technology transfer in level of international policies, by the hands of these German companies, Germany became the major source of know-how in transportation which would later be America (Fig. 4.31).

Until the construction of Mameki Bridge in 1946, the Ministry preferred to bid to foreign companies through agent middlemen instead of inviting offers directly from the producer companies. However, this method caused increase in costs because of commission fees of the agents and caused some problems because of lack of direct contact. Hence, the ministry opened an international bid and directly contacted with the producer companies for Mameki Bridge with a cabinet decision (Fig. 4.33).

In spite of drastic changes in economical circumstances due to WWII, the construction of steel bridges had not decelerated in the second period of the road bridges. The number of steel bridges constructed was seven between 1938 and 1948 while six between 1923 and 1938. However, most of them were bided long before WWII. In the eve of the war, contractors were experiencing problems in importation of steel from Europe. The transportation fees and insurances increased under high risks of war, this was added to total cost of the bridges, and contractors were stranded as in cases of Kozluk and Şırzı Bridges.

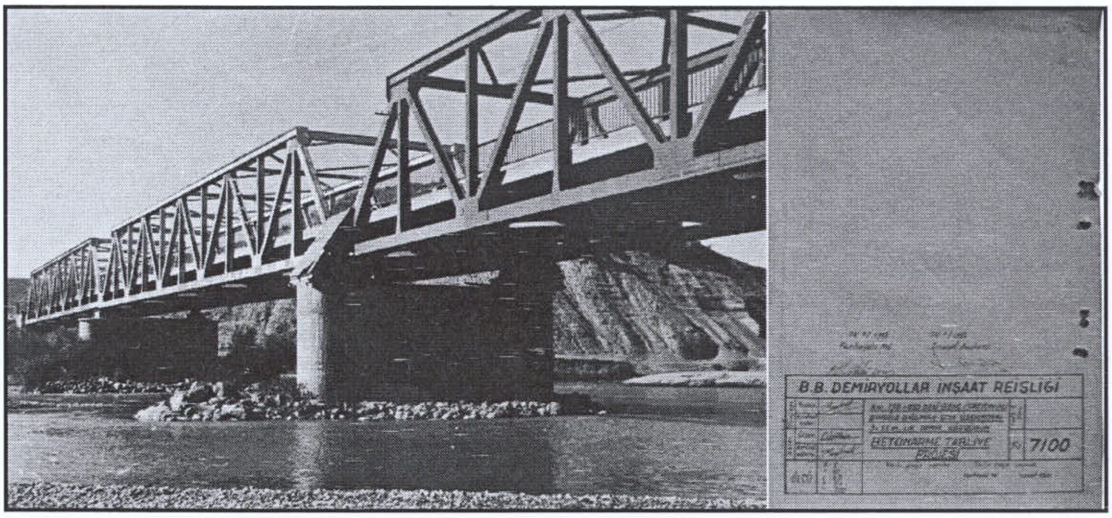
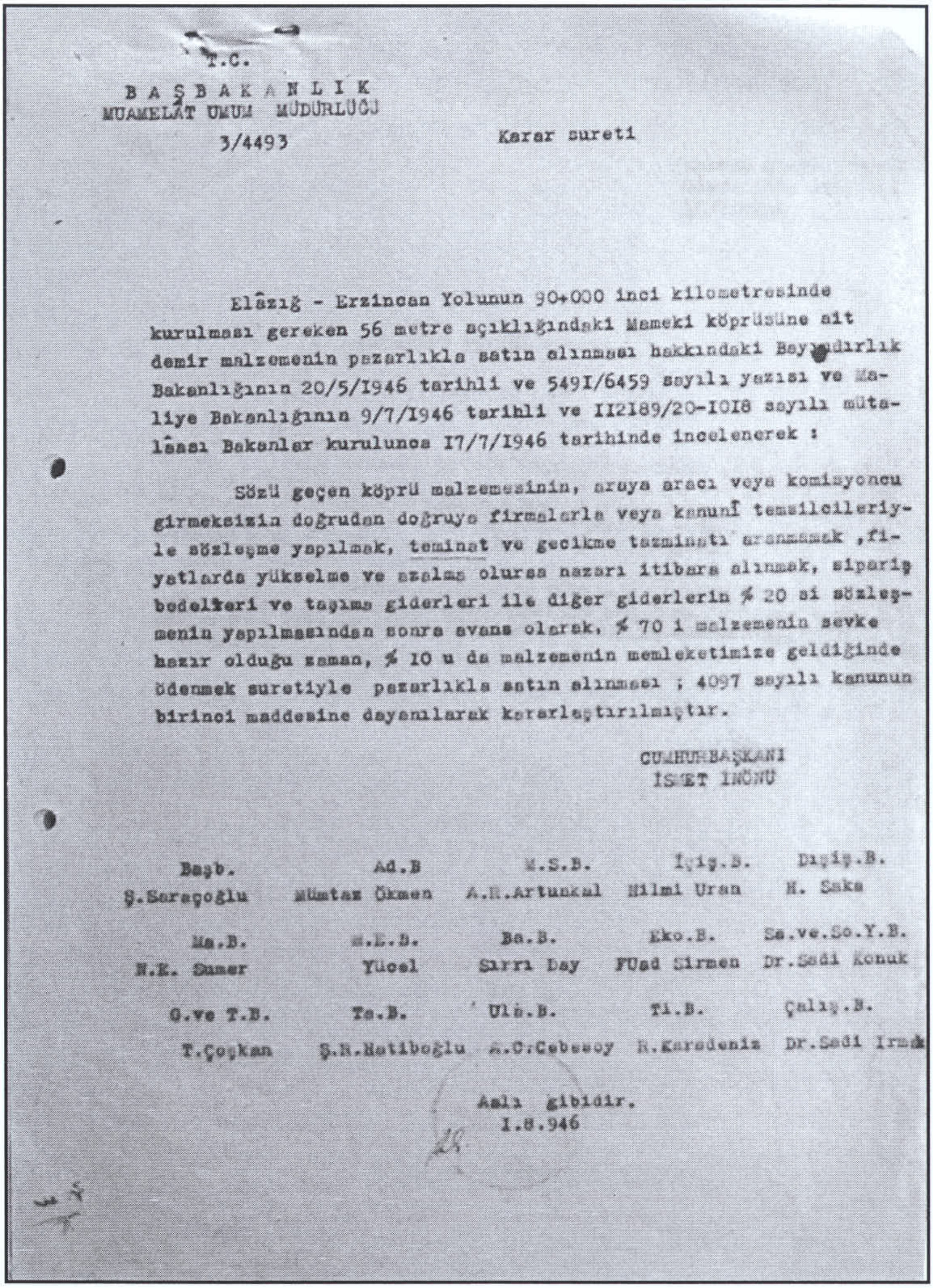


Figure 4.32 Right: Cover page of the project signed by the Department of State Railroads. Left: Genç Bridge in 1952. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2939; KGM Archives, off-track bridge files, region 8.



T.C.
BAŞBAKANLIK
MUAMELÂT UMUM MÜDÜRLÜĞÜ
3/4493

Karar sureti

Elâzığ - Erzincan Yolunun 90+000 inci kilometresinde kurulması gereken 56 metre açıklığındaki Mameki köprüsüne ait demir malzemenin pazarlıkla satın alınması hakkındaki Bayındırlık Bakanlığının 20/5/1946 tarihli ve 5491/6459 sayılı yazısı ve Maliye Bakanlığının 9/7/1946 tarihli ve 112189/20-1018 sayılı mütalâası Bakanlar kurulunca 17/7/1946 tarihinde incelenerek :

Sözü geçen köprü malzemesinin, araya aracı veya komisyoncu girmeksizin doğrudan doğruya firmalarla veya kanunî temsilcileriyle sözleşme yapılmak, teminat ve gecikme tazminatı aranmamak, fiyatlarda yükselme ve azalma olursa nazarı itibara alınmak, sipariş bedelleri ve taşıma giderleri ile diğer giderlerin % 20 si sözleşmenin yapılmasından sonra avans olarak, % 70 i malzemenin sevke hazır olduğu zaman, % 10 u da malzemenin memleketimize geldiğinde ödenmek suretiyle pazarlıkla satın alınması ; 4097 sayılı kanunun birinci maddesine dayanılarak kararlaştırılmıştır.

CUMHURBAŞKANI
İSMET İNÖNÜ

Başb.	Ad.B	M.S.B.	İçiş.B.	Dışiş.B.
Ş.Saraçoğlu	Mümtaz Ökmen	A.R.Artunkal	Hilmi Uran	H. Saka
Ma.B.	M.E.B.	Ba.B.	Eko.B.	Sa.ve.So.Y.B.
N.E. Sümer	Yücel	Sırrı Day	FUad Sirmen	Dr.Sadi Konuk
G.ve T.B.	Ta.B.	Ulş.B.	Ti.B.	Çalış.B.
T.Çoşkan	Ş.R.Hatiboğlu	A.C.Cebesoy	R.Karadeniz	Dr.Sadi Irmak

Aslı gibidir.
1.8.946

Figure 4.33 Cabinet decision for inviting offers directly from producer companies for construction of Mameki Bridge 17.7.1946/4493. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2315

The destructive economic conditions of war had been recovered quickly after 1949. Nevertheless, construction of steel road bridges was not favored any more. In 1948, instead of consulting, the Department of State Railroads personally undertook construction of Genç Bridge and accomplished in 1952 (Fig. 4.32). The steel parts were fabricated in Germany. On the other hand, twelve meters spanning Kirazdere Bridge was constructed with the steel elements donated by the General staff for the construction of militarily important road bridges. The steel beams were bought from England for gun emplacements during WWII. The Genç Bridge in 1952 and the Kirazdere Bridge in 1953 would be the last road steel bridges constructed. From then on steel would not be preferred in construction of road bridges except for the unique examples like Bosporus Bridge. (Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2939 and 215)

4.3.2 Decision Processes: National Security, Accessibility, Representation, and State of Technology

Construction of long span road bridges was not considered only as an issue of the Ministry of Public works, but rather an affair of the state with special importance of national security. Therefore, principal statesmen were involved in the decision processes. The constructions were decided by governmental decrees signed by the minister, the prime minister, and the president. Moreover, Turkish General Staff had also influence on decision processes of both roads and bridges. Due to the strategic importance of bridges, general staff was asked opinion on consistency of the locations with national security. Even in some cases, they proposed new bridges on militarily important routes and their proposals primarily taken into consideration. In addition, there are numerous secret correspondences on arrangements on the eve of WWII such as strengthening of existing bridges due to military loads and preparation of destruction plans.

The bridges were not only vital for national security but also for ensuring domestic safety and territorial integrity. Especially under unsettled social circumstances of the early republic, it was vital for perpetuation of the republican regime to strengthen central authority against reactionary and separatist factions (Fig. 4.34) (BİD, 1936(a), pp.114-115). Nevertheless, the republican elites believed that strengthening of the new regime was both an issue of security, and an issue of modernity and development. Therefore, it was crucial to access the modernity into inner world of the traditional lives of individuals and gain the support of the masses. Under these circumstances, the construction facilities as outcomes of modernity, technology, and development were concentrated at the remotest corners of the country. As Şen (2003, p.91), conveyed legitimation of the early republican bridge building policy was based on the statement that bridges are much more important than roads in most cases when considered the geography of Anatolia because the public who was largely not mobilized may benefit the bridges in crossing the wild rivers and high valleys even if the roads have not built yet. However, the real deprivation in transportation occurs when the wild rivers and high valleys are not crossed.

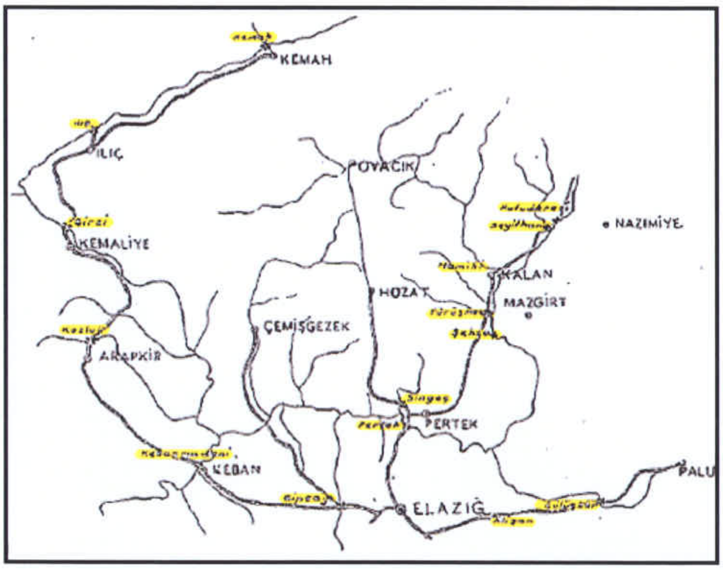
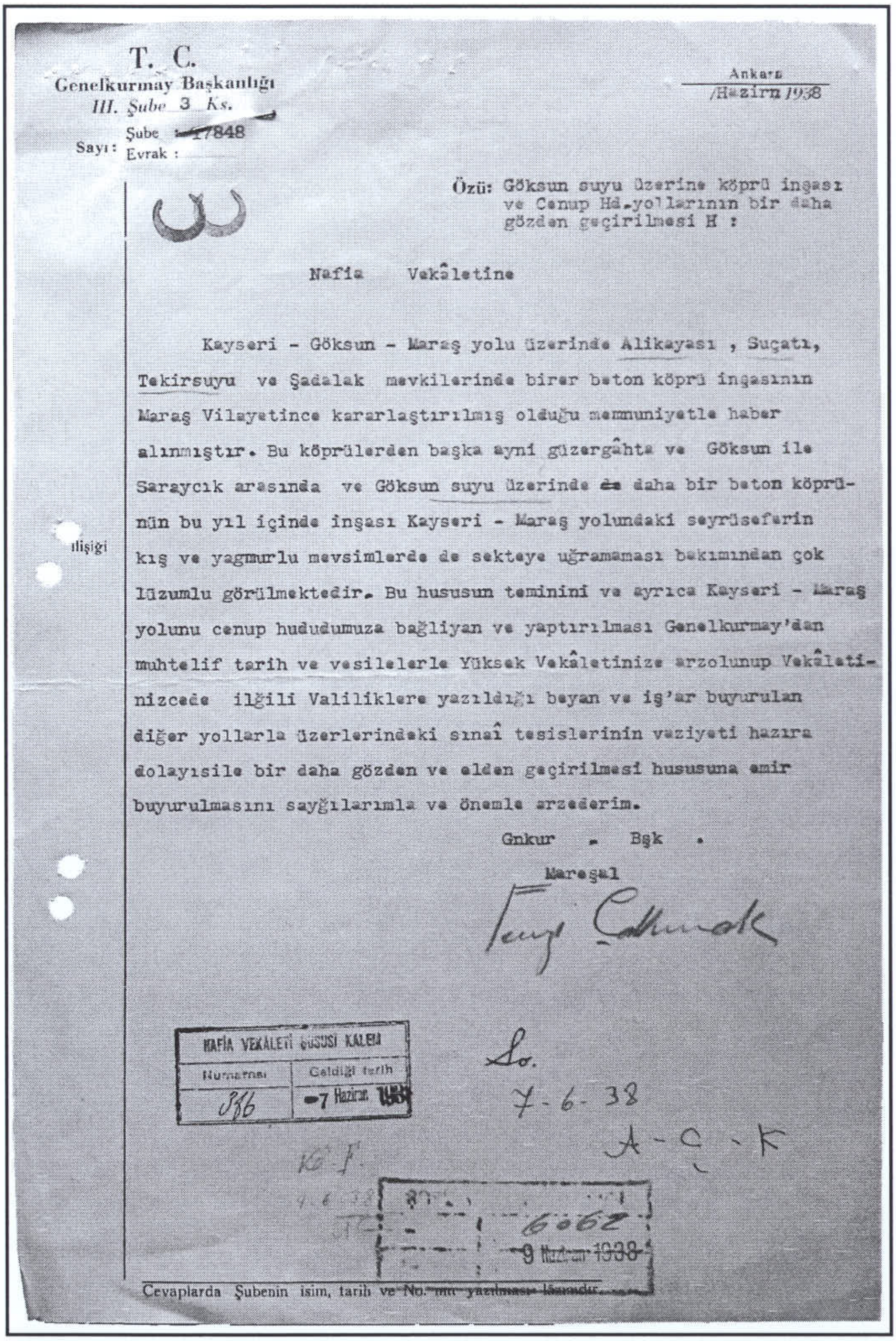


Figure 4.34 Map showing the fifteen new bridges constructed in Tunceli after Dersim revolt circa 1930, Source: "Cumhuriyetin 20. Yılında Büyük Şose Köprüleri", *Bayındırlık İşleri Dergisi,* T.C. Bayındırlık Bakanlığı, 1943, y10, s5-6, p. 400.

Therefore, the construction of long span road bridges until 1948 was concentrated mostly on eastern Anatolia and black sea regions. 31,4% the bridges were built in areas of the first, third and fourth general inspectorships where there were domestic safety problems and 25,3 % of were built in black sea region where transportation was difficult because of harsh the topography. Among them, there were Pertek Bridge the first reinforced concrete bridge spanning more than hundred meters built by Turkish contractors, Kemah Bridge the first steel suspension bridge of Turkey, and Singeç Bridge, which was personally opened by Ataturk himself in 1938 (BİD,1943(b), pp.389-434).



T. C.
Genelkurmay Başkanlığı
III. Şube 3 Ks.
Sayı: Şube 17848
Evrak :

Ankara
/Haziran 1938

Özü: Göksun suyu üzerine köprü inşası ve Cenup Hd.yollarının bir daha gözden geçirilmesi H :

Nafia Vekâletine

Kayseri - Göksun - Maraş yolu üzerinde Alikayası , Suçatı, Tekirsuyu ve Şadalak mevkilerinde birer beton köprü inşasının Maraş Vilayetince kararlaştırılmış olduğu memnuniyetle haber alınmıştır. Bu köprülerden başka aynı güzergâhta ve Göksun ile Saraycık arasında ve Göksun suyu üzerinde ~~de~~ daha bir beton köprünün bu yıl içinde inşası Kayseri - Maraş yolundaki seyrüseferin kış ve yagmurlu mevsimlerde de sekteye uğramaması bakımından çok lüzumlu görülmektedir. Bu hususun teminini ve ayrıca Kayseri - Maraş yolunu cenup hududumuza bağliyan ve yaptırılması Genelkurmay'dan muhtelif tarih ve vesilelerle Yüksek Vekâletinize arzolunup Vekâletinizcede ilğili Valiliklere yazıldığı beyan ve iş'ar buyurulan diğer yollarla üzerlerindeki sınaî tesislerinin vaziyeti hazıra dolayısile bir daha gözden ve elden geçirilmesi hususuna emir buyurulmasını saygılarımla ve önemle arzederim.

İlişiği

Gnkur. Bşk.
Mareşal
Fevzi Çakmak

NAFİA VEKÂLETİ HUSUSİ KALEM
Numarası: 336
Geldiği tarih: 7 Haziran 1938

So.
7-6-38
A-Ç-K

6062
9 Haziran 1938

Cevaplarda Şubenin isim, tarih ve No. nun yazılması lâzımdır.

Figure 4.35 Correspondence between the Turkish General Staff and the Ministry of Public Works on construction of a bridge on river Göksu. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2190

The construction facilities in the country between 1948 and 1960, along with the necessities of NATO, mostly took shape on economic issues. The role of Turkey in the capitalist new world order, as agricultural producer and universal consumer, made the problem of accessibility the main concern and priority area of action of the new government. As mentioned in the program of first Menderes Government, "transportation and construction works were given weight as being issues which are closely associated with agricultural and national economy" (DP Government Program I, 22.5.1950). Under these circumstances, primary concerns in construction of road bridges were rapidity, quantity, stability, and economy rather than design. During these "boom" years, too many road bridges were constructed in almost all of the regions in parallel with the construction of a nationwide highway system (KGM Bulletin, 1957, pp.12-13).

The modernity project ascribed meanings to science and technology as symbols of change and rendered the material transformation of the external world into understandable physical outcomes for public by steam engines, cars, steel and concrete bridges, high-rise buildings and other engineering edifices. The early republican regime also commissioned the engineering structures as icons of development, hence, reshaped enthusiasm for technology so as to cast itself as visibly modern. Especially in untamed geography of Anatolia, the engineering structures such as bridges, tunnels, silos etc. made a sense of mastery toward nature. To those who were traveling inside the country, they appeared as fascinating landscapes of development with their purity of forms, clarity of construction, rationale in their function, and contrast within their rural context (Örmecioğlu, 2006; pp.48-52).

Correspondingly in DP period, engineering edifices were introduced as apparent evidences of development of nation, however this time the notion of development was accompanied with liberalism. In 1950s, the notion of "contemporary civilization" was coincided with liberal economy, liberal society, and democracy as main ground of DP era. Hence, construction of *"bayındır ülke"* was defined as both the tool and the product of democracy and liberal society through construction of physical environment of liberal economy. Under these circumstances, the bridges were particularly given weight as important apparatuses of integration of the peasant economy into the national economy. In one of his speeches, Orhan Eren, the major of Ankara, conveyed referring to construction of the Birecik Bridge;

> " ...in near future, the Birecik Bridge, which would connect Anatolia had split up everlastingly by a legendary river into two parts staring at each other wishfully, would be

opened to traffic...These dams, power stations, these factories, these roads and bridges, these harbors constitute a new society, a liberal society of liberal citizens!"

(Orhan Eren , Mayor of Ankara 9.4.1956 [52]).

Within a rational causation, early republican modernist architects had related modern forms with new building technologies, especially reinforced concrete. According to their discernment, which Bozdoğan (2001, pp.106-153) defined as "aesthetics of progress", it was irrational to build dome under contemporary technological knowledge. However, the discussion was not applicable in the area of engineering because of the nonexistence of same kind of a dilemma. Even as dome was criticized as being irrational in the age of flat roofs, the arch form was not questionable for reinforced concrete bridges because the pretensioning in beams had not been invented yet. Nevertheless, the trend on the use of decorative elements derived from classical Ottoman architecture within beaux-art principles also led to very rare stylistic approaches on proto-modern bridges and discrete cases among early republican engineering society as well.

Istinye Bridge is one of these rare and unknown examples. As it is written on the bridge, it was built in 1928 in Istanbul. Although it is a three span bowstring bridge made up of reinforced concrete, it was also decorated with neo-classical architectural elements. For instance, on both sides of the bridge, there are four columns with spheres on the top. And, the columns were concrete but decorated as they are masonry. Unfortunately, there is no information about the designer and contractor of the bridge. Today it still exists but in a very bad condition because of the new bridge built on it (Eyüpgiller, 2004[53]).

Second example was two identical bridges built in 1920s Ankara. The Etlik and Ziraat Mektebi Bridges were both designed in the same span and façade but different widths; width

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[52] "...üç gün sonra yine aziz Anadolu'yu birbirine hasretle bakan iki parçaya bölmüş efsanevî bir nehrin üzerinde bu parçaları ebediyen birleştirecek olan Birecik köprüsü geçit vermiye başlıyacaktır...Bu barajlar, santraller, bu fabrikalar, bu yollar ve köprüler, bu limanlar yeni bir cemiyet meydana getiriyor, hür vatandaşlardan mürekkep hür cemiyeti yaratıyor." Available on 22.12.2009 at http://www.byegm.gov.tr

[53] This bridge was presented under the title of "20. Yüzyıl Mimari Mirasına Bir Örnek: İstinye Köprüsü" in do.co.mo.mo-tr poster presentations by Kutgün Eyüpgiller. Source: Do.co.mo.mo-tr, Türkiye Mimarlığında Modernizmin Yerel Açılımları, 10-11 Nov. 2004, Ankara.

of Ziraat Mektebi Bridge was 12,20 m. while width of the Etlik Bridge was 8,00 m. Constructions began in 1925, most probably under contractorship of Erzurumlu Hacı Ahmedzade Nafiz (Kotan) Bey, and the bridges were opened to traffic in 1926. Today Etlik Bridge is still in use while Ziraat Mektebi Bridge was demolished during a municipal operation in 1950s.

What is remarkable about the bridge is its unique façade designed in neo-classical form. Although the structural system of Etlik Bridge was continuous girder made up of reinforced concrete, the form transformed into a basket-handle arch with an additional curvature between the lower side of the beam and the joint. By a similar approach, the ribs carrying the load of the cantilevers on both sides of the deck were also decorated with smaller arches. In spite of lack of written documents about the designer of this neo-classical façade, İlter (1989, pp.6-9) conveys referring Kemal Hayırlıoğlu, one of the reputed engineers of the Directorship of the Roads and Bridges, that the façade was designed by Mimar Kemalettin Bey (Fig. 4.36).

In addition to built neo-classical design, there is also a façade proposal found in the archives, which could possibly be attributed to Kemalettin Bey, because of the decorative elements that remind of the Ottoman architecture. The striking part of this proposed façade is the newels that look like miniature minarets. As is known, Kemalettin Bey is one of the key figures of "national architecture renaissance". Other than the public buildings, this nationalistic style was also adopted for the ferry stations built in Istanbul between 1913 and 1917 (Bozdoğan, 2001, pp.18-20). Nevertheless, as far as is known, there is no further example that Kemalettin Bey was involved among proto-modern engineering structures, and also no information on such kind of discourse in the area of engineering. Hence, the Etlik Bridge is not only unique for engineering but also for architecture.

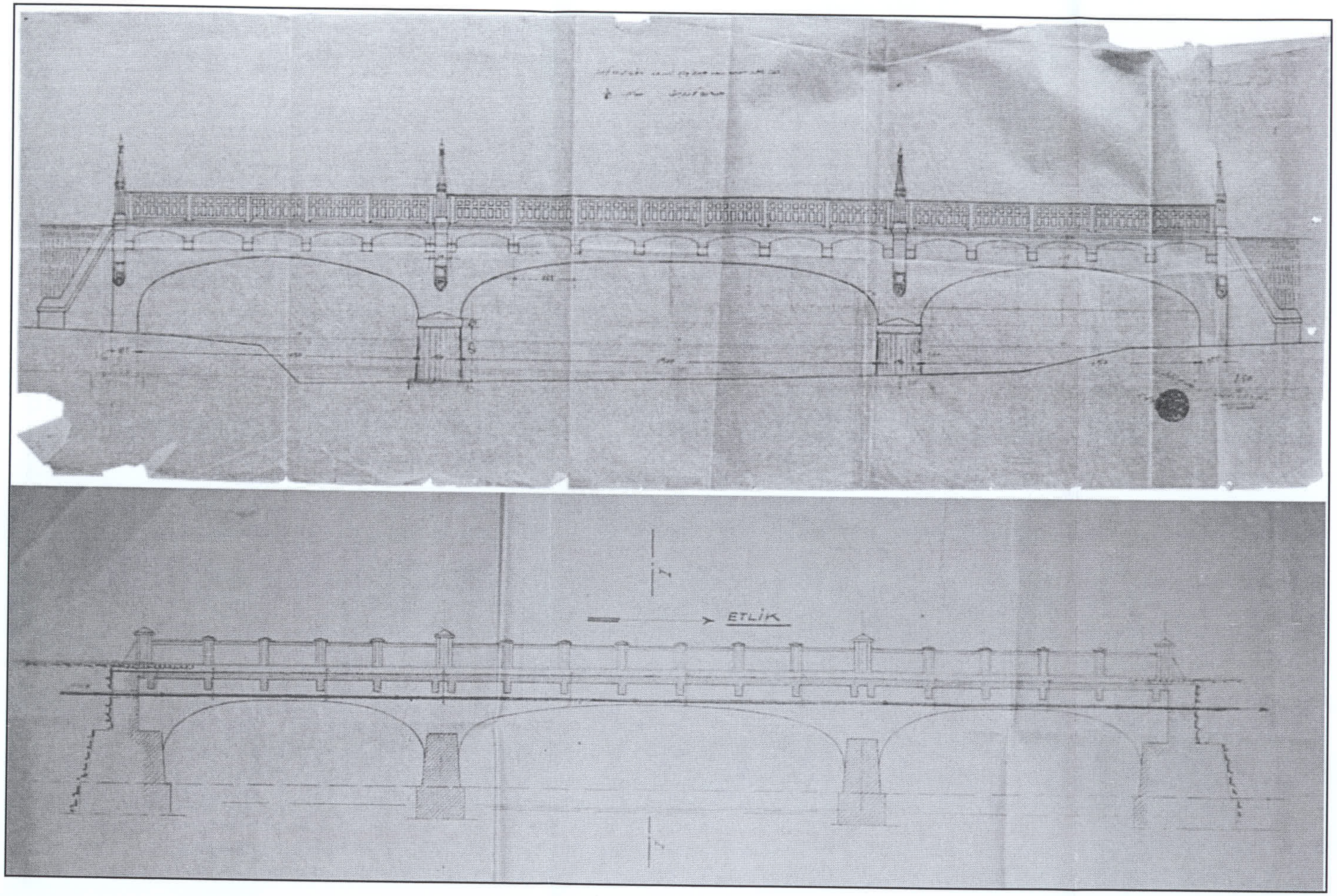

Figure 4.36 Up: Façade proposal for the Etlik Bridge with minaret-like newels. Down: Longitudinal section drawing of the Etlik Bridge, 1936. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 1839

In our republican road bridge history, there are no further decorated examples except for these three bridges one of which today does not exist. Nevertheless, the first façade proposal for Gazi Bridge and its related discussion in 1930s is also worth to mention in relation with the topic. This discussion was not only significant as being the only argument on decoration of engineering structures but at the same time as being only example of modern-national polemic between various state-related agents of *"bayındır ülke"*. Moreover, as a case where there are dominant the historical and cultural circumstances, problematic geographical and urban conditions, and purviews of various agents were discussed Gazi Bridge also serves an excellent example for decision processes.

As it is known, bridging Golden Horn was a challenging engineering problem strived since Byzantine period. As Eyice (1988, p.1214/156) refers Kronikon Paskale, the first bridge on Golden Horn was built by Justinian. The following bridge was believed to be built by Fatih Sultan Mehmet during the siege of Constantinople. Leonardo Da Vinci and Michelangelo also attempted, even Leonardo had prepared a proposal in 16^{th} century. Since then, there was no other recorded attempt for bridging the Golden Horn until Mahmut II reign. (İlter, 1973, p.30; Evren, 1994, pp.24-25)

In 1836, Sultan Mahmut II had built a wooden bridge in Unkapanı; it was followed by another wooden one on Galata in 1845 by Sultan Abdülmecid. Both were built in the shipyard in Golden Horn by Ottoman labor. The one on Galata was replaced by another wooden bridge in 1863 before the visit of Napoleon. Nevertheless, the new one got old and destroyed in a short period of time, since it was also made up of wood. The third Galata Bridge was decided to be built up with steel. A contract was signed with a French firm in 1870 for it, while another contract was made with an English firm in 1872 for the second bridge of Unkapanı. Because of the delays during the construction, these two bridges would be switched places nevertheless; they would both be opened in 1875.

By the end of 19^{th} century, Ottoman Empire especially Istanbul was on the eve of huge transformations. After the proclamation of the second constitution, the construction works were accelerated by the foreign indebtment contracts signed one another. In 1908 development plan by Noradunkyan, projects were considered to be realized by foreign investment and expertise (See Chp.2). Under these circumstances, the project for Galata Bridge, which was detained by Abdülhamid for long years, rapidly handled. It would be the first modern bridge on which tramway lines would cross and connect the both shores of

Istanbul. After twenty years long negations with various firms, in 1907, *İttihat ve Terakki* (Comitee of Union and Progress) which was actually adherent of Germany settled with a German firm MAN A.G. Deutsche Bank was the financier. The new Galata Bridge was constructed over a period of forty months and opened to the traffic in 1912 and in 1914, electrification of the tramway lines was realized. The bridge was celebrated with an enthusiasm[54] as the first modern floating bridge in the world (Watanabe, 2003, pp.128-132). It was used until the fire in 1992.

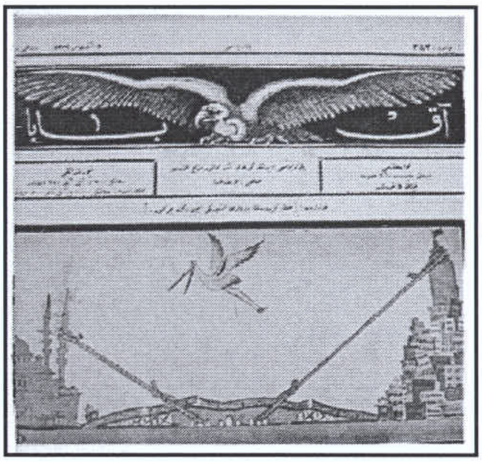

Figure 4.37 Due to problems in old pontoons of the Galata Bridge, it was sinking in 1926. A caricature from the popular media criticizing the municipality for not having the precautions. "The suspension bridge which we will have in the following months" Akbaba Journal, 2.8.1926 Source: Evren, B., "Galata Köprüleri Tarihi", Milliyet Yayın A.Ş., 1994, p.34.

[54] "Son zamanlarda Türk imparatorluğunda kaçırılanları yakalama yönünde güçlü bir çaba sürüyor ve vatandaşların yaşam standardını yükselterek güvenliklerini sağlamak açısından gerekli olan karayollarının yapımına ağırlık veriliyor. Bu nedenle yeni demiryolu hatlarının yanı sıra, Türkiye'nin Avrupa ve Asya yakalarında birkaç bin km uzunluğunda karayolu yapımı planlandı ve hatta bir kısmının yapımına başlandı bile. Başkentte uzun süredir özlemle beklenen telefon ve elektrik hatları yapımına başlandığı gibi, tepelik arazisi yüzünden çok güç bir iş olan şehir trafiğinin düzeltilmesi çalışmalarını da heryerde görmek mümkün. Bir tünel içerisinde Galata'dan Pera'ya çıkan teleferiğin de eskisinden 1.5 kat fazla sefer yapabilmesi sağlandı. Atlı tramwayların gideceği yollar belirlendi ve bu tramwayın yol şebekesi hatırı sayılır ölçüde genişletildi. Ayrıca atlı tramwayın elektrikle çalışabilmesi için yol şebekesinin üstüne çekilecek elektrik hatlarının yapımına da başlandı...Her iki işletme de kısa sure once bir metro inşa ve işletme hakkını alan tek bir firma halinde yeniden örgütlendi. Ulaşım araçlarının yapımına hız verilmesinin önemi, yeni siyasi gelişmelerin de etkisiyle Konstantinopel trafiğinin son üç yılda üçte bir oranında artmasıyla ortaya çıktı. Bu devlet girişimiyle özel girişimlerden Türkiye'nin inşaat sanayi ve ticaretinde önemli bir payı bulunan Alman sanayi yararına da verimli sonuçlar beklenmekte." Albert Enderlen (Engineer of MAN A.G. in construction of Unkapanı Bridge) "Altin Boynuz Üstündeki Yeni Köprü", 1912. Source: Evren, op. cit., 1994, pp.140-157.

When the new bridge was built, the former one was moved in pieces, re-assembled instead of old Unkapanı Bridge in 1912, and served twenty-three years more in its new location until 1936. However, Unkapanı region was more open to storms and the bridge was designed for conditions in Galata. New conditions quickly eroded the structure and the pontoons started sinking. Soon after proclamation of the republic, the municipality handled the problem, imported new parts from Belgium, repaired the foundations with reinforced concrete, and replaced to the old pontoons of the bridge. At the same time, they had started to work for a new bridge. In spite of the restorations in 1924, the weathered structure of the old bridge detached in a heavy storm in 1936.

However, bridging the Golden Horn had been a huge challenge for engineers. It is 7,5 kilometers long and, at its widest, 750 meters across. The various widths changing from 700 to 250 meters were not the problem by themselves. The main problem of the Golden Horn was its depth rather than the width. The width was approximately 35 meters deep between Sirkeci to Kasımpaşa shores, while more than 40 meters in Unkapanı-Azapkapı part. Ayvansaray region it decreases to 2,5 meters. Sea floor was filled with a tick muddy layer and the bedrock is at a depth, which cannot be reached. The very problematic soil conditions of the Golden Horn made it almost impossible to built footings in water. The downstream in the Golden Horn was likewise a difficulty. As the stream is the only means of changing water where there is no tide, the second obligation in design was not to block the stream if not the water would be polluted. Moreover, as there were shipyards in the fiord, the bridge had not to prevent the entrance of the ships and smaller boats.

In 1928, a commission was founded to define the main specifications the tender of new Unkapanı Bridge. Among them, there was *Fuat Bey* the ex-director of the Municipal Department of Technical Services, *M. Fuat Bey* the director of Technical Services of the State Railways, engineer *İrfan Bey*, and *Fikri (Santur) Bey* the author of the first book on iron bridges and the Rector of the School of Engineering. The commission had proposed soil survey, determined the type of bridge as floating bridge, and calculated the estimated cost of such kind of bridge as three-million Turkish Liras. Then in 1929, a project competition-tender was opened for the contractors who would propose a project on previously defined principles and an offer for construction of it. Three firms, one from Germany and two from France, submitted their proposals. Nevertheless, none of the offers was accepted due to exorbitant prices (İlter, 1973, p.60). Consequently, Monsieur Piegaud, the vice manager in

Ecolé de Ponts et Chausses and inspector in the Ministry of Public Works of France, was commissioned.

Pigeaud designed a pontoon bridge and submitted the project in 1930 (Fig. 4.39). Thereafter, the project was investigated by various commissions of many important Turkish and foreign experts and various reports were prepared. The foreign experts were Andre Fiçeniçki professor of bridges in the Engineering School of Warsaw, Monsieur Grelot chief-engineer in the iron bridges department of the French Ministry of Public Works, and Mr. Rutiman a Swiss engineer specialized on iron bridges. The Turkish experts were from the School of Engineering Mehmet Fikri Bey (Santur), Mustafa Hukuki Bey (professor of mechanical engineering) and Burhanettin Bey (professor of masonry bridges), the Department of State Railroads İrfan Bey (Chief of the bridge department), and Emin Bey (engineer in the bridge department), and director Ziya Bey and ex-director Fuat Bey from the Municipal Department of Technical Services[55].

Even as the Pigeaud project was commissioned without tender, alternative projects had kept on being proposed. American *Waddell & Hardesty Consulting Engineers* was interested in the project for long time. In the letter J.A.L. Waddell, the owner of the firm, after criticizing the floating bridge type as old technology of two or more decades earlier, says:

> "It is obvious that in the admirable modernization plans which are being efficiently pursued by the exceedingly foresighted and able leaders of the progressive Turkish republic, the most advanced scientific types of public constructions should be adopted; and it is to be hoped that American engineers may be given an opportunity to contribute thereto."
>
> *(Letter from J.A.L. Waddell on 31.08.1934. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094)*

Instead of the pontoon type, they proposed a Waddell & Hardesty prepared two types of vertical lifts, a lifting span and lifting deck, for Gazi Bridge (Fig. 4.38). The type was invented personally by Waddell and applied in many bridge in America since 1890s.

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[55] Report from the Municipality of Istanbul to the Ministry of Internal Affairs on 15.10.1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094.

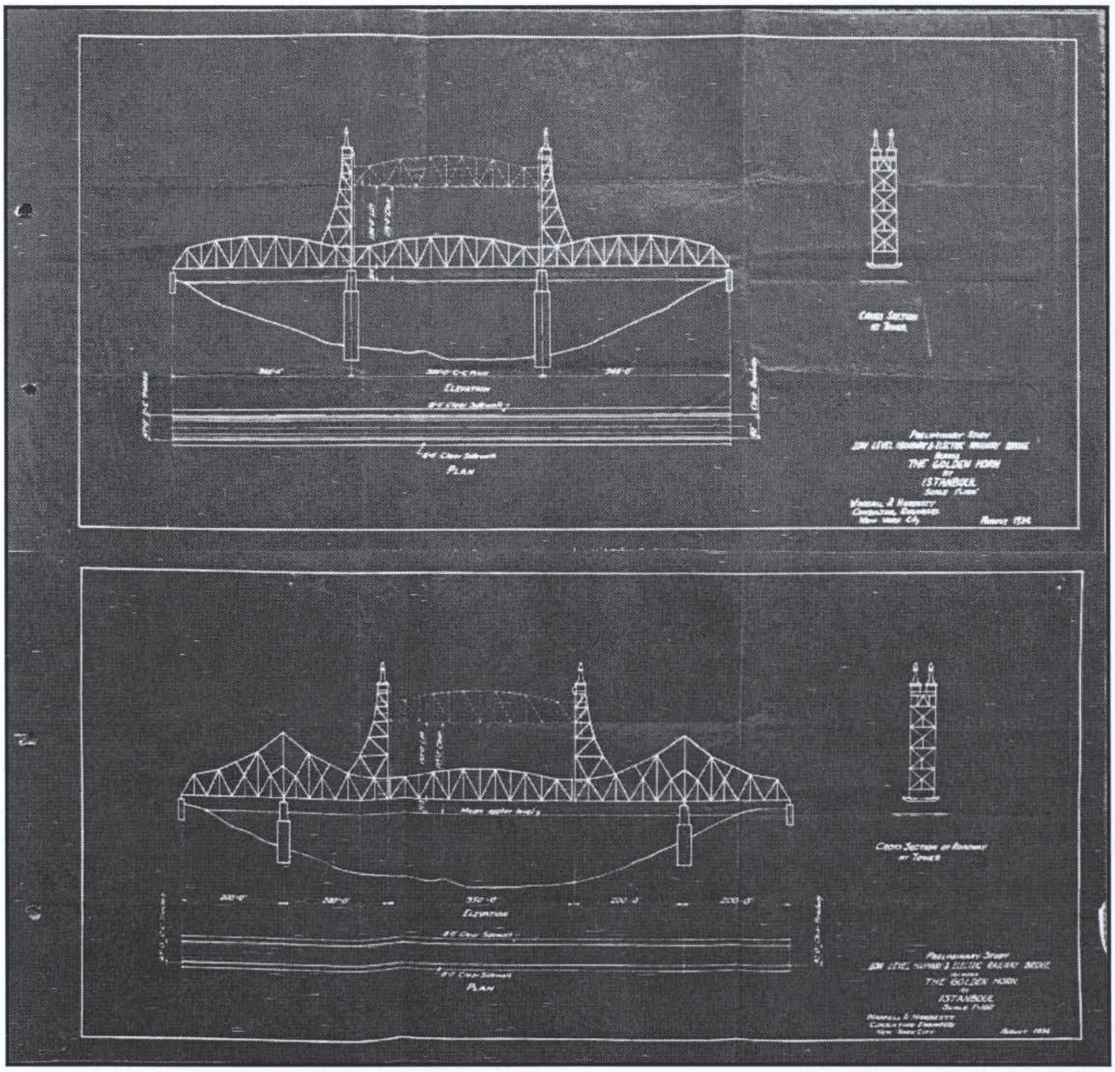

Figure 4.38 Drawings of the two lift-bridge proposals of Waddell & Hardesty Co. on August 1934. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094

During the design processes of both the bridges in 1912 and 1940, many different bridge types were proposed and discussed, but pontoon bridge type was decided as the most suitable for both and the bridge plans had been prepared accordingly. Nevertheless, the various other types were considered, but they also were problematic in their own rights. The suspension type was proposed by Ernst Egli, who taught at architecture department of the School of Fine Arts for long years and who put forward an idea of suspension bridge for Golden Horn and his proposal was discussed in the newspapers of the period (Cumhuriyet, 5 July 1932; Evren, 1994, pp.53). Even as a second step of Galata Bridge, another suspension bridge for Bosporus was also discussed in media. Moreover, under this agenda, Nuri Demirağ would have the engineers of Golden Gate Bridge design a suspension bridge project for Bosporus and submit to Ataturk in 1933 (NuD, 1957, pp.54-60).

Prost who started to work on his plans for Istanbul in 1935, made two important decisions about the Galata Bridge. First was changing the location of the bridge 50 to 100 meters into the fiord. Hence, he designed two squares in Karaköy and Eminönü and connected them by the bridge (Aydemir, 2008, pp.104-111). The second was restricting the height of constructions in Bosporus in order to protect the city silhouette. He defined "The height of buildings to be constructed in areas that are 40 meters or more above sea level is not to exceed 12 meters in height, and that construction on lower levels is not to exceed those heights at the 40 meters level" (Ayataç, 2007, pp.114-137). However, a suspension bridge had to be at least 48 meters high from the sea level in order to let bigger ships to cross under. A suspension bridge with its towers would certainly be higher than the limits and its main gauge would be so high to dominate other important buildings in the historical peninsula. Hence, would not be in accord with the silhouette of the city. However, the bridge was already designed and Prost's revisions led to 40 meters extension in total length. The plan obligations were restrained suspension type while soil conditions of the sea floor which was not suitable for foundations in water was preventing the masonry and lift-bridge type proposals. As the commission estimated the cost of such kind of bridges with pile foundations would cost almost seven to eight million Turkish Liras (İlter, 1973, p.60). As Enderlen[56] narrated there were also other proposals discussed such as a tunnel and a dam, which has a bridge for ships in the middle.

[56] Albert Enderlen (Engineer of MAN A.G. in construction of Unkapanı Bridge), "Altın Boynuz Üstündeki Yeni Köprü", 1912, source: Evren, op. cit., 1994, pp.140-157.

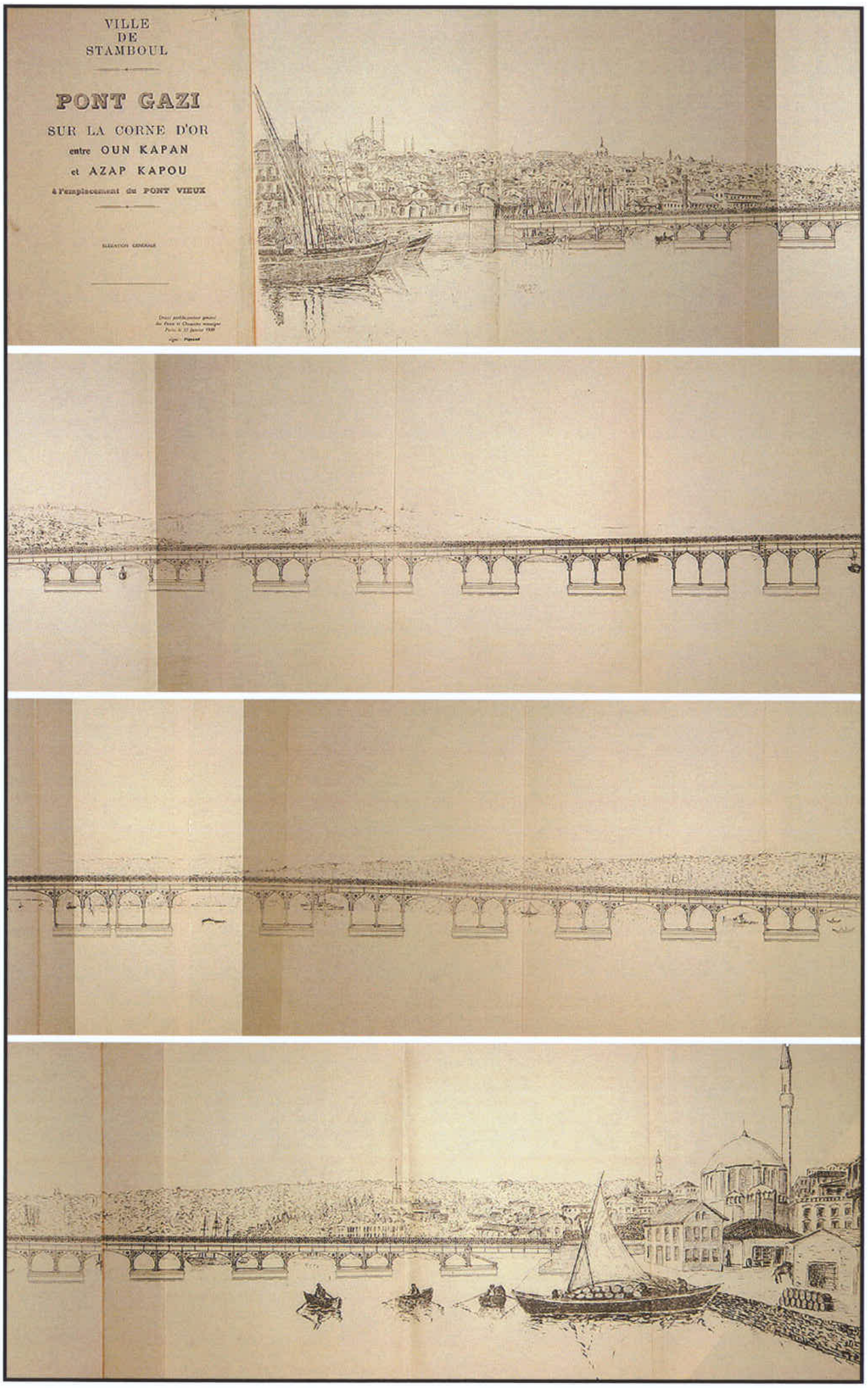

Figure 4.39 Orientalist elements on the first façade proposal of Pigeaud for Gazi Bridge, 1930. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2095

Since 1928, the municipality was taking up taxes from mass and private transportation for financing to construction of Gazi Bridge by the Law No.1223[57]. However, the collected amount was only one and half million Turkish Liras by 1935 and the project still could not put out on tendered. Moreover, more than two hundred agent-middlemen were applied for the importation of steel parts even if there were less than twenty factories doing steel construction jobs [58] (Evren, 1994, pp.50-58).

Meanwhile, heated debates had taken place between the Ministry of the Public Works and the Municipality of Istanbul and among the members of the city council on the proposal of Pigeaud. In addition to technical topics such as on which code the calculations would ground and the material of the deck, the main discussion was based on the façade design of the proposal. The façade proposal was clearly consist of orientalist architectural forms and ornaments. This design, which was formed in repetition of the non-structural elements reminding Ottoman architecture such as basket-handle and pointed arches in a rhythm, was unacceptable under early republican cultural politics. The related state departments such as TCDD-Steel Bridges Department, Istanbul Technical University, Directorship of Roads and Bridges and especially the Ministry of Public Works, that were appointed for "determining the national architectural style of every kind of public buildings[59]", harshly criticized the design as being not contemporary enough for modern Turkish Republic. While the ministry was criticizing, the municipality was defending the proposal in series of reports and correspondences with the Ministry of Internal Affairs.

The main standpoint of the ministry and related directorates was the design of the bridge, which was "...not compatible with the modern taste and contemporary technological

[57] "Köprünün giderlerini karşılamak için Istanbul civarında işleyen vapor, tern, tramway ve tunnel arabaları, otobüs ve minibus gibi toplu taşıma araçlarından yolcu biletleri ve abonman defterine beher sefer için on para zam yapılması vergi ve resmleri kanunun 23. maddesinde belirtilen resimlerden zata mahsus otomobil, çift ve tek hayvanlı binek arabaları ile binek hayvanlarına ilişkin kısmına şehir meclisinin yüzde yüz ve kalanına yüzde elliye kadar zam yapmasına izin verilmesi..." Law No. 1223 on Gazi Bridge in 14.4.1928.

[58] "...Bu işle meşgul 20 den fazla müessese olmadığı halde belediyeye müracaat edenlerin adedi ikiyüzü geçmiştir. Belediye bu komisyoncuların dalavereleriyle mücadele vaziyetindedir" Cumhuriyet ,5 July 1932. Source: Evren, op. cit. 1994, pp.50-58.

[59] Law No. 2443 in 26.5.1934 on "Organization and Duties of the Ministry of Public Works".

advance in terms of both façade design and steel structure" (From M. Fuat the Director of Technical Services of the State Railways to the Ministry of Public Works on 10.12.1933).

> "...while the general view of the bridge complies with the taste of the imperial times and suits with the twenty years earlier conceptions in other countries, it is not able to satisfy the taste of the republican generations who aim at working with modern and latest methods, and building the country[60]."
>
> From Hilmi, the Minister of Public Works, to the Ministry of Internal Affairs, 6.1933

On the other hand, the ministry defended the forms as being functional elements for avoiding ferryboat accidents.

> "...the basket-handle arches were designed for ferry boats crossing Golden Horn day and night to help perfectly align with the spans, and easily pass under[61]"
>
> From Muhittin Üstündağ, the Mayor of Istanbul to the Ministry of Internal Affairs, 5.10.1933

Nevertheless, in the following lines, the municipality stood for the pointed arch form with a nationalistic defense as noble form of Turkish architecture remained from great Turkish masters such as Sinan, Kasım, and Hayrettin but not of degenerated Ottoman architecture created by foreigners in the decline of the Empire[62]. Conversely, the Ministry assumed the

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[60] "...köprünün manzarai umumiyesi, memleketimizde saltanat devrindeki zihniyetlere ve sair memleketlerde 20 sene evvelki telakkilere bir derece kadar tevafuk etmekte (uygun olmakta) ise de, en modern ve en yeni usullerle çalışmayı ve memleketi imar eylemeyi hedef ittinaz eylemiş olan cumhuriyet neslinin zevkini tatmin edebilecek bir halde değildir" from Hilmi The Minister of Public Works to the Ministry of Internal Affairs, 6.1933, source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094.

[61] "Köprünün alttan geçitlerini çerçeveleyen saçtan sepet kulbu münhanileri, gece gündüz geçen gemilerle haliç vapurlarının köprü gözlerini eyi ağızlayıp açıklığı ortalayarak geçmelerini sağlamak için yapılmıştır..." From Muhittin Üstündağ, the Mayor of Istanbul to the Ministry of Internal Affairs, 5.10.1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094.

[62] "malzemenin gördüğü işi en eyi gösterebilen şekiller bugünkü düşüncelere gore en güzel şekiller olsaydı; bundan altmış sene evvel ve saltanatın koyu bir devrinde yapılmış olan Unkapanı köprüsü: malzemenin gördüğü işi en eyi gösterebilen şekilde yapılmış olduğu için bugünkü düşüncelere gore en güzel şekillerden birine numune olurdu. Halbuki eski Unkapanı köprüsüne kim güzeldir der?.... zaten saltanat devrinin bir mimarlık zihniyeti bile yoktu. O devirde ne vakit Sinan, Kasım, Hayrettin gibi büyük sanatkarlar parlamış ise sivri kemerler ve tavabii de o parlaklık nisbetinde çok kullanılmıştır. Ne vakit mimarlık ecnebiler ve Türk olmıyanların elinde kalmışsa Nuru Osmaniye, Laleli, Selimiye kışlası gibi karışık binalar almış yürümüştür. Bunlardan dolayı köprü bütünü görünüşünün saltanat

bridges as culturally and politically constructed symbols of technology and modernity, which had to be in accord with "the taste of the nation on its way to modernism[63]". As is seen the state was defining them as not only functional objects but also made extraordinary effort to emphasize their functionalism as a part of the aesthetic experience of modernity.

The broad and intense polemic had carried on with the long correspondences between various departments of the state until 1933s. Although the municipality insisted on defending the design as not being orientalist but functional; the ministry did not approved the design of such kind of important bridge unless "it was...appropriate for Istanbul, the republic and the [Turkish] reforms" (From the Ministry of Public Works to the Ministry of Internal Affairs on 14.12.1933).

The law giving the municipality the authorization to make approval of the designs and bids of the projects in Istanbul was revised in 1935, under the pressure of the ministry. The new law limited the decision powers of the municipality and defined the Ministry of Public Works as "the component authority on approval of the designs and bids of the piers and bridges projects in Istanbul cost more than fifty thousand Turkish Liras" (From the Ministry of Public Works to the Prime Ministry on 23.12.1935) [64].

Finally, five years after the preparation of the design, Pigeaud's revised project was put on tender in 17.10.1935. As the Unkapanı Bridge in 1912, Maschinenfabrik Ausbrug-Nünberg A.G. obtained the contract once more with a German consortium for construction of the Gazi Bridge. The consortium consisted of four forerunner firms of German steel industry *Fried Krupp A.G., Guteoffnungs-Hütte Werk Sterkrade, Dortmunder Union Brückenbau A.G* and *MAN.* MAN was the leader of the contractors. Hugo Herman and engineer Galip Fescioğlu were the agent-middlemen in Istanbul. Chief engineers were K. Karner and A. Paul. Sadık

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devrindeki sihniyetlere ve sair memleketlerdeki yirmi sene evvelki telekkilere bir dereceye kadar tevafuku iddiası varit olamaz. hem biz saltanat devrindeki zihniyetle hareket etmeyiz." From Muhittin Üstündağ, the Mayor of Istanbul to the Ministry of Internal Affairs, 5.10.1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094

[63] Correspondence between the Ministry of Public Works and the Ministry of Internal Affairs, 19.12.1933, source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094.

[64] Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2095.

Diri and Ferruh Atav Co. was the subcontractor of the pile foundations. Halit Köprücü had not been the partner yet, but he was the second contractor -in-command in Gazi Bridge project. The project was realized under the responsibility of both the ministry and the municipality. The control engineers were Necati Turfan and Sadi Cimilli from the municipality. Engineer Balaj also attended final controls in name of the ministry. (Submission record on 7.11.1939 Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094)

The location was changed on the suggestions of Prost and project was revised accordingly during the constructions. The estimated construction time was extended because of the bargaining dispute on the price of modifications. Moreover, the places for rivets and bolts were misfabricated; hence, the holes on the imported steel elements had to be repaired in site and re-drilled. Delays in estimated time raised doubts on construction and criticized on daily media. These doubts had continued until the submission of the bridge and "[The] Gazi Bridge become the most gossipy issue of the city[65]." (İkdam, 1940)

The bridge was opened to traffic on 20th October, 1939 thirty-eight months after the ground-breaking ceremony in August 1936. In his speech during inauguration ceremony Lütfü Kırdar the major of the city announced the bridge was named as *"Gazi"* as "symbol of the gratitude [of the public] to eternal savior" (Evren, p.58)

Gazi Bridge was designed to have five main sections, two spans of 19 meters on both sides of the bridge, two symmetrical parts of 170 meters on ten pontoons, and a central section of 70 meters, which could be opened for larger ships to cross under. Totally, the bridge stands on twenty-four pontoons of 25x9x5,4 m dimensions that were made up of ST52 steel. Total weight of the steel parts is 7500 tons. The foundations on both sides rest on four hundred and ninety piles eighteen meters long on Unkapanı and sixteen meters on Azapkapı. The total length of the bridge is 477 meters while width is 25 meters together with 4,5 meters wide pedestrian ways on both sides. This is the longest pontoon bridge of the world of its time (İlter, 1973, pp.60-63). Although the contract price was 1.585.666 TL., the total cost of the bridge announced at the inauguration was 2.350.000 TL. On the other hand, the cost of

[65] "....Gazi köprüsü Istanbul şehrinin en dedikodulu meselesi halini aldı...". "Sipariş ve inşada suiistimal ihtimali var mı?", İkdam, 15.02.1940. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094.

Unkapanı Bridge, which was also built in floating type by the same construction firm in 1912, was 237.000 TL[66].

Yeni köprünün inşaat vaziyetini şu resimde görüyoruz

Gazi Köprüsü İnşaatı Bir Senedir Niçin Duruyor?

Tenvir Edilmesi Lâzımgelen Ciddî Bir Vaziyet Karşısında Bulunuyoruz

Bir seneye yakın bir zaman evvel Gazi Köprüsünün temeli atılmıştı. Hazırlanan proje mucibince bir buçuk milyona M. A. N. şirketine ihale edilen köprünün derhal yapılmasına başlanacak ve Dahiliye Vekili Bay Şükrü Kayanın temel açma törenindeki nutkunda söylendiği gibi üç sene içinde köprü hazır olacaktı.

Lâfını senelerdenberi duyduğumuz bu köprü ne oldu? Merak edip araştırdık. Gördük ki, bir seneye yakın bir zamandanberi tecrübe kazıkları kakmaktan fazla bir şey yapılmamış.

Niçin böyle olduğu hakkında aldığımız malûmat ta şudur: Köprünün projesi, Prof. Pigeaud isminde bir Fransız tarafından hazırlanmıştır. Bu zat Fransada yol ve köprü müfettişidir. Hiç şüphesiz nazarî malûmatı vardır. Belki de kitaplar yazmış ...

300 HÂKİM ARASINDA TERFİ, NAKİL

SICAKTAN 300 ÖLÜ

Gazi Köprüsü

(Baştı 1 incide)

Figure 4.40 News about Gazi Bridge construction of daily media. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2094

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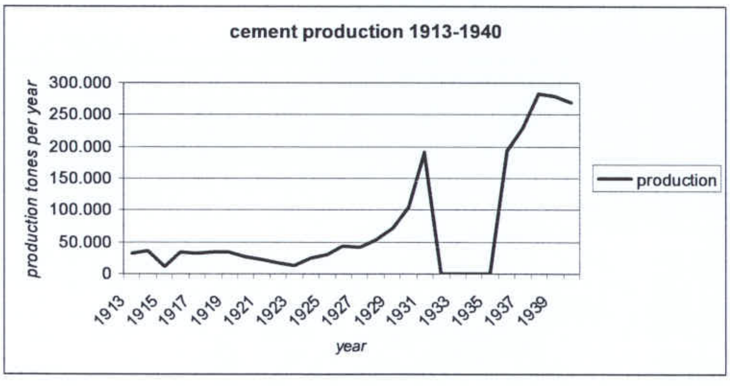
66 1 lira was equal to 3,70$ in 1912 while it was 1,26$ during the early republic until the devaluation in 1946. Hence, the cost of Unkapanı Bridge in 1912 was 876.900$ while Gazi Bridge in 1940 cost 2.961.000$.

In spite the state was considering bridges as culturally and politically constructed symbols of technology and modernity and spending a large amount money to import latest technology for their construction, the building processes of these modern monuments of engineering had a striking contrast with the primitive building technology of the country. The problems in building processes can be described under three main headings; first was the problems about labor, second was material and the third was about organizational problems. As mentioned in previous chapters, lack of qualified labor force in every level of construction from masters to engineers caused need for foreign labor force and led to intense efforts on development of national technical education. The problem about the building materials and equipments was as deep as labor problem. As Aslanoğlu explains (Aslanoğlu, 2001, 26-30, 92-99) despite the urgent need for reconstruction of the country demolished by the war, the building industry of early 1920s was consist of three saw mills, two brick factories and two cement factories. Hence, the increase in demand soon caused building materials shortage. Especially the ingredients of concrete the cement, the aggregate and the iron rods should immediately be obtained to sustain the renovation. Thus, cement industry included in priority developing industries and supported by low-interest credits.

Ankara was the one of the most needed areas of cement. Hence, in year 1926, a cement factory of 18.000 tones capacity was established by Municipality of Ankara and first rolling mill was also established in Istanbul in same year. This was followed by the establishment of 14.000 tpy capacity Kurt Cement factory, 65.000 tpy capacity Yunus Cement factory, and 25.000 tpy capacity Zeytinburnu Cement factory in 1929 by private enterprise.

Table 4.6 The graph showing the cement production between 1913 and 1940. Prepared based on data gained from Sey, Y., "Türkiye Çimento Tarihi, TÇMB Yayınları, Istanbul, 2004.



Despite all the efforts, weak Turkish building industry hit hardy by 1929 World economic crisis. This would harshly affect the Turkish economy and the cement industry during the first half of 1930s. The crisis initially caused the decrease in production, then trusting and the increase in prices, and finally stopped constructions nationwide. The state, as the biggest constructor, was the most affected employer by these events. Therefore, in the second half of 1930's the production increased by state interventions. Although it was decided in 1933, the first state owned cement factory could not be realized until 1943.

Under post-WWI conditions, the main rational under wide spread of reinforced concrete in Europe was its cheapness and quickness. Besides, reinforced concrete was not the only one; all rayon (nitrocellulose), synthesized plastic (bakelite), synthetic rubber, plastic, nylon etc. became widespread in post-war period because of the same reasons. However, concrete in Turkey was far beyond being cost-effective under the harsh economic conditions of the early republic, while importation and production of cement was limited, and the amount of cement on the market was far below the consumption level. Moreover, there were high taxes on the importation of cement due to *Teşvik-i Sanayi Kanunu-1927* (the Law on Encouragement of Industry).

There are an extensive amount of complaint letters and articles found in bridge files of the Ministry and of KGM and the journals of that period. As we learnt from Zeki Sayar's article in 1936 (p.244), on the contrary to fasten the constructions, constructions were behind the time because of the cement queue. Besides, reinforced concrete construction was not cheap at all, rather as Zeki Salâh (1934, p.155) claimed it was a 'luxury material'. However, besides all these negative factors, still Turkish construction sector was 'amazingly' persisting on the reinforced concrete.

> "It is not that amazing for Italy who costs a tone of cement for 20 TL to develop a good highway network. What the amazing is the persistence of poor Turkey who costs a tone of cement for 50-100 TL on construction."
>
> Dr.Vedat Nedim , 'Statecraft on Cement Industry', Kadro Magazine, 1934, pp.19-27

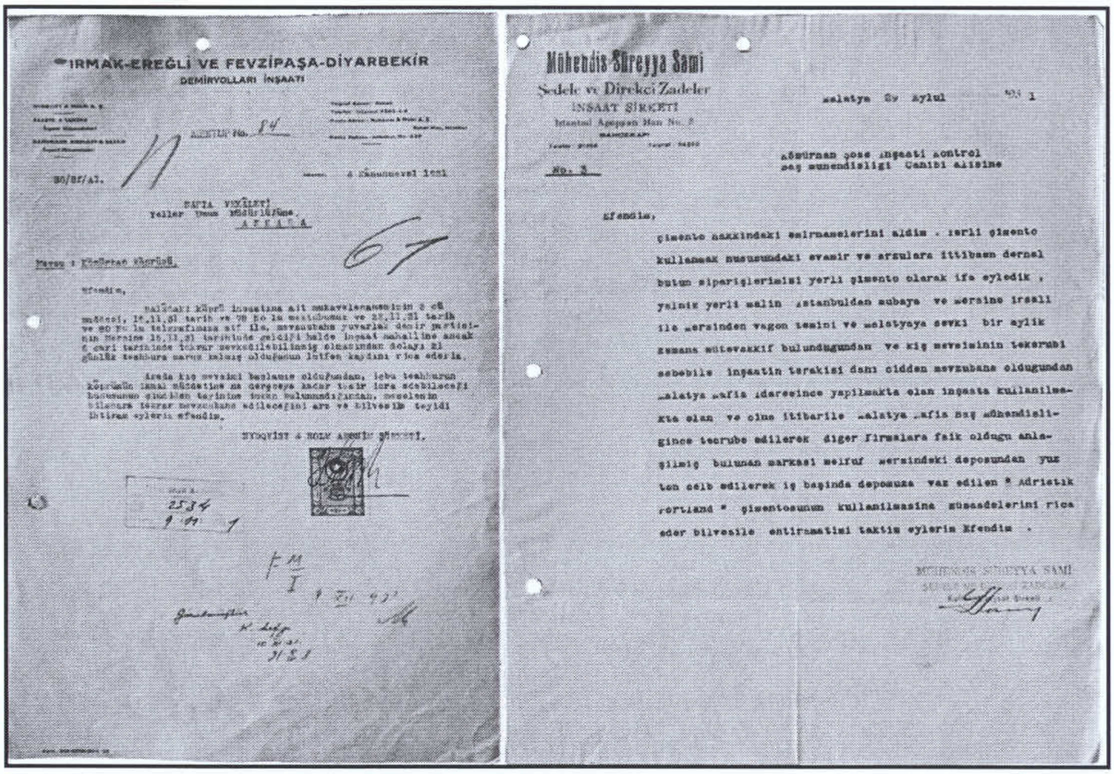
In early 1950s, there were few cement factories in the country. When the construction boom had been initiated by the new DP government, it caused increase in demand while the production of cement was limited. Soon there appeared a greater shortage of cement. The supply of cement was the main problem, which caused delays in constructions in almost all constructions of the period. The problem called *"çimento buhranı"* (cement crisis) and/or *"çimento sıkıntısı"* (cement problem) was also on the agenda of then Prime Minister Menderes. As he narrated in his diary, the establishment of cement factories would cause an argument between him and the Minister of Public Works, which was ended with the submission of the resignation of the minister (Taşkın, 2002, p.119; Altun, 2006, p.68)[67]. Thereafter, the government started to invest heavily on cement industry. Nevertheless, Menderes had proved right and despite the opened cement factories, the shortage was recurred by the end of 1950s.

In spite of all these negative conditions, reinforced concrete had been the official material of new Turkish building sector; its usage was increased day by day. In addition to engineering buildings like dams, bridges etc., public buildings had been constructed with reinforced concrete, in universities, students designed diploma projects on reinforced concrete; even one storey private houses were also designed and built with reinforced concrete.

This was also valid in case of bridges. Because of the abandonment of traditional building techniques in favor of modern ones, new and modern bridges could not be built with local materials although stone or wood were easy to provide and familiar for local labor. In 1930s, the preferred modern building materials were produced in few cities thus in most of the constructions they had to be transferred from various distances. Besides, in most cases, bridges were built in remote places where roads had not built yet, and so this maximizes the transportation problem of the materials. The problem was also seen in the case of imported materials. When a material was imported, it firstly shipped to the harbor closest to the building site, and then transferred to railroad. After railroad, trucks, which were in limited number in Turkey before Marshall Plan, carried the materials to the possible closest location through road network. Afterwards, materials were loaded to mules or donkeys and pounded along rest of the road by this way, and finally reached the building site. For instance, the iron rods for Kömürhan Bridge reached the building site twenty-one days after they arrived at Mersin Harbor in 15.11.1931. Sometimes contractors avoided from tendering the bids as in case of Kemah Bridge because of laborious undertakings caused by these kinds of transportation problems. Often the bridge locations were changed in early stages of design

[67] The scene was dated in Menderes's diary as March 8, 1951.

due to transportability of materials. In his report on proposed place of Şırzi Bridge, Engineer Balaj (6.10.1937) underlines the transportation problems and says "it is hard to have building site on proposed place" ("Kozluk ve Şırzi Köprüleri Hakkında Rapor", From Engineer Balaj to the Department of Roads and Bridges, 6.10.1937, Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2024, 2025, 2293 and 16041).



IRMAK-EREĞLİ VE FEVZİPAŞA-DİYARBEKİR
DEMİRYOLLARI İNŞAATI

Nafia Vekâleti
Yollar Umum Müdürlüğüne
ANKARA

Efendim,

Mühendis Süreyya Sami
Şedele ve Direkci Zadeler
İNŞAAT ŞİRKETİ

Malatya 29 Aylul 931

No. 3

Kömürhan şose inşaati kontrol
baş mühendisligi Canibi alisine

Efendim,

çimento hakkindaki emirnamelerini aldim . yerli çimento kullanmak hususundaki evamir ve arzulara ittibaen derhal butun siparişlerimizi yerli çimento olarak ifa eyledik , yalniz yerli malin Istanbuldan Mubaya ve Mersine irsali ile Mersinden vagon temini ve Malatyaya sevki bir aylik zamana mütevakkif bulundugundan ve kiş mevsiminin tekarubi sebebile inşaatin terakisi dahi cidden mevzubahs oldugundan Malatya Nafia idaresince yapilmakta olan inşaata kullanilmakta olan ve olma itibarile Malatya Nafia baş Mühendisliğince tecrube edilerek diger firmalara faik oldugu anlaşilmiş bulunan markasi meiruf Mersindeki deposundan yuz ton celb edilerek iş başinda depomuza vaz edilen " Adriatik Portland " çimentosunun kullanilmasina müsaadelerini rica eder bilvesile ehtiramatimi taktim eylerim Efendim .

MÜHENDİS SÜREYYA SAMİ

Figure 4.41 Correspondence about transportation of cement for Kömürhan Bridge, 29.9.1931 and 6.11.1931 Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 16041

Due to the Law on Encouragement of Industry, there was a condition on usage of national production and the Ministry of Public works approved the materials on this priority (Fig 4.41). Importation was only allowed in cases of deficiency in national production and long queues caused extension in time. When the studied files are analyzed for the sources of the materials, we mostly see that the cement was obtained from national factories such as Yunus, Arslan, and Zeytinburnu; iron rods were supplied from Karabük Iron and Steel Industries; and wood for scaffolding was obtained from the closest Department of Forestry. Ruberoid and construction chemical for isolation were imported. Even though nationally produced materials were preferred, importation of cement and iron was unavoidable under huge demand of construction boom, too. However, both local and foreign building materials industry in 1930s and 1940s had not reached to level of a standardized quality. Therefore, almost all kind of materials cement, iron, ruberoid even paints were firstly tested and then approved. Because of the lack of laboratories in the ministry, the tests were done in the labs of the *Mühendis Mektebi* (Fig. 4.42).

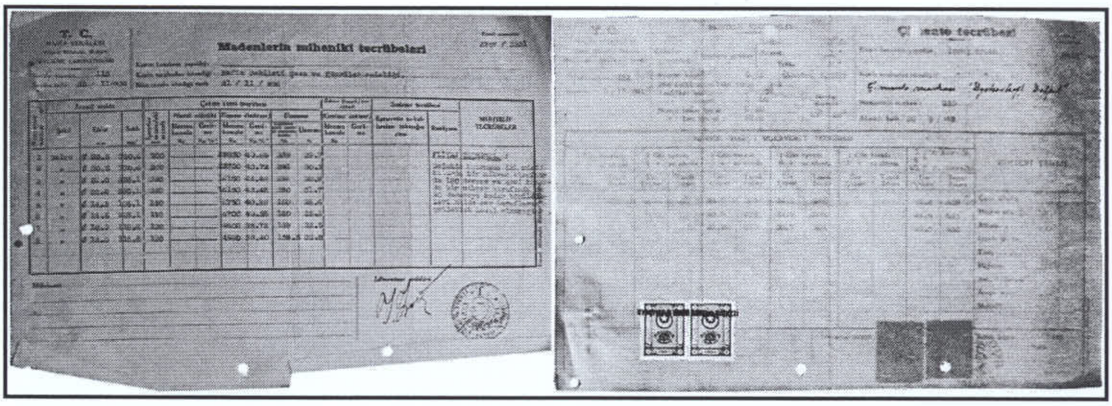


Figure 4.42 (Right) Cement test results for Kömürhan and (left) Iron test result for Çetinkaya Bridges in Mühendis Mektebi labs. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2233 and 16041

Another reality about the building sector of the covered period of the study was the mediocrity of equipments and machinery (Fig. 4.43). The most developed construction equipments were pile drivers and they were only in few companies experienced in pile foundations such as SaFerHa. Other types of heavy machinery were almost not used; rather constructions were handled by large labor force. Moreover, motor-driven pumps and power plants, which were sine qua non for excavations of foundations, were limited in number especially prior to 1948. Quite often construction firms did not own these machineries and the ministry lent them to contractors. Besides, these machineries were often old and not functioning smoothly. Hence, the construction period had extended if they got broken. Even concrete mixers were advanced equipments, which were not wide spread. As we learn from the correspondences between the Department of Roads and Bridges and contractor-engineer Ferruh Atav during the construction of Büyük Menderes Bridge, concrete had been still mixed by hand circa 1944 except for big scale constructions. The department demanded a concrete mixer for more qualified mixture, but the construction time was extended two months while waiting for the ordered mixer from Europe.

By removing of imposed controls over importation and by support of Marshall Plan, construction equipments in the Turkey were increased in number after 1950s. In 1946 before establishment of KGM, the Department of Roads and Bridges own 214 heavy machinery including trucks, while the number was reached to 2874 by 1950 (Batmaz, 2006, p.112). Most of this machinery was obtained from the United States of America as part of Marshall Plan aid. These construction equipments were lent by lease agreements to the road and bridge contractors. The subject of these lease agreements were commonly light machinery such as concrete vibrators, mixers, electricity generators, motor pumps etc.

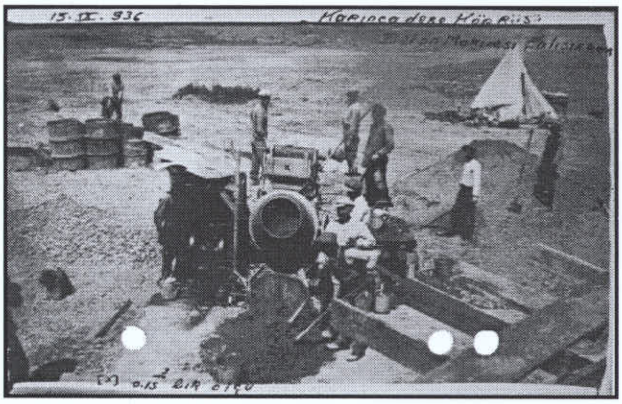
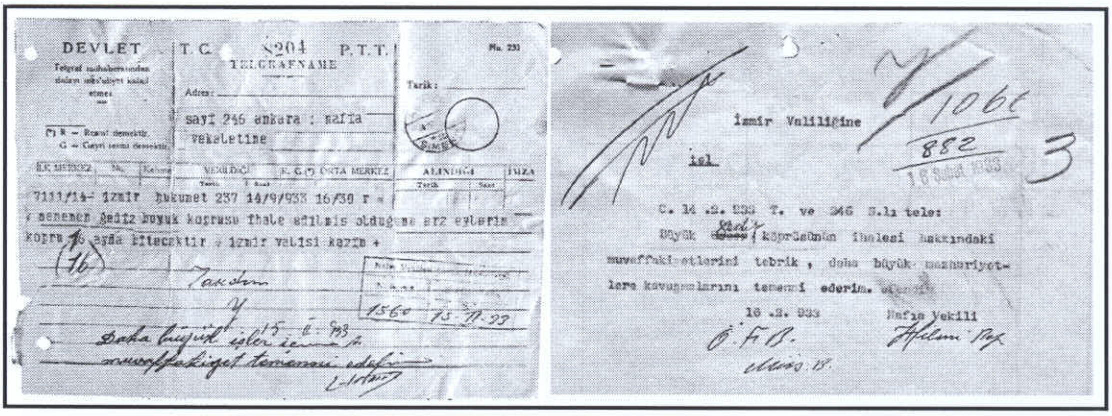


Figure 4.43 Concrete mixer in construction of Karıncadere Bridge, 19.9.1936. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 1894

In spite of the plenitude in the first half of 1950s, asymmetrical increase of importation over exportation had drained away the foreign-exchange reserves by 1955s. Now, there were problems in maintenance and repair of the imported machinery due to lack of replacement parts; and so the existing machinery stock was proving useless day by day. For instance, sometimes contractors undertook state bids by extreme discounts just for getting rubber tire allocation for their trucks (Batmaz, 2006, p.117). The shortage was not limited with replacement parts, all kinds of construction materials even nails went on the black market. Allocation of building materials by the state as in WWII years started again.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TELGRAFNAME
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İzmir Valiliğine
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Figure 4.44 Left: Telegraph from Kazım Dirik the Governor, informing about the tender, 14.2.1933. Right: Answer from the Ministry congratulating the Governorship, 16.2.1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2113

In addition to military demands of the army, constructions of the bridges were decided by the government also on socio-economic demands of provinces reported annually. Every year, each governorship reported the conditions of existing roads and bridges, and its future transportation requirements officially. Additionally, some civil societies for instance group of villagers also petitioned directly to the Ministry and demanded bridge on their nearby rivers. All these official and unofficial demands queued according to their state of urgency, and a plan of bridge construction made by the Ministry on the available yearly budget. Circa 1930s, the state went through a moderate and inconspicuous decentralization attempt. The Ministry turned over the bridge planning, tendering, and controlling activities together with 85% of the road taxes to local authorities gradually, and it concentrated only on big span bridges. First bridge constructed by a local authority was Gediz (Menemen) Bridge in 1935 (Fig. 4.44). The Ministry gave technical and fiscal support. It was planned in the Ministry, but put out to tender by the İzmir Governorship -by technical support of the Ministry-; and the 200.000 TL budget financed equally by both the Ministry and the Governorship. The constructions were controlled by temporarily charged engineer under the Governorship. It was given the name of then governor of İzmir, Kazım Dirik, as result of his personal efforts on construction.

4.3.3 Construction Processes: Bidding, Controlling, Logistics and Inaugurations

The tenders were commonly handled in closed bidding method but bargaining method also used when needed. The bidding document requirements for tenders were quite similar in present system; letter of bank guarantee or bonds verify financial capacity, certificate of proficiency taken from the Ministry on former references of the contractor demonstrating minimum knowledge and experience to perform the work, and the offer letter showing the price proposed. Additionally in international tenders, the firms were asked to have an official agent or a branch manager in Turkey. Written proposals enclosed in sealed envelopes and delivered to the tender commission. The envelopes were opened in serial sequence and recorded as a list, which was later signed by the chairman and members. The lowest offer, which was in accordance with the requirements set forth in the tender documentation, obtained the contract. If no proposals are submitted or the proposals are not believed acceptable by the commission, a new tender was opened or the tender could be finalized by bargaining method. Its main difference from present system was to award the contract to the lowest bidder. The obvious disadvantage of the lowest offer method was predatory price cutting and consequential problems such as low quality workmanship or unfinished constructions because of bankruptcies. As mentioned before in contracts, there were rules on usage of national production building materials and employment of foreign labor should not be more than 10% of total amount of the labor. Nevertheless, the importation of materials was inevitable because of the capacity of inner production, hence, in such cases foreign currency transaction had to be done from the Central Bank because of fixed exchange rate regime.

In addition to design and drawings, controlling the construction processes of bridges was also handled by engineers and technicians working for the Ministry. There were also many foreign engineers working for the Ministry in controlling and planning. Nevertheless, as a result of insufficiency in number of engineers, most of the constructions were controlled by supervisors, while engineers were charged as chief control of group of constructions in close locations. These kinds of deficiencies caused many defects in constructions as in example of Manavgat Bridge. However, the worst case was the Gezer Bridge which was collapsed a year after construction in 1930 because of improper construction. After the collapse, the state had taken out warrant against persons who holds the technical responsibility and engineer Rudolf Beer, the chief control of Gezer Bridge, fled off the country. Nevertheless, the constructions were quite successful despite few discrete examples. Thus, it is possible to say that Turkish construction sector, had quickly and effectively adopted contemporary reinforced concrete technology in bridge constructions. Especially after the earthquake in Erzincan in 1939, none of the bridges in the region was collapsed, most remained undamaged, and only few of them had cracks. The damaged bridges were especially in fixed arch system, but these cracks did not caused serious structural problems, just converted the system into three-hinged arch such as in cases of Fadlı and Akçağıl Bridges. After this experience, hinged systems were preferred in earthquake regions.

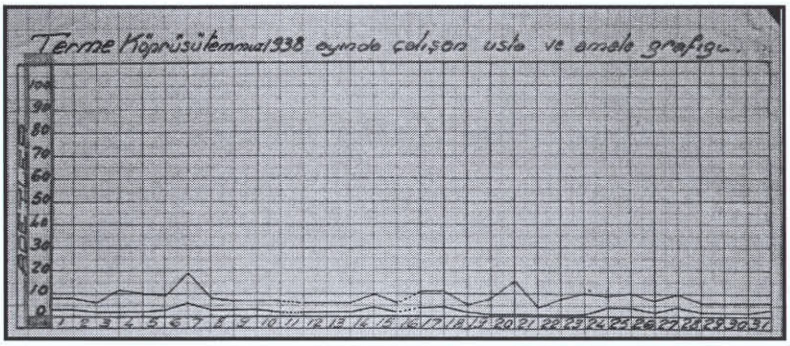

Figure 4.45 The graph showing the number of masters and workers during July 1938. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2235

The construction teams differed from thirty to hundred workers depending on the scale and urgency of the construction project (Fig. 4.45). Nevertheless, in normal conditions, an average construction team had twenty to thirty members and this number changes from five to thirty in various stages of the construction. In addition, sometimes the constructions supported with working teams of convicts or troop of soldiers especially during excavation of the foundations (Akkaya, 1989, p.94 and Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 3451).

Construction camp was generally consisted of few primitive huts made up of mud brick; these were workers dormitory, engineer's house and office buildings, and temporary tents when needed. Especially before 1950s, almost every site had a small graveyard for workers died from malaria which was one of the biggest health problems in every region of the country. Wishing to create a healthy generation free of disease, the Ministry of Health carried on a struggle against malaria epidemics between 1924 and 1950 (Tuğluoğlu, 2008, pp.351-359). Within this scope, building sites were sent certain amount of quinine. (Akkaya, 1989, p.94-97). The uncomfortable working conditions for both laborers and engineers continued until second half of 1950s. In this period, foreign companies set modern building sites for big scale projects that they had undertaken such as Seyhan Dam. They built small houses, dining baths, hall, and electrified them. As Müfit Kulen conveyed, "this had been awareness for our contractors and engineers. The fact that men deserve such comfort was comprehended" (Batmaz, 2006, p.158[68]).

The construction and controlling practices were parallel with current processes. As same in today's constructions, the process was recorded to attachment books and construction site diaries. The ministry was informed by reports and diagrams in every two weeks. Moreover, prior to starting, a work plan in line with the contract had to be prepared. Most of the constructions were contracted to finish in eight to twenty-six months but almost 80% of them take time extensions because of problems in supplying the building materials, extreme changes in costs under economic fluctuations, harsh winter conditions, and natural disasters such as water floods, and landslides. Nevertheless, contractors and the state had kept on the constructions and counterbalanced the disadvantageous situation on a unique relationship based on mutual trust, which today do not exist. Although not officially authorized, the engineer-cum-bureaucrats took the initiative and made payments in advance to the contractors in need without waiting for bureaucratic process; in return, contractors had never taken advantage of this good will. Hence, the trust-based relationships between the state and contractors helped them to overcome poor conditions of the building sector, underdeveloped bourgeoisie, and rigid bureaucratic procedures in the early phases of the republic and finally

[68] "[Yabancı firmalar] Türkiye'ye geldiklerinde aşırı demeyeceğim ama, asgari konfor teminini ön plana aldılar...netice itibariyle güzel şantiyeler kuruldu. Güzel şantiye derken villalar falan kastetmiyorum ama, bazı ahvalde böyle iki üç odalı ufak evler, muntazam yatak yerleri, yemek yerleri, banyolar, elektrik jenaratör getirildi, elektrik getirildi... Bunlar açıkcası bir görgü oldu bizim müteahhit arkadaşlarımızada, çalışan müteahhitlere de tabii. Bir insanın bu gibi bir konfora layık olduğu ortaya çıktı." Oral history study with Müfit Kulen, source: Batmaz et al., op cit., p.158.

they achieve to finish the constructions (Koç, 1983, pp.43,48). The contractor-state solidarity that defined by Akkaya (1989, pp.30-31) as "a nice custom which was never led to an act of misconduct" was ended after a problem during the construction of Porsuk Dam in 1952. The construction of Porsuk Dam was undertaken by Hazık Ziyal. When Ziyal had to make huge amount of cash payment for cement of the project on condition of cement monopoly, he became hard up for money. Then, the responsible bureaucrat ordered to pay the progress payment beforehand by preparing documents as he completed the first part. This was a common practice for such kind of conditions but the clerk who made the payment noted on the paper as "paid on the order". The inspectors opened investigation on this note, and in the end, the bureaucrat sentenced while the contractor bankrupted (Akkaya, 1989, pp. 122-125, 133). After long years of jugment, they both were accuited and Hazık Ziyal got his payment as late as prime ministry of Süleyman Demirel (Interview with Demirel on 20.1.2008). The last example of such kind of solidarity in bridge constructions was happended during construction of Birecik Bridge.

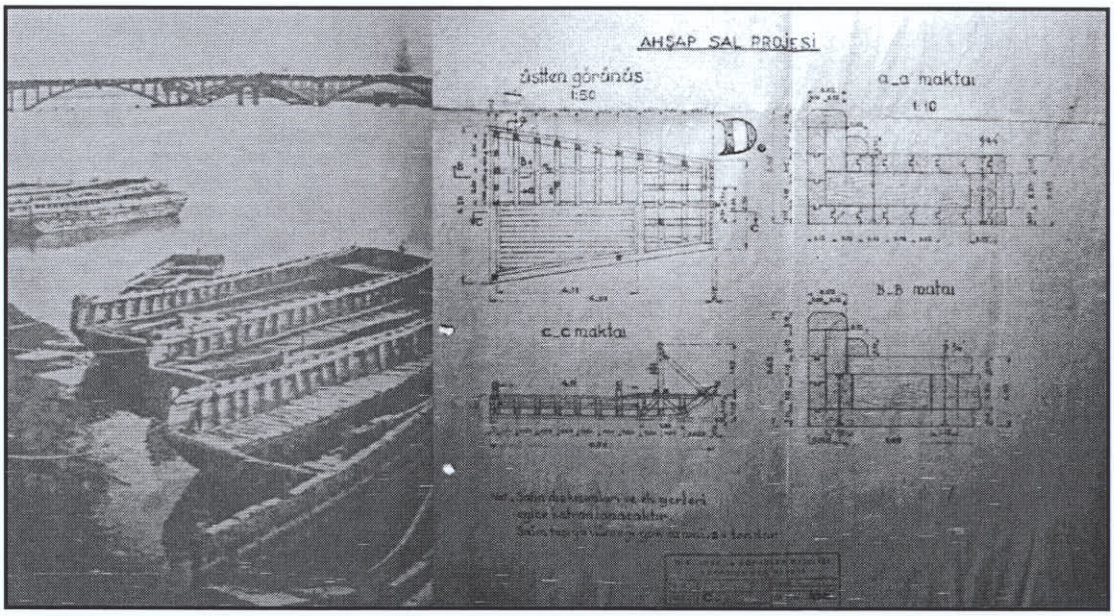

Figure 4.46 Right: Drawing of a raft by the Ministry of Public Works. Left: The rafts and the Birecik Bridge under construction. Sources: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2334 and KGM Bulletin, Dec. 1955, back cover

As is known Birecik had been a strategically important node of the Silk Road, an ancient trade route from China to west through Anatolia. Since very early times, the caravans cross the river Fırat on rafts at Birecik. This primitive method, which caused loss of many lives, had continued for ages because, the high flow of the river did not let the construction of piers in water. It even could not be bridged by technological means of 19th century.

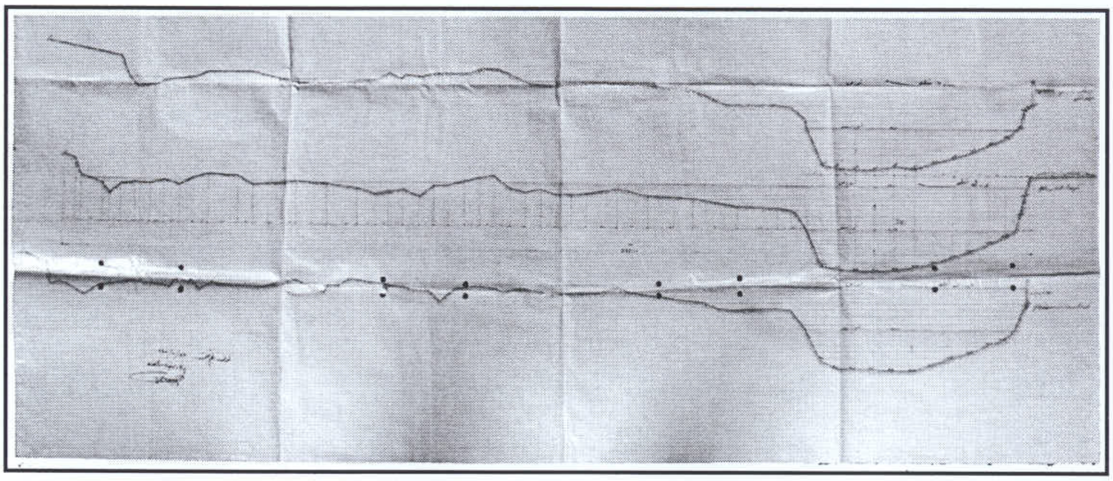

Figure 4.47 Section from the river Fırat on Birecik region, prepared in 1926. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2334

The earliest document found about construction of a bridge in Birecik dates back to late Ottoman period. It is copy of a report in French and titled *"Viaduc a projeter sur l'Euphrate a Biredjik: Raport, Considérations générales"*. The report was a preliminary survey on traffic, soil conditions, river flow regime, and conditions for a potential construction such as supply and transport of materials. It was prepared and signed by engineer Younés as "Aleppo, 16-29 November, 1328 (1912)" and approved by chief engineer Nadir Bey (Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2334). The Birecik Bridge was presumably one of the bridges (like Kömürhan Bridge) mentioned in 1908 development plan of Noradunkyan as the decided projects on the river Fırat in Zor region, Aleppo[69] (Noradunkyan, 1324(1908), pp.25-27).

[69] "İcrası mukarrer ameliyat meyanında [yerine getirilmesi kararlaştırılmış işler arasında] Edirne vilâyetinde vaki [bulunan] Meriç Köprüsü'nün ikmali [tamamlanması], Halep vilâyetiyle Zor

And it is quite possible that the report was prepared by Régie Général, the French company that gained the concession of repair and construction of Ottoman roadways in 1909.

The following study was done in 1926. In addition to the section drawings of the riverbed, various sketches for masonry and wooden bridges were prepared. Nonetheless, the project was shelved once more for an unknown reason. In 1934, the municipality restarted the project and send engineer Mecit Bey to the region to define the most suitable location for the bridge. Mecit Bey decided two suitable locations, Telmusa and Birecik and prepared a report on comparison of both. In spite of the advantages of Telmusa location such as being far from the Syrian border and having shorter sections of the riverbed, he offered Birecik because of its economical importance. According to his report, even in traffic volume lower than normal under winter conditions, the amount of crossing in Birecik was 380 men, 44 animal, 2 automobiles, and 2 motor trucks on 23.1.1934 (Report by eng. Mecit Bey to the Department of Roads and Bridges on 30.1.1934, Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2052). Because of the economic potential of such kind of project, construction of the bridge caused competition between the close towns of the possible locations. Some towns gathered signatures, and petitioned directly to the prime minister and demanded bridge on their nearby. Nevertheless, the project could not be realized even after the third survey under economic conditions of great depression.

By 1948, the economical problems had been left behind to some extent through Truman Doctrine and Marshall Funds. Under the increasing financial resources and increasing priority of transportation facilities of raw materials from industrial centers to the consumer markets within the country and abroad, the Birecik Bridge project was reconsidered. In October 1949, a group of expert consists of both Turkish and American engineers had gone to Birecik for on-site survey (Fig. 4.48). Next year the exploration works were put out a tender. Fevzi Akkaya of STFA who started to be known for his precise drilling works undertook the exploration works of the bridge for 28.836,50 liras and accomplished in short period of time. Then, the project was prepared and put out to tender on 23.7.1951. STFA also

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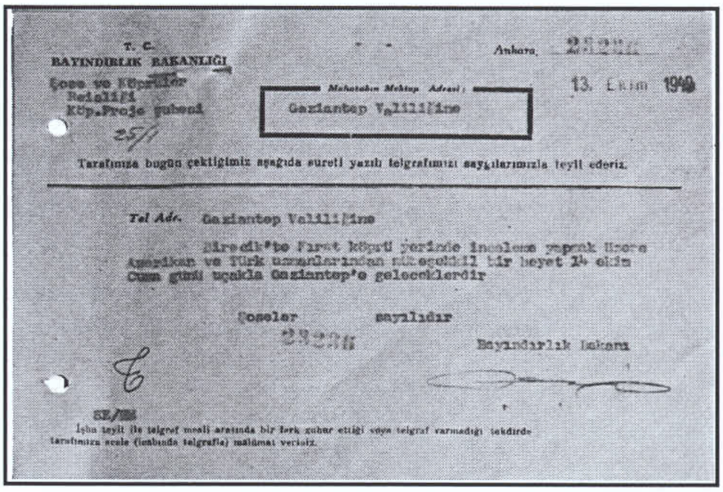
sancağında Fırat Nehri üzerinde iki köprü ve Mamuretü'l-aziz [Elazığ] vilâyetinde İzoğlu mevkiinde kezalik [aynı şekilde] Fırat Nehri üzerinde bir asma köprü inşası gibi birkaç cesim [büyük] köprü tesisi dâhil bulunmaktadır." Source: "Noradunkyan Efendi'nin Nafıa Projesi", Nafıa Nezareti, 1324 [1908], pp. 25-27.

made bid for construction, but after severe competition, a young construction firm named *Amaç Ticaret Türk Anonim Şti.* obtained the contract by 18,75% reduction for 2.008.520,92 TL. The security deposit was 319.315,33 TL. In addition to *STFA* and *Amaç Ticaret TAŞ.*, *Siyami Yurtören* and *Rıza Batuk* were also participated in the tender.



T. C.
BAYINDIRLIK BAKANLIĞI
Şose ve Köprüler
Reisliği
Köp. Proje Şubesi
25/1

Ankara,
13. Ekim 1949

Muhatabın Mektup Adresi:
Gaziantep Valiliğine

Tarafınıza bugün çektiğimiz aşağıda sureti yazılı telgrafımızı saygılarımızla teyit ederiz.

Tel Adr. Gaziantep Valiliğine

Birecik'te Fırat köprü yerinde inceleme yapmak üzere Amerikan ve Türk uzmanlarından mürekkep bir heyet 14 ekim Cuma günü uçakla Gaziantep'e geleceklerdir

Şoseler saylıdır

Bayındırlık Bakanı

İşbu teyit ile telgraf meali arasında bir fark zuhur ettiği veya telgraf varmadığı takdirde tarafımıza acele (muhabirde telgrafla) malûmat veriniz.

Figure 4.48 The telegraph informing the governor's office of Gaziantep that a group of Turkish and American experts would make on-site survey for Birecik Bridge. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2052

Constructions were started in 1952. Engineer Ertuğrul Barla was the first supervisor of the construction and Dr. engineer Adnan Arbatlı, son of well-known contractor Muhtar Arbatlı, was the second[70]. Later engineer Kadri Çile took over the supervisorship in May 1953 and had continued working until he was shot in construction site by an ex-worker who he fired. According to some sources, he was killed by the river drivers who were against construction of the bridge (TMH, 2006, pp.2-3). The tragic death of engineer Çile was transfigured as *"Bayındırlık Şehidi"* (martyr of development). Last supervisor, engineer Suavi Atasagun,

[70] There were conflicts between the supervisor and the control engineer of the Ministry. The disaccord had caused problems in construction process and finally, Arbatlı quitted. Source: Correspondence on the conflict during 1952 and 1953. Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2052.

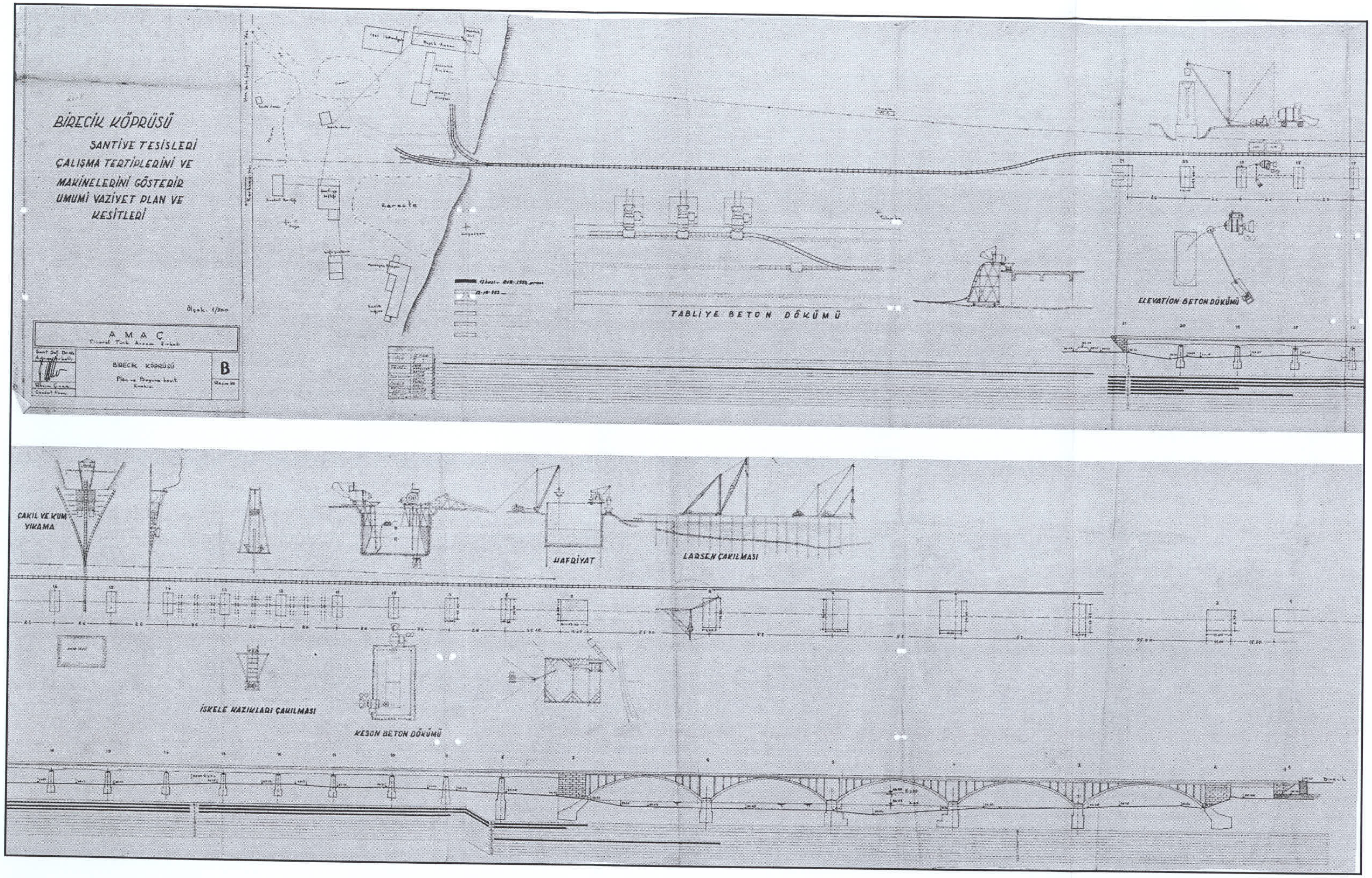


Figure 4.49 Site plan of Birecik Bridge showing the equipments in the site. Source: KGM Archives

completed the project in 1956. The control engineer was engineer Mustafa Tanrıkulu throughout the construction.

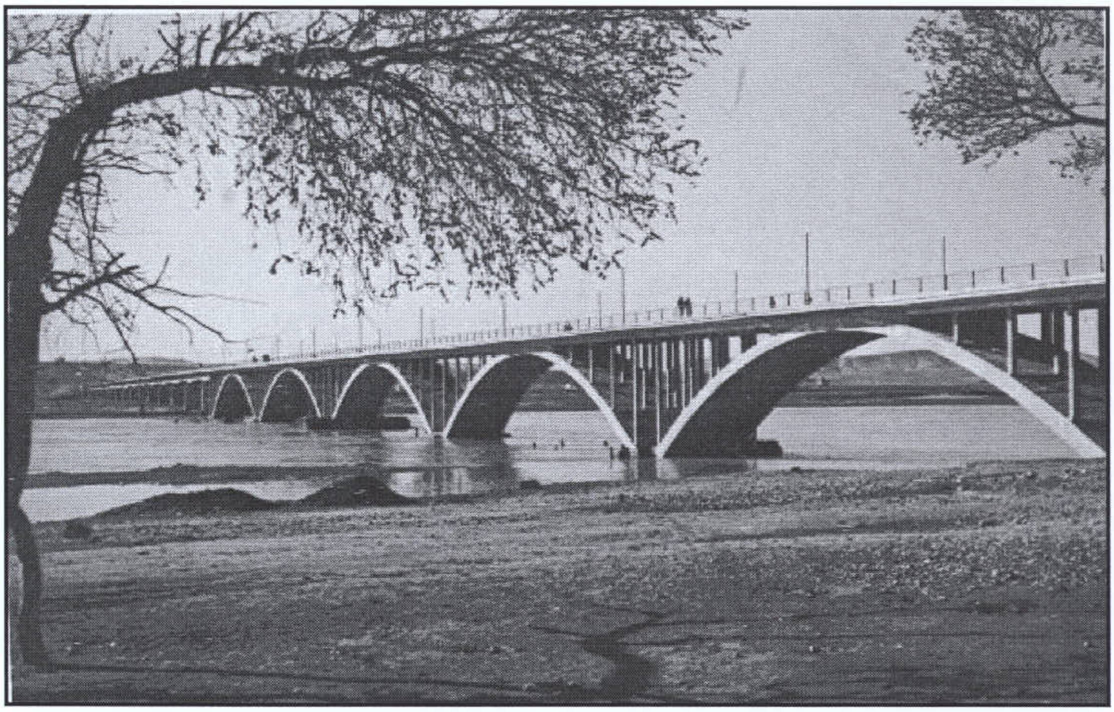
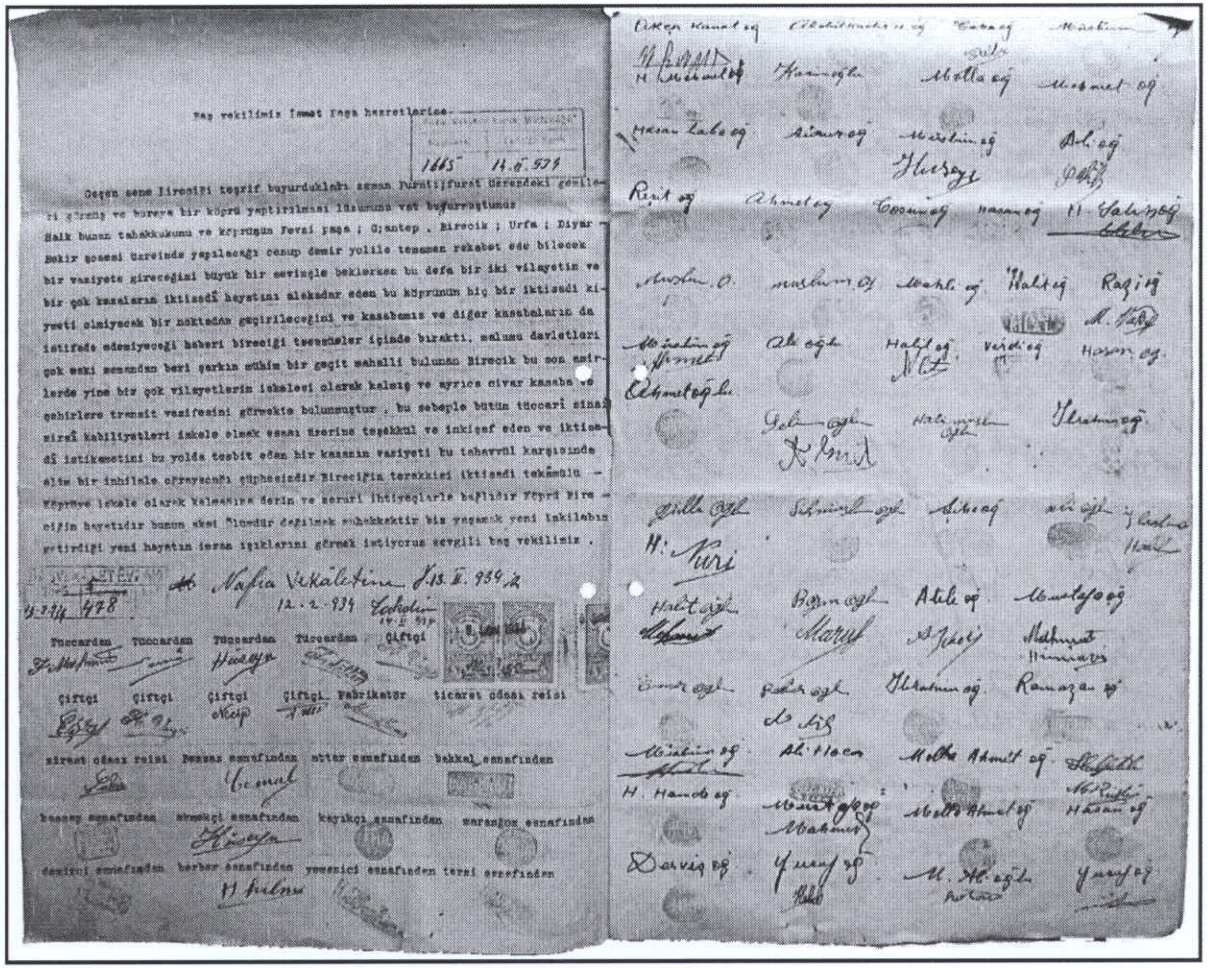


Figure 4.50 Photograph of Birecik Bridge circa 1960. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2052

On the date it was constructed, the Birecik Bridge was the longest road bridge and the longest reinforced concrete bridge of Turkey. Moreover, it was ranked as the third longest bridge after Fırat and Karakamış steel railroad bridges. The total length of the bridge is 694,60 meters and width 11,0 meters. It was designed as twenty spans, five of which are arches spanning 57,0 meters, while rest span 26,0 meters and there are also 22,0 meters long overpasses on both sides (TMMOB, 2007, pp.168-173). The centerings for the 57,0 meters spanning arches were designed in steel truss by Ligor Ekserçoğlu. During the construction, 4400 tons of cement, and 921 tons of iron was used and 17.000 m3 concrete was poured.



Baş vekilimiz İsmet Paşa hazretlerine

1665 14.6.934

Geçen sene Bireciği teşrif buyurdukları zaman Piratijfurat üzerindeki gemileri görmüş ve burera bir köprü yaptırılması lüzumuna vat buyurmuştunuz

Halk bunun tahakkukunu ve köprünün Fevzi paşa ; G;antep . Birecik ; Urfa ; Diyar Bekir şosesi üzerinde yapılacağı cenup demir yolile tamamen rekabet ede bilecek bir vaziyete gireceğini büyük bir sevinçle beklerken bu defa bitin bir iki vilayetin ve bir çok kazaların iktisadî hayatını alakadar eden bu köprünün hiç bir iktisadi kiyeti olmıyacak bir noktadan geçirileceğini ve kasabamız ve diğer kasabaların da istifade edemiyeceği haberi Bireciği teessüfler içinde bıraktı. malumu devletleri çok eski zamandan beri şarkın mühim bir geçit mahalli bulunan Birecik bu son asırlarda yine bir çok vilayetlerin iskelesi olarak kalmış ve ayrıca civar kasaba ve şehirlere transit vazifesini görmekte bulunmuştur . bu sebeple bütün tüccarî sinaî zirai kabiliyetleri iskele olmak esası üzerine teşekkül ve inkişaf eden ve iktisadî istikametini bu yolda tesbit eden bir kazanın vaziyeti bu tahavvül karşısında alim bir inhilale uğrayacağı şüphesizdir Bireciğin terakkisi iktisadi tekâmülü – köprüye iskele olarak kalmasına derin ve zarurî ihtiyaçlarla bağlıdır Köprü Bireciğin hayatıdır bunun aksi ölümdür değilmek muhakkaktır biz yaşamak yeni inkılabın getirdiği yeni hayatın irfan ışıklarını görmek istiyoruz sevgili baş vekilimiz .

4.7.934 478

Nafia Vekâletine 13.VI.934

12.2.934

Tüccardan Tüccardan Tüccardan Tüccardan Çiftçi

Çiftçi Çiftçi Çiftçi Çiftçi Fabrikatör ticaret odası reisi

ziraat odası reisi bezzaz esnafından attar esnafından bakkal esnafından

kasap esnafından ekmekçi esnafından kayıkçı esnafından marangoz esnafından

denizci esnafından berber esnafından yemenici esnafından terzi esnafından

Figure 4.51 Petition of Birecik to Prime Minister İsmet İnönü for construction of the bridge in their nearby, in 1934,
Source: Unclassified material from State National Archives of Turkey-Republican Archives, KGM Fund, Binder No.2334

As in all constructions of the period, main problem during the construction of Birecik Bridge was the supply of building materials especially of cement. Iron was supplied from Karabük, while cement from the factory in Sivas or imported when it could not be supplied from local producers through Mersin and transport by train and trucks. Timber was supplied from the nearby Regional Department of Forestry as usual. As defined in technical specifications in tender documents, the calculations were predicated on German reinforced concrete code. Other striking articles in the specifications were on the use of concrete mixer and concrete vibrator. The special emphasis on their use shows us that their use had still not widespread in 1950s.

In the time of tender, Amaç Co. [71] was a young anonym company and it had already made high price cut to undertake this prestigious project. Unfortunately, the firm had to cope with many problems during the construction. For instance, Fırat had overflowed four more times except for the regular season of floods in 1952 and 1953, and washed away the scaffoldings and some of the construction machinery. As a consequence of these unexpected floods, the time had to be indulged for twenty-six months and total time increased from twenty-four to fifty months. However, even this would not have been enough for complete. The real problem was the extreme increase of the prices over the financial capacity of the contractor. The increase in the unit cost of bridge construction was more than four times between 1951 and 1955. The contractor, who already made high price cut, could not cope with effect of high inflation on costs. Although the Department was aware of the problem, it was not possible to make extra payment except for the contract. However, it was obvious that the situation would lead to bankruptcy of the contractor if not solved. In such case, restarting with a new contractor would extend the estimated construction time, which was already too late. As told above, there had been a unique relationship based on mutual trust and solidarity between state and contractor in Turkey until 1950's. However, it was the time when constructive bureaucracy was irritated because of the investigation and trial on the construction of Porsuk Dam. Therefore, the problem of Amaç Co. was solved prudently by application of "the nice custom" within the legal framework of the contract. By depending on the article that says the contract could be cancelled if cost increases over 20% of the price, the contract was cancelled, put out to tender again. Although second tender was open

[71] According to the circular of signature, the authorized persons of the firm were Hürren Şeren and Hikmet Bekiroğlu. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2052.

to all contractors, none of them participated in tender except for Amaç Co. and same company obtained the contract on 30.11.1955. Hence, the loss of Amaç Co. was recovered partially.

ABONESİ :
Yıllığı : 200 Kuruş
6 aylığı : 100 »
Sayısı : 5 »
İdare evi :
Vatan Basımevinde
Hususi daire

BAFRASESİ

Hertürlü yazılar
Yayın direktörlüğü adına
gönderilmelidir
Dercedilmeyen yazılar
iade edilmez.
İlânat pazarlığa tabidir.

18 Ağustos 1937 Çarşamba

çarşamba günleri çıkar, her şeyden bahseder
MEMLEKET GAZETESİDİR.

Yıl : 1 Sayı : 19

KADİRŞİNASLIK VE ŞÜKRAN BORCU

Yeni yapılan Kızılırmak köprüsüne (Çetinkaya)köprüsü adı konmasını Teklif ediyoruz

Bafra kasabasiyle Hinterlandının mühim bir kısmını yine Bafra muhitinin diğer bir kısmından ve komşu kaza ve vilâyetlerden ayıran Kızılırmağın asırdide ahşap köprüsü senenin her mevsiminde mütemadiyen tamir gördüğü halde yine yolcularının emniyetle geçmesine müsait değildi. Hele araba ve hayvanlar için geçmek bir nevi tehlike teşkil ederdi. Altı yüz küsur metro uzunluğunda bulunan bu ahşap köprü tuğyan zamanlarında sarantılar geçirir, karlı havalarda buz tabakalariyle örtülerek yol vermezdi. Vatandaşlar için ıztırap verici bir manzara olan bu köprü Bafranın başta gelen mühim bir derdi idi. Geçmiş devirlerin alâkalanmadığı, Halkın bu derdi karşısında Cumhuriyet hükümeti derin bir hassasiyet göstererek rejimin şanına yakışır muazzam bir beton köprü yükseltmiştir.

Yüz binlerce liraya mal olan bu medeni abidenin değeri Bafra ve muhiti için biçilmez bir kıymeti haizdir. Bununla beraber hâlâ kullanılmakta olan ahşap köprünün bu köprü ile mukayesesinden kendini alamayan her ziyaretçinin, eski idarelerin [illegible] üzerinden geçtikleri bu ahşap köprü ile Cumhuriyet rejiminin henüz doğuşunda yarattığı ve başardığı bu yeni eserin mukayesesinden ve aradaki baş döndürücü farktan kendilerini alamayarak gayri ihtiyari takdir ve şükranla kalplerinin kabardığı, yüzlerinden ve gözlerinden belirmektedir.

İşte muazzam vasfına lâyık 251 metre uzunluğunda ve yedi gözden mürekkep betonarme Kızılırmak köprüsünün çok çetin bir azmin mahsulü olduğunu hakkiyle takdir etmek ancak eseri görmekle kabildir. Bu çetin işin başarıcısı da kendi isminden ilham alarak vasfına ve ünvanına lâyık eseri vucude getirmiş olduğundan dolayı değerli ve sayın Nafia vekilimiz Bay Ali Çetinkaya'nın ismine izafetle „Çetinkaya„ köprüsü namiyle bu köprünün adlanmasını dilemek ve temenni etmek Bafra için bir nişanei şükran ve kadirşinaslık eseri olduğundan Halkımızda beliren bu arzunun gazetemiz vasıtasiyle teklifini efkârı umumiyemiz namına bir borç biliriz.

Büyük önderimizin çizdiği bayındırlık yolunda yürüyen İsmet İnönü Hükûmetinin azimkâr ve kudretli Nafia vekilinin, Bafranın içten gelen bu arzusunu kabul buyuracağına emin olan gazetemiz, bu teklifin Belediye meclisince fevkalâde bir içtimada alınacak bir kararla teklif ve temennisini sayın Ali Çetinkayaya arzolunması mu'tasavver bulunduğunu dahi memnuniyetle öğrenmiştir. Belediyemizin Halk efkârına bihakkın tercüman olan bu tasavvurunu biranevvel kuvveden fiile çıkarmasını sabırsızlıkla beklemekte ve yerinde vuku bulacak bu hareketinden dolayı Belediyemizi takdire şayan görmekteyiz.

Karasinek ve Sivrisinekle Mücadele Talimatnamesi

Bafra Belediye Reisliğinden :

1 - Kuyular; helâ çukurlarile münasebetleri olmayan yani her ikisi arasındaki mesafe 10 metreden fazla olan kuyular (10 metre dahilindeki kuyular sureti kat'iyede doldurularak kapanacaktır.) üzerleri harçlı olarak yapılacak Sivrisinek ve sair mevad içerisine girmeyecek surette mazbut kapaklarla kapatılmış bulunacaktır.

2 - Bulaşık çukurlarile helâ çukurları gayet muntazam surette üzerleri kapatılmış olacak, ve hiç bir sivrisinek ve karasinek içine giremeyecek şekilde bulunacaktır.

3 - Helâ deliklerine es, subap veya münasip şekilde kapak konacaktır.

4 - Dükkânlar ve umumi mahaller mutlak surette birer adet (fazlası ihtiyarî) sinek kapanı bulundurmağa mecburdur.

5 - Şehir dahilindeki ahırlarda son derece temizliğe itina edilecek ve her sabah ahırdaki mevcut hayvanlar çıktıktan sonra her taraf silinip süpürülecek ve bu suretle toplanan gübreler imha edilecek veyahut her defasında kireçlenecektir.

6 — Ahır gübrelerinin ve süprüntülerin karasinek ve sivrisinek üremeyecek hale sokulmaları için bu [illegible] kireç, sulfatdüfer veya mazot dökülecektir.

7 — Evlerde veya dükkânlarda veya umumi mahallerde [illegible] süprüntü teneke veya sandıklar kapalı olacak ve bu kaplar içine sinek girmeyecek tarzda [illegible] yapılacaktır.

8 — Kasaba hudutları dahilinde açık su kanalla

(Sonu sahife 2 de)

Figure 4.52 News about the proposal of the Municipality of Bafra on giving the name of Ali Çetinkaya, the Minister of the Public Works to the Kızılırmak Bridge. Source: "Kadirşinaslık ve Şükran Borcu: Yeni Yapılan Kızılırmak Köprüsü'ne Çetinkaya Köprüsü Adı Konmasını Teklif Ediyoruz.", *Bafrasesi Gazetesi,* Year:1, Vol: 19, 18 August 1937.

The supplementary contract was igned by Celal Bayar and Adnan Menderes who were personally interested with the project. It was for six months and the contract price was 1.010.517,76 TL. Together with this amount the total cost of the bridge had became 3.019.038,68 TL. However, in 1951 the cost was estimated as 2,5 million liras and time as twenty-four months. As result of the obvious disadvantage of the lowest offer method, the bridge was cost half million Turkish Liras more than estimated price and realized more than twice times of the estimated time. Even after submission of the bridge, Amaç Co. suffered under fiscal crisis for a time.

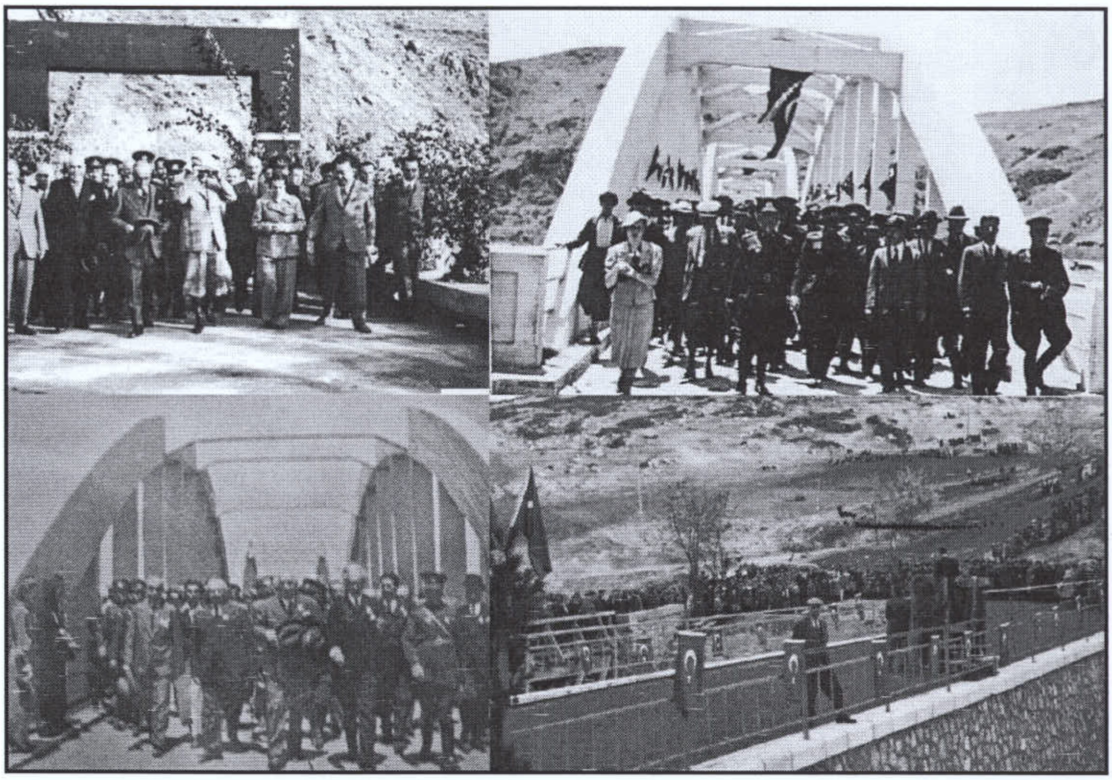


Figure 4.53 Scenes from various inauguration ceremonies. In all ceremonies there are women figures. From left to right up down: Inagurations of Singeç Bridge by Ataturk in 1937, Bafra Bridge in 1937, Sakarya Bridge by Ali Çetinkaya in 1937, and crowd in inauguration of an unknown bridge, circa 1940s. *Sources:* Available on 22.2.2007 at http://egitek.meb.gov.tr/uretim/atacd/009/5b35.htm ; KGM Archives and www."Nafia Vekili Ali Çetinkaya Sakarya Köprüsü'nü Açtılar", *T.C. Bayındırlık İşleri Dergisi (BİD),* Vol. 4, No.1, 1937, pp.148-154.

The bridges, which built with extreme devotion under problematic economic conditions and poor state of building sector, were opened to traffic with big vigorous ceremonies. They have been perceived not only as merits of level of national engineering and technology but also means of modernity project; therefore, the inaugurations turned into enthusiastic celebrations of achievements of the republican regime. Especially foremost big scale bridges, spanning major streams such like river Fırat, were opened to traffic by the participation of crowded group of state elites, journalists and public. Even special trains were laid from the capital for those who would attend the inaugurations of major big span bridges.

15/7/932

SON POSTA — Sayfa 9

Memlekette Köprü Siyaseti İyi Neticeler Veriyor

Asırlardanberi Yapılamıyan Köprüler 3 Sene İçinde Nasıl Vücuda Getirildi?

Kömürhan Köprüsüne "İsmet Paşa„ İsmi Verilecektir

Ankara, 15 (Hususî) — Üç senedenberi tatbik edilen ve üzerinde hummalı bir faaliy[...] çalışılan k[ö]prü siyaseti [...]elerini vermiye başlamıştır. Anadoluda, Romalılar ve Selçukiler devrinden Cümhuriyet devrine kadar ancak kârgir ve demir olarak 80 büyük köprü yapılabilmişti. Cümhuriyet devrinde ve birkaç sene içinde yapılan köpr[ü]l[er] [k]emiyet ve keyfiyet itibarile [b]u köprülere kat kat faik bulunmaktadır.

Üç sene zarfında 2600 metre tulünde 30 u mütecaviz esaslı ve büyük betonarme köprü yapılmıştır. Bu rakama küçük köprüler dahil değildir. Köprü siyaseti için şimdiye kadar 2 milyon lira sarfedilmiştir. İnşaatı tamamile ikmal edilen köprülerin umum tulü 2000 metredir. Mütebaki 600 metrelik köprünün inşaatı da ikmal edilmek üzeredir.

Kömürhan, Çarşamba, Porsuk, Sarıoğlan, Nazilli, Kalabak, Dalamaçay, Güngörmez, Büyükagonya, Müstecap, Küçükağonya, Çan, Sekilik, İncesu, Manavgat, Ömerli, Pertek, Bakırçay, Sünnet, Silâhtar, Çakıt, Koyunağılı köprülerinin inşaatı ikmal edilmiştir.

Aksu, İspiroğlu, Nişankaya, Akçaağıl, Vezirhan, Keloğlu, Paşir köprülerinin inşaatına devam edilmektedir.

Malatya ile Elâziz arasında ve Fırat üzerinde yapılan Kömürhan köprüsü bugün temamile ikmal edilmiş bir haldedir. Orta gözü 109 ve tulü 160 metre olan bu köprü Asyadaki betonarme köprülerin en muazzamıdır. Bu köprünün küşat resmi bugünlerde oraya gidecek bir heyet huzurunda yapılacaktır. Ve köprüye "İsmetpaşa„ ismi verilecektir. Bu beton köprü azametinde Fransada 3, Almanyada 1 ve Amerikada 2 köprü vardır.

Bu mevsimde suların çekilmesi dolayısile köprü faaliyeti hat bir devreye gelmiştir. Bu meyanda Sinobu Kastamoniye birleştiren ve Gökırmak üzerinde bulunan İspiroğlu köprüsile, Antalyadaki Büyük Aksu köprüsünün inşaatı faaliyetle ilerlemektedir. Aksu köprüsü, yeni yapılan Kömürhan ve Çarşamba köprülerinden sonra memleketin en mühim yol köprüsü olacaktır.

İki senedenberi inşasına devam edilen, Sakarya üzerinde ve Gölpazarı ile Vezirhan istasyonu arasında yapılan demir köprünün esasl kısımları ikmal edilmiştir.

Beypazar - Sarıköy arasında ve Sakarya üzerindeki Koyunağılı köprüsünün de inşaatı bitmiş ve müruru ubura açılmıştır.

Şarkî Karahisarda, Suşehri civarında Kelkit ırmağı üzerindeki betonarme köprünün büyük müşkülât arzeden bir ayağının inşası muvaffakiyetle bitirilmiştir.

Kâğıthane deresi üzerinde yapılan Sünnet köprüsile, Alibey deresi üzerindeki Silâhtarağa köprülerinin inşaatı ikmal edilmiştir. Resmi küşatları bugünlerde yapılacaktır. — Sabah

Kömürhan köprüsünden iki manzara

Figure 4.54 News about Kömürhan Bridge on popular media. Source:" Memlekette köprü siyaseti iyi neticeler veriyor: Asırlardan beri yapılamayan köprüler nasıl vücuda getirildi. (Kömürhan Köprüsüne "İsmet Paşa" ismi verilecektir).", *Son Posta Gazetesi,* 15 July 1932, p.9.

As parallel to the development politics of the early republic, the reconstructed places – sometimes a drained marsh, sometimes a renovated village- were renamed with names reminding "*bayındırlık*" such as çirkinoba to güzeloba, kurakbayır to yeşilbayır[72] etc. Some of the bridges were named in line with this policy. During his last visit to eastern Anatolia in 1937, Ataturk opened a reinforced concrete arch bridge on Soyungeç River and named it as Singeç Bridge[73]. In some cases, the bridges were named with the names of bureaucrats or state elites who contributed the construction processes such as İsmet Pasha, Kazım Dirik and Çetinkaya bridges (Fig. 4.52).

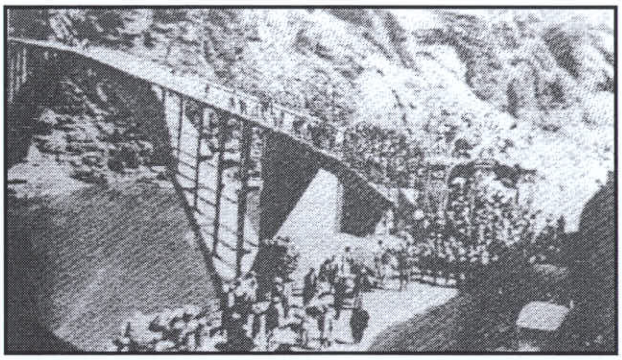


Figure 4.55 Photo from the inauguration ceremony of the Kömürhan Bridge on 5.9.1932. Crowded groups of guests are crossing the bridge on foot. Source: available at www.ahmetduman.av.tr on 25.6.2009

For instance the Kömürhan Bridge, which was given the name of then Prime Minister İsmet Pasha by suggestion of the Ministry and order of the President Mustafa Kemal, was opened to traffic by himself on September 5, 1932. Delegations from Sivas, Antep, Maraş, Malatya,

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[72] Uglyville to niceville , aridhill to greenhill. (author's translation)

[73] "17 Kasım 1937 sabahı Atatürk, önce Dördüncü Genel Müfettişlik'e gelerek, General Abdullah Akdoğan'dan Elazığ ve sorunları hakkında bilgi aldı. Bir süre sonra da Tunceli'ne bağlı Pertek ilçesi'ne hareket etti. Buradan Murat Suyu'nu geçerek Hozat Deresi üzerinde yeni yapılmış olan Soyungeç köprüsüne geldi. Beton köprü gerçekten gösterişli yapılmış, çevrenin yıllardan beri süregelen ulaşım sorununu çözmüştü. Atatürk, köprünün açılışını yaptıktan ve kurdeleyi kestikten sonra : 'Daha önce soyunup suya girdikten sonra geçilen ırmağa Soyungeç denmiş. Şimdi buna lüzum görülmeden sinerek geçiliyor. Köprüye bundan sonra Singeç diyelim' dedi." Source: *Ulus Gazetesi*, 18 Nov. 1937.

Urfa, Elaziz (Elazığ), and Diyarkır, agents from NOHAP, and crowded group of press, and public had attended the inauguration ceremony. Guests were offered breakfast and lunch at site.

The last of this kind of enthusiastic inaugural ceremonies was for the Birecik Bridge (Fig. 4.56). In spite of the above mentioned long and problematic construction process, the Birecik Bridge was completed two months earlier than expected by the financial support of the supplementary contract and opened to traffic on April 10, 1956. President Celal Bayar and Prime Minister Adnan Menderes were present at the ceremony with a crowded group of invited guests such as members of the parliament, General Riley the head of American Economical Aid Committee, head of planning committee of Iraq and press members. The construction of the bridge was introduced, in the daily media as "one of the unique edifices of constructive capacity and ability of Turkish power". The Mayor of Gaziantep Kamil Ocak celebrated this construction enthusiastically and said "Turkish engineers, Turkish technicians, Turkish laborers connect east and west!" [74]

[74] Apr. 10, 1956, Gaziantep:

"Türk gücünün yapıcı kudret ve kabiliyetinin canlı ve müstesna eserlerinden bir yenisini teşkil eden Birecik köprülünün açılış merasiminde bulunmak üzere dün gece trenle Adana'ya hareket eden Reisicumhur Celâl Bayar ve Başvekil Adnan Menderes beraberlerinde vekiller, mebuslar, Irak İmar Meclisi Reisi, Amerikan İktisadî Yardım Heyeti Başkanı ve basın mensuplara olduğu halde, bugün saat 10.00 da Gaziantep'e gelmişlerdir.

Burada önce Gaziantep Belediye Reisi Kâmil Ocak, Reisicumhurla Başvekil ve diğer vekillerle misafirleri selâmladıktan sonra şu konuşmayı yapmıştır:

"Bugün memleket hizmetine resmen girecek olan muazzam eserlerinizin kıymet ve mânasını müdrik olan hemşehrilerimizin sevinç ve heyecanını şu mahşeri tonluluk ne güzel ifade etmektedir. Gazi yurdun kahraman evlâtları size medyunu şükrandırlar. Uzun yılların affedilmez ihmâli neticesi olarak muasır medeniyetinin nimetlerinden nasibini alamıyan Türk milletini en kısa bir zamanda kalkındırmak, iktisadî hürriyete kavuşturmak ve lâyık olduğu seviyeye çıkarmak irin büyük bir azim ve enerji ile işe başlayan demokrat iktidar, dünya çapındaki teşebbüslerinin hakikate inkılâp ettiğini görmekle bahtiyardır.
...Fırat'ın coşkun suları üzerinde kurulan ve karanlık sefalet dolu bir maziyi kapayarak saadet yolu açacak olan bu köprü Türk milletine hediye ediliyor. Türk mühendisi, Türk teknisyenleri, Türk işçisi Şarkla Garbı birleştiriyor. Temel atmalar resmi küsatları, resmi kuşatlar temel atmaları kovalıyor.

Daha dün denilebilecek kadar yakın bir mazide hükümet elivle tek bir çivinin çakılmadığı bu devirde bugün hükümet konakları hastaneler, postahaneler, enstitüler, iş hanları, banka binaları, çimento fabrikaları vesaireler demokrat iktidarın yapıcılık kudretine birer delil olarak semalara yükseliyor. Bütün bunları, aziz hemşehrilerim bir tek cümle ile ifade etmek istersek diyebiliriz ki, Türk milleti mesut ve müreffeh bir istikbale doğru cesur ve metin adımlarla başdöndürücü bir süratle ilerliyor...

Yapamazlar, tamamlıyamazlar, yarıyolda kalacaklardır, diyenlere onbeş gün evvel Karadeniz kıyılarında Zonguldak'tan, bir hafta evvel Tuncbilek' ten, dün Çukurova'dan bugün Gaziantep'ten ve

Figure 4.56 Crowd in the inauguration ceremony of the Birecik Bridge on 10.05.1956. President Celal Bayar and Prime Minister Adnan Menderes stand in the front. Source: Cover page, *Bulletin of General Directorate of Highways (KGM)*, Vol.6, No.66, 1956.

As a matter of fact, the bridge had truly connected Urfa and the rest of the Southern Eastern region with middle Anatolian markets and western harbors. Before 1956, Birecik was a little town of agriculture. By the reduced costs and increased transportation safety and comfort, the economical mobility and capacity of the trade route from east to west were increased. Especially mechanical and agricultural sectors developed and in the following decades, Gaziantep became a small-scale industrial center under the demand for production and repair of machinery parts. In addition to its importance as being the longest road bridge of the country in 1950s, the bridge is vital as being the tool of sustainable economic development and sustainable modernization. As clearly seen in case of the Birecik Bridge, the

birkaç saat sonra da tarihte ilk defa insan gücüne mağlüp olan Fırat'ın azgın sularının üzerinde cevap veriyoruz. Başladık, yaptık, tamamlıyacağız. Eserler meydanda!"

Source: *Ayın Tarihi*, Başbakanlık Basın Yayın Müdürlüğü, Ankara, Apr. 1956 (Available on 2.11.2009 at http://www.byegm.gov.tr) construction of road bridges lead to socio-economical transformations in their region. Therefore they had been not only ends but also means of modernity

4.4 Concluding Remarks

In addition to financial infrastructure, construction of a modern bridge requires high level of engineering knowledge, an adequate level of organizational and constructional capabilities, and qualified labor force, which are all outcomes of positive sciences, advanced technologies, and modernized ideas on state and public service. Therefore, together with all individual and organizational bodies that are needed to construct them, they are served to public use as products of modernity project.

While being acclaimed as ends of visible modernity, they were charged as modernizing apparatuses as well. Especially on the harsh geography of Anatolia where wild rivers and deep valleys limit the transportation, bridges become critical nodes of the network by which modernity accessed to the inner world of the traditional lives at the remotest corners of the country. Hence, these products of modernity expected to become means of prosperity and development in which modernity project would gain the support among the masses.

Although the modernity project underwent huge transformations between 1923 and 1960, the expectations from engineering edifices as being means-cum-ends of modernity had continued through out the covered period of the thesis and after it.

CHAPTER 5

CONCLUSION

Le Corbusier asserts in "The City of Tomorrow" that, "means of transport are the basis of all modern activity" (1987, p.85). Most of contemporary intellectuals share the idea and support the view that first steam engines, then automobiles were part of the moving forces behind the modernity. Acceleration realized by technology altered (and have still been altering) the relation in between time and space, and distorted pre-modern perceptions of life, hence, led to new constructions of modern reality (Fig. 5.1).

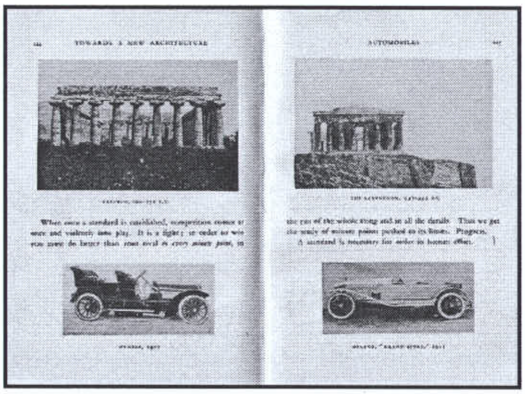

Figure 5.1 Automobile was a fetish object for avant-garde architects in early 20th century. Source: Le Corbusier, "Towards a New Architecture", Praeger, NY, 1970, pp.184-185.

Under these circumstances, "...the development of mechanical means of transport ha[d] not only responded to a practical need for shortening distances, it ha[d] also been a prerequisite for conceiving and "performing" the idea of the modern" (Simonsen, 2005, pp.98-117). However, at the time, Le Corbusier was glorifying the mechanized transport as "means of modernity" the automobile ownership was roughly one car per ten thousand people in Turkey (Karacan, 2005, App.7). Under these circumstances, mechanized transport could not be the means but rather the "desired ends of modernity."

Even in late Ottoman period, when there was a dualism between civilization and culture, these "desired ends" of western technology had been part of the concept of "*muasır medeniyet*". However, they could not be accomplished by neither Ottoman nor republican reforms. Hence, modernity without its means could not able to transform the individual lives and wide spread in social base especially in rural areas. Moreover, lack of means of individual motorization necessitated the preference of railways over roadways in both periods. Therefore, as in Ottoman period, the new republic had to keep on making main investments on establishment of railroad network while considering roads just as capillary feeders of it connecting the hinterland to primary system. Hence, both the Ottoman Empire and the republic aimed at least to provide accessibility to the remotest corners of the country via the bridges built by their modest sources. Therefore, road bridges were considered as fundamental parts of "*bayındır ülke*" even in the absence of roads.

As seen, in spite of the republic's strong claim on differentiation from its Ottoman precedents, the republican definitions of two basic concepts *"muasır medeniyet"* and *"bayındır ülke"* had remained almost the same. Especially the main approaches in relation with the road bridges such as politics of transportation in *"bayındır ülke"* and the conception of technology in definition of *"muasır medeniyet"* had transferred exactly unchanged. Moreover, the Ottoman politics on technology, and engineering initiated in 19th century had been continuing to a large extent.

On the other hand, even in late 1940s when nationwide highway constructions were initiated, the level of mass motorization was almost the same. In spite of lack of a rational ground, highways were constructed vigorously under American technical and financial support. This transformation in transportation policy was actually for construction of an infrastructure for broader transformations of national economy-politics on behalf of unification of Turkey with global, capitalist systems. Moreover, the changes in the state's economic and strategic policies were in tune with the paradigm shifts in the concepts of *"bayındır ülke"* and *"muasır medeniyet"*. Thereafter, the *"bayındır ülke"* has been more interconnected and constructed but at the same time an agricultural image, while *"muasır medeniyet"* refers to the civilization created on the values of liberal capitalist system. As happened all around

Europe in postwar period, in Turkey the roads were means of imposing American ideas on mobilization. Besides, the Turkish road network was not considered in isolation but as part of a larger European whole of main international traffic arteries. Soon after the mass motorization increased but not as end of industrialization and prosperity rather as the means of Americanization within the country. From then on, American style living was taking important place in weekly magazines, music, and cinema, and was promoted and propagated by means of popular media.

Accordingly, while transforming the physical environment of the country, these transformations had also manipulated engineering ideology. The Turkish engineers, were evidently apolitized, Saint Simonian characters, and had preferred constructing the physical bases of the republic instead of intellectual bases in early periods of the republic. They had maintained this ideology during several decades and deliberately kept low-political profiles until 1950s. By increasing number of nationwide construction projects initiated after American support, the operative effect of engineers, both working under public service and in private sector, had increased. Engineers working under public service came into prominence as vital receivers of transatlantic technology transfer and became influential bureaucrats while their departments were gaining ground. Concurrently, engineers working in private sector had been thriving by increasing number of bids; furthermore, by accumulation of capital and experience, they were taking the necessary steps for establishment of a successful construction sector and national bourgeoisie. Consequently, engineers became the most active professional group participated and received share from the American plan. In time, especially engineers working under public service became dominant and well-known technical personalities, and had the first steps of transforming their identities first into influential technocrats, then popular political characters.

During 1950s, engineers were still embracing Saint Simonian principles, and staying distant to politics. Nevertheless, the effects of the period would arise in the following decade and the concepts of planning and scientific management would activate the engineers once more in 1960s. Thereafter, the implementer-bureaucrats would transform into planner-technocrats. In following decades, they would have undertaken political roles both governmental and oppositional circles.

In that context, road bridges, which constitute the main case of the thesis, have implicit connections with the above-mentioned transformations. Unlike German and Italian roadway projects of 1930s, the road bridges in the early republic were not designed as a part of a network and not for motor vehicles. Due to lack of road network, they were materialized not as branch of a broader nationwide project but as independent engineering edifices that provide accessibility to remotest corners of the country at critical nodes. During the covered periods of the study, road bridges mainly had two major morphological and technological thresholds; in the establishment of the republic and in the second half of 1950s. While first was a sudden shift, the second was a slightly alteration.

Despite the continuity in policies on roads and bridges since the late Ottoman period, republican bridge implementations noticeably differentiate from the former. As we learn from the correspondence during the design process of Gazi Bridge, this morphological distinction was clearly intentional. In Turkish bridge tradition, bridges were generally masonry arches made up of stone. While structural type, construction technique, and materials remained almost unchanged ever since the Seljuk dynasty, the bridge morphology slowly transformed in time, and best examples Turkish stone arch bridges were constructed in the 16th century by Architect Sinan. In almost all of his bridges, Sinan adopted pointed arch form. Thereafter, it was repeated frequently; hence, became Ottoman bridge typology. Nevertheless, the pointed arch form was gently changed towards stilled semi-circular arch form in the last century of the Empire when western type education in engineering was initiated (Çulpan, 1975, pp.70-97)[75].

However, the real differentiation initiated after 1923 by using new construction techniques and materials. Ever since construction of Riva Bridge in 1925, reinforced concrete arch bridges emerged as new tradition of republican bridge construction as counterpart of Ottoman stone arch bridge. Although the arch form was maintained, especially the brand new image constructed by the help of reinforced concrete made impression of a radical transformation. As Bozdoğan (2001, pp.150-155) conveyed, this was also the period, when reinforced concrete was favored over masonry with stone and brick in all kinds of constructions in need for reflecting the spirit of *"muasır medeniyet"* of the twentieth century. Abandoning the local materials caused creation of new images similar with desired

[75] Some of the few road bridge examples of this period are Yeni Köprü (1847) built in Abdülmecit era, and Gazi Mihal Bridge (1905) built in 1905 in Abdulhamit era in Edirne. For more information see: Arseven, C. E., "Türk Sanatı Tarihi, Menşeinden Bugüne Kadar Mimari, Heykel, Resim, Süsleme ve Tezyini Sanatlar", Vol. VII, Maarif Basımevi, Istanbul (undated), pp.529-534 and Çulpan, C., "Türk Taş Köprüleri: Ortaçağdan Osmanlı Devri Sonuna Kadar", Türk Tarih Kurumu Basımevi, Ankara, 1975.

contemporary modern examples but far from vernacular aesthetics and led to the "national architecture" discourse. In spite of the vivid shift in preferences of materials, the state of building industry in early republican period was not better than in late Ottoman period; there were only few cement factories and no local production of steel until 1937. Moreover, the importation, and transportation of these materials increased costs and construction periods. Despite the irrationality of construction with imported materials, reinforced concrete bridge constructions had kept on. However, this techno-modern illusion depended on foreign sources was impeded by the shortage of building materials during WWII.

The second threshold in bridge morphology was appeared after 1950s. Unlike the previous, this was not a sudden repeal of the former but rather a replacement realized slightly during a decade. Moreover, it was not a change under ideological needs of modernity project but a compulsory transformation under functional and technological change in the new era started after 1948. While the change in transformation politics after Marshall Plan had increased the importance of roadways, it accordingly affected the socio-economic importance of road bridges. Although the new politics did not deprive their importance, they surely surpassed it and highlighted their role of being means of modernity rather praising being ends of it. Hence, the new road bridges that now arose with their functionality were also transformed morphologically and dissolved within the highways, which were built as straight lines in a raw engineering approach. Bridges crossing the highways were constructed in a functional manner without any attempt to realize some principles of an architectural design. In spite of strong modernist role of highways under 1950s interpretation of *"bayındır ülke"* and *"muasır medeniyet"* concepts, there was no effort to express the idea visually in Turkey.

While in first half of the 1950s, wide span road bridges continued being constructed out of reinforced concrete in arch form as a structural obligation, after the second half, respectable amount of them were constructed on ready-to-built gerber bridge plans in various spans by developing material properties of cement and iron. After 1960s and 1970s, the road bridges would totally transformed into oversimplified modest forms as result of spread of girder type by rising post-tension, pre-tension and prefabrication technologies. Consequently, rather than being singular engineering artifacts, they were multiply produced and they became functional part of the highway network. Thus, they were homogenized not characterized and resembled each other in time, and they lost their aesthetic qualities and became functional parts of roads. Under these circumstances, only exceptions were design of prestigious engineering edifices such as bridge project for Bosporus. Nevertheless, in consequence of the underdeveloped design practice in bridge construction, even the design of Bosporus Bridge turned out to be a typology after construction of the second one.

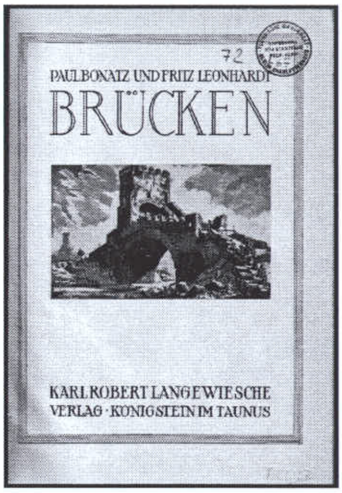

Figure 5.2 Bonatz was one of few architects studied aesthetics of highway bridges during his work in autobahn project in the Third Reich. In spite of his broad experience on bridge building, he would not be consulted in design of road bridges while he was working as consultant of the Turkish Ministry of Public Works. Cover page of the book titled "Brücken" (Bridges) by Paul Bonatz and Fritz Leonhardt. Sources: Bonatz P. and Leonhardt F., Brücken, Karl Robert Langewiesche Verlag, Königstein im Taunus, 1951.

Lastly, the lack of aesthetic concerns in design of road bridges is also worth to mention; especially when the unified nature of engineering and architecture in the early phases of engineering is considered. Although it is quite understandable under poor economic conditions of the country, that main concern in bridge design was spanning maximum length with minimum cost, it is still interesting that there is no official aesthetic concern during the design of these modern icons in spite of intense stylistic concerns in architectural productions of the period. Besides, the absence of architect as one of the actors in construction of road bridges was a situation continuing even after the studied periods of the thesis.

This study aimed to present an illustration of relations between technology, engineering, and modernity in case of road bridges. During the periods studied, the lack of the desired technological advance and its products in social life as means of modernity seems like the main impediment affected to spread and take root of daily rituals of modernism. On the other hand, the latest technology utilized in construction of reinforced arch bridges of the early republic such as Kömürhan Bridge was more successful while serving modernity as imported ends of development, although the noble aim under construction of these high technology road bridges was serving as means of it. Therefore, its effect was limited with propagation of glorious illusion of *"muasır medeniyet"*, but, could not let to social transformations. In postwar period, when physical transformation that would let to permanent social transformation was initiated, it was rather an external manipulation than an internal motivation. Nevertheless, mass motorization as powerful technological means of modernity had easily transformed the society into revised definition of modernity.

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APPENDIX A

GLOSSARY

Ahşap köprüler	Wooden Bridges, book written by Mehmet Fikri in 1330 (1911)
Amme İşleri Nezareti	Ministry of Public Works
Araba	Carriage, Coach
Araba Sevdası	The Carriage Affair, famous novel by Recaizade Mahmut Ekrem (1898)
Autobahn	Motorway
Autostrada	Motorway
Automobil Verkehrs und Übungsstraße GmbH (AVUS)	German Car Racing Circuit
(die) Bagdadbahn	A German project for construction of a railway line from Konya to Bagdad in 19th century
Bağlı Ortaklık	Government linked company
Bay	Wealth
Bayındır	Prosperous
Bayındırlık	Prosperity
Bayındırlık Bakanlığı	The Ministry of Public Works
Bayındırlık faaliyetleri	Construction facilities
Bayındırlık şehidi	Martyr of development
Bayındır ülke	Developed country
Bayındır ülke ideali	Developed country ideal
Belediye Kanunu	Law on Municipalities No.1580
Belediyeler İmar Heyeti Kuruluş Kanunu	Law No.2763 on Establishment of Municipal Development Committee
Belediye Yapı ve Yollar Kanunu	Law on Municipality Buildings and Roads No.2290
Belediyeler İstimlak Kanunu	Law No.2497on Municipal Condemnation
Betonarme Köprüler ve Hesabatı,	Reinforced Concrete Bridges and Its Computation, a book by Ahmet İhsan Bey in 1928
Cemiyet-i Müteşebbise	Association of Entrepreneurs'

Corps des Ponts et Chaussees	Corps of engineers work in roads and bridges constructions
Çimento buhranı	Cement crisis
Çimento sıkıntısı	Cement problem
Darülfünün	House of Sciences, university, higher education
Demir Köprüler	Iron Bridges writen by Mehmet Fikri Bey (Santur) in 1331 (1912)
Dersaadet Belediye Kanunu	Law on Municipality of Capital City
Devlet Planlama Teşkilatı	State Planning Organization (DPT)
Ecole de Pont et Chaussees	The School of Roads and Bridges, very first engineering school established in France in 16th century.
Emlak-ı Mülkiye Kanunu	The Law on common property in 1877
Emaneten yapım usulü	Force account work method
Feshane	Fez workshop
Genç Mühendis İktisad Cemiyeti	Young Engineer Economy Society
Haddi layık teklif	The appropriate bid
HaFraBa	Association for the Planning of the Hanseatic Cities-Frankfurt-Basel
Hars	Culture
Hendesehane	The School of Geometry which was nucleus of the School of Engineering
Hendese-i Mülkiye Mektebi	Civil Service School of Engineering
Humbarahâne	School of Bombardiers
Hükümet namına vukubulacak müzayede ve münakasa ve ihalat kanunu	The law on public auction, underbidding and import done on behalf of the government) in 19 April 1925
İktisadi Devlet Teşekkülü (İDT)	State economic enterprises fully owned by the government
İmar	Development
İmar akıncıları	Raiders of development
Inspecteur Général des Ponts et Chaussées	General inspector of highways
İştirak	Government affiliated company
İttihat ve Terraki	Committee of Union and Progress
Kaiserreich	German term for monarchial empire in late 19th century
Kalkınma	Development

Kamu iktisadi Kuruluşu (KİK)	State economic enterprise
Kondoktör Mektebi	Higher School of Technicians
Kondoktor Mekteb-i Alisi	Higher Conductor School
Kraft durch Freude (KdF)	Strength through joy
Lahiya	Old Turkish name of reports and proposals submitted to the Sultan about various subjects.
Mamuretü'l Aziz	Old name of province Elazığ
Medeniyet	Civilization
Menâfi sandıklan, memleket sandıkları	Ottoman credit enterprises established in late 19th century
Mesire yerleri	Recreational places
Meşrutiyet	Constitutional monarchy (1876)
Milli dava	National cause
Muasır medeniyet	Contemporary civilization
Mühendishâne (Yüksek Mühendis Mektebi)	Higher School of Engineering
Mühendis Mekteb-i Alisi	Engineering School
Mühendis Mektebi İktisat Cemiyeti	Economic Association of the School of Engineering
Mühendis Mektebi Talebe Cemiyeti	Students Association of the School of Engineering
Mühendishâne-i Bahri Hümâyun	Imperial School of Naval Engineering
Mühendishâne-i Berri-i Hümâyun	Imperial School of Military Engineering
Mühendishâne-i Cedide	New School of Engineering
Mühendishâne-i Hümayun	Military Engineering School
Nafıa	Utile
Nafıa birlikleri	The military troops utilized in road constructions
Nafıa Fen Mektebi	Construction and Science School
Nafıa Vekaleti	Ministry of Public Works
NATO Müşterek Enfrastrüktür Programı Gereğince Türkiye'de Yapilacak İnşa ve Tesis İşlerine Dair Kanun	The Law on Construction and Establishment Works in Turkey in Relation to NATO Joint Infrastructure Program, in 1953
Nef (نفع)	Utility
Nizam-ı cedid	New order
Osmanlı Mühendis ve Mimarlar Cemiyeti	The Ottoman Society of Engineers and Architects
Ömür	Life
Reichsautobahnen	German name for motorways built in 1930s

Sanayi-i Nefise Mektebi	Academy of Fine Arts
Sanayi Mektebi	Industrial School
Tanzimat	Administrative reforms – 1839
Teknik Güç	Technical Power
Teşvik-i Sanayi Kanunu	The Law on Encouragement of Industry, 1927
Tıphane-i Cerrahane-i Şahane	Military Medical School
Turuk-u Maabir Mektebi	The School of Roads and Bridges
Türkleşmek, İslamlaşmak, Muasırlaşmak	Turkification, Islamization, Modernization
Ulufeli Humbaracı Ocağı	Corps of Bombardiers
Umumi Hıfzısıhha Kanunu	Law on General Hygiene No.1593
Umr (عمر)	Vitality
Umur-u Nafia Nezareti	Ministry of Public Works
Umur-u nafia programı	Development plans
Vak'a Nüveys	Historian
Vakfiye'nin Tamir ve İnşası Nizamnameleri	The regulation on construction and renewal of foundation buildings in 1880
Yol mükellefiyeti	The road tax system
Yabancı Sermayeyi Teşvik Kanunu	The Law on Encouraging Foreign Investments, 1951
Yüksek Mühendis Mektebi Matbaası (YMM)	Higher School for Engineering Press

APPENDIX B

ROAD BRIDGES AS ENGINEERING MERITS

Bridges are one of the most prestigious crafts of engineers. Their daring structures against nature have always fascinated people. Bridging wild rivers or deep gorges is not only vital as being critical nodes of road network but also important as being the challenge of man's genius against nature. Therefore, bridges are one of the important engineering structures that illustrate important technological turning points. Ever since the industrial revolution, the bridges, which were made up of stone, brick and wood, started to be built from cast iron, steel and reinforced concrete. Accordingly, with the invention of new building materials new structural systems and techniques emerged.

B.1 Structural Systems and Materials of Modern Bridges

As in all structures, bridges are designed to span specific distances under particular loads. For highway bridges in addition to gravitational loads and wind loads, live loads due to vechile or pedestrian traffic and horizontal loads due to water flow are considered where applicable. All bridges can be classified into the following three basic types based on how they carry the load. These are compression, tension, and both of these at the same time (Fig. B.1)

Arch bridges of all kinds –traditional masonry bridges, reinforced concrete bridges and steel bridges - bear compression while thrusting outwards as well as downwards at the same time. They have four different types according to their supports, which allow the structure to respond to varying stresses and loads. These are fixed arch, one-hinged arch, two-hinged arch and three-hinged arch bridges (Fig. B.2).

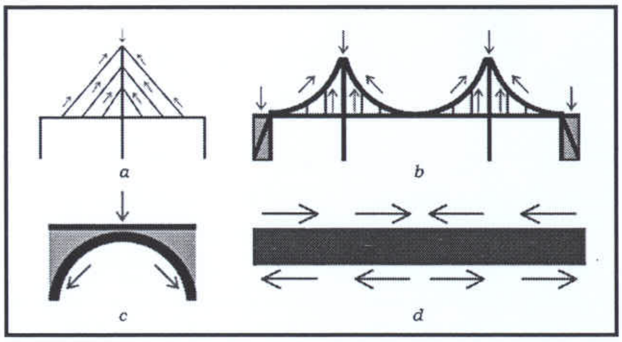


Figure B.1 (a) Tension (cable-stayed), (b) tension (suspension), (c) compression (arch), and (d) tension/compression. Source: Wilson, T., Wash Bridge Competition: Bridge Engineering. (Available at http://www.phlf.org/downloads/education/Edu_WabashBridgeDesign.pdf on 2.2.2008)

Since ancient times arch was believed as having the most pleasing appearance and aesthetic elegance. Therefore, early modern bridge designs with new building materials are in form of arch, which is the well-known bridge type of western world. The masonry arches of ancient times made up of brick and stone firstly experienced with reinforced concrete. Joseph Monier a French gardener patented the first reinforcement in concrete for his bridge designs in 1867. However, Monier was not an engineer, hence; he was not permitted to build bridges in France. For this reason, he had to sell his patents to German and Austrian contractors Wayss, Freitag and Schuster, who built the first generation of reinforced concrete bridges in Europe. Following patents were granted immediately. Among them, another French François Hennebique established an international firm to market his patent especially on his bridges. Other important bridges in the beginning of 20^{th} century with impressive central spans were built by Eugène Freyssinet in France (DeLony, 1996, pp.1-30 and Menn, 1990, pp.1-49). All of these first generation of reinforced concrete bridges were designed in arch form.

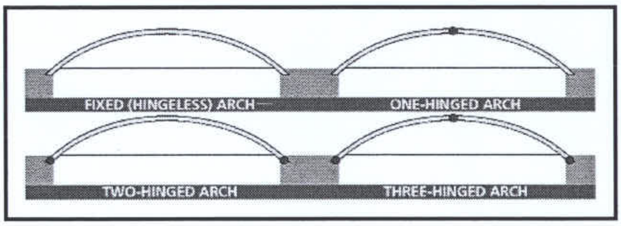


Figure B.2 A through arch showcase for all type of arch bridges. Source: "Bridge Basics" Available at http://www.pghbridges.com/basics.htm on 02.02.2008)

While some engineers were experiencing reinforced concrete arch bridges on roadways and in-city pedestrian roads, the others were in search for new materials and structural types alternative to masonry arches for the most popular transportation system of 19th century, the railroads. Gustav Eiffel also interested in the type and experienced various arch designs in France. The most well-known of his steel arch bridges is the Garabit Viaduct in 1885 with 165m span (Billington, 1983, pp.60-72). In spite of his pioneering innovativeness, Eiffel did not used decarburized steel in his designs because he was not convinced of the efficacy of the new material. Nevertheless, especially after the advances in steelmaking processes – invention of the Bessemer and the open-hearth process–, steel arches were favored for long spans railroad bridges and viaducts because they better withstood the impact, and vibration loads of trains. The type had wide spread by time and its best and the last examples were designed in the first half of the 20th century.

Figure B.3 (a) Wildegg Bridge with a span of 37m in Switzerland in 1903 (Wayss, Freitag and Schuster), (b) Risorgimento Bridge in Rome with a span of 100m in 1912 (F. Hennebique), (c) the Saint-Pierre du Vauvray Bridge in Paris with a span of 131m in 1922 (Eugène Freyssinet). Sources: (a) Menn, C., "Prestressed Concrete Bridges", (edited and translated by P. Gauvreau) Birkhäuser, Boston, 1990, p. 15; Photographed by the author; Troyano, L. F.,"Bridge Engineering: A Global perspective", Thomas Telford Publishing, London, 2003, p.332.

The tension bridges are the suspension and cable-stayed types. The feature of suspension bridges feature is long cable strung over towers and anchored on both sides. The road deck is hung to this main cable by smaller cables in tension. While in cable stayed bridge the cables are that connected directly from a tower to the deck. These cables in tension support the deck.

Figure B.4 (a) Garabit Viaduct (1885) with 165m span, (b) Hell Gate Bridge (1917) a two-hinged trussed arch spanning 298m, and (c) Bayonne Bridge (1931) a parabolic two-hinged arch of 511m span. In all these great arches the top chord serves as part of a stiffening truss while the bottom chord carrying the load. Sources: (a) Troyano, L. F.,"Bridge Engineering: A Global perspective", Thomas Telford Publishing, London, 2003, p.18 (b) Available at www. nyc-architecture.com on 8.8.2009; (c) Troyano, L. F., "Bridge Engineering: A Global Perspective", Thomas Telford Publishing, London, 2003, p. 27.

Suspension and cable stayed bridge types are also ancient types. They were rediscovered in modern sense parallel with the advances in steel design in 19th century. In 1822, Marc Séguin discovered the strength of wire cable –made up of several thin iron wires– and evolved the Anglo-Saxon type, constructed with chains of linked wrought-iron eye-bars. In the early stages of development both types used together as in cases of Roebling's Niagara Suspension Bridge (250m, 1855) and Brooklyn Bridge (486m, 1883) (Billington, 1983, pp.72-84). However, the reaction of suspension bridges under repeated rhythmic loads or the wind was not completely understood until the 1940s, following the collapse of the Tacoma Narrows Bridge.

Structural steel is stronger and more flexible than cast iron, and allowed greater design flexibility. Hence, engineers tried them in every kind of known types constructed previously with stone, iron and wood. The last decades of 19th century witnessed passionate research on structural abilities of steel vary from plate-girders to various forms of trusses throughout the world.

The tension/compression bridges can be classified in two different types as girder type bridges and truss type bridges. These two types are basically the same, excepting one is more complex of the other which spans larger distances in much economical and light weight solutions. A beam is a single building element that tends to bend under load. Therefore, top half of its section has compression forces while bottom half is under tension. Trusses are combination of several elements especially in triangular shape where upper parts are taking compression while lower parts are tension. This rigid self-supporting system of triangles transfers loads to the piers.

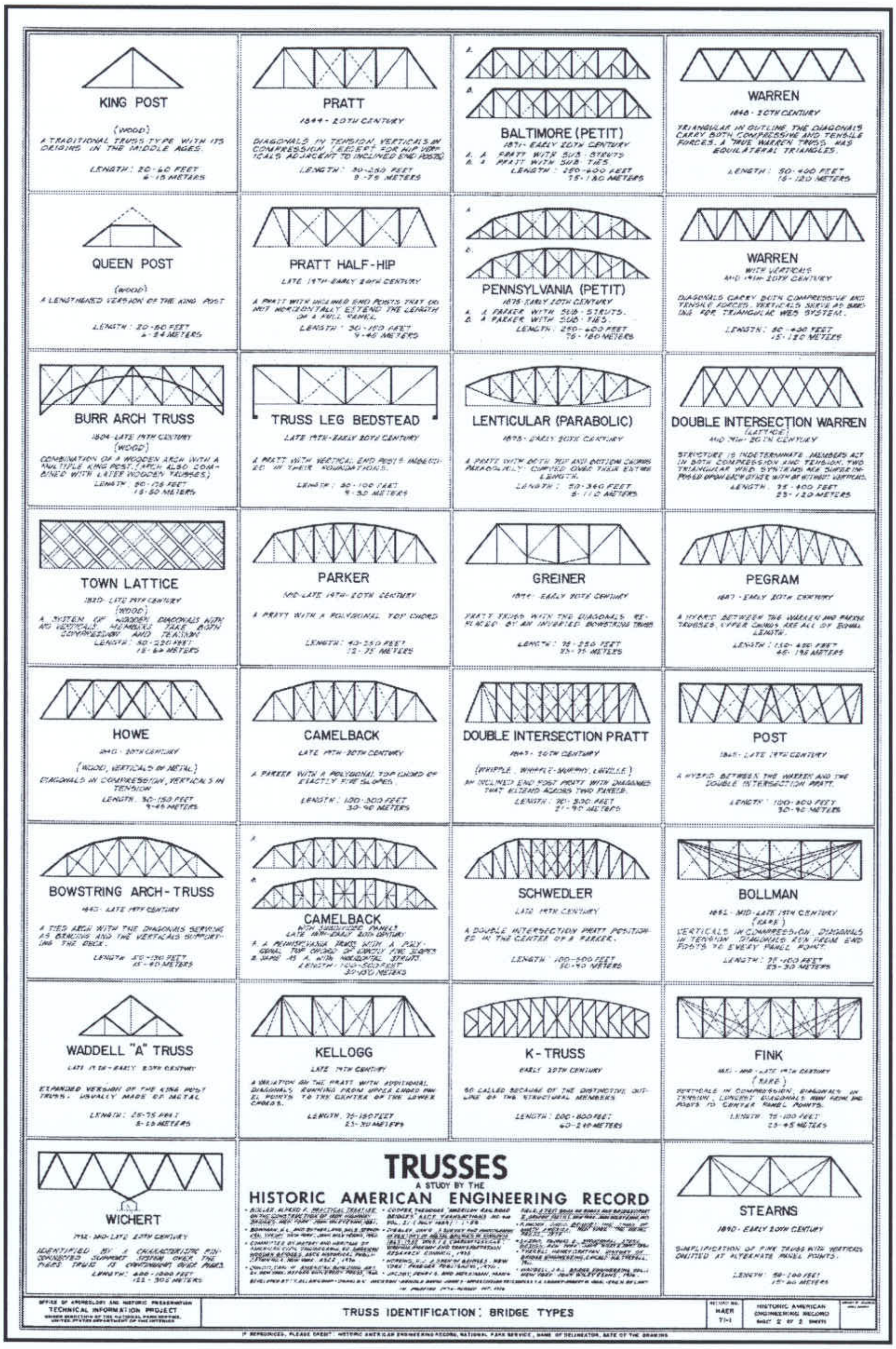


Figure B.5 Graphic showing various truss types. Source: Historic American Engineering Record, The Society for Industrial Archeology, Record No. HAER TI-1

Structurally, a bridge is a simply supported beam on two supports. In larger spans serious of simply supported beams used one after another or multi-spans are joined together over piers with a continuous beam. The more complex form of simple beam is the cantilever, a form patented by Heinrich Gerber in 1866 for his cantilever truss bridge design in Hassfort, Germany. His main principle is to have a continuous girder hinged at the points where the moments were zero, by supporting the weight of the anchored ends with the central span. After the first examples in steel truss, the principle would be adapted to reinforced concrete girders and suspension bridges. At the end of 19^{th} and in the early 20^{th} centuries, the type wide spread and Gerber bridges came to be the longest span bridges of their time until their records had been surpassed by suspension bridges in 1924 (Troyano, 2003, pp. 349-353).

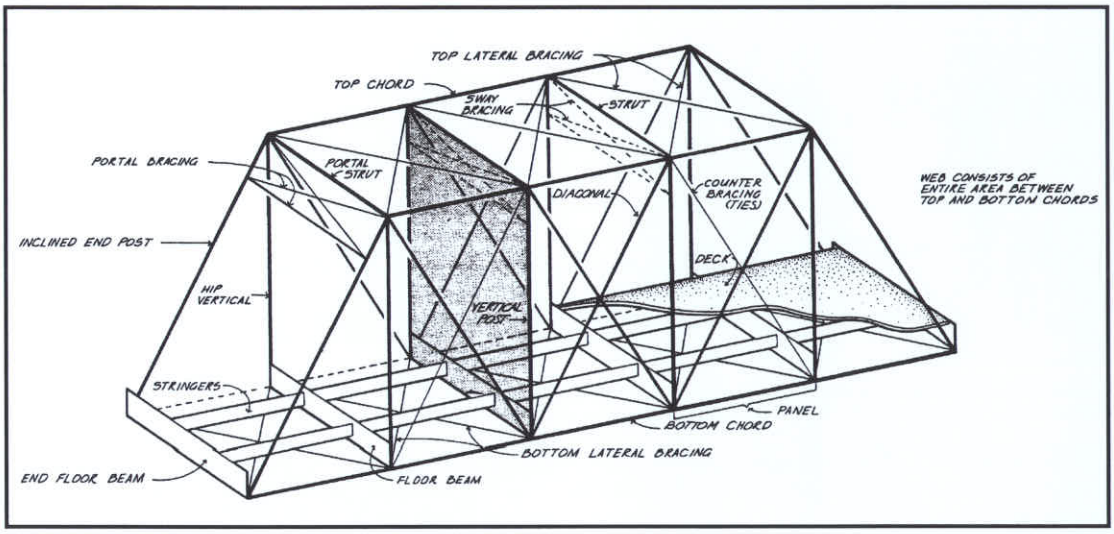


Figure B.6 Structural elements in a truss. Source: Historic American Engineering Record, The Society for Industrial Archeology, Record No. HAER TI-1

Another advanced type is tied-arch, which is also known as bowstring, invented in USA by Squire Whipple in 1847. As in an actual bowstring, the tie member of his design –the slab– connecting the two ends of the arch and carries the horizontal thrust from the arch and permits the reactions to be vertical as in the case of girder bridges. Although he proposed the type for iron-truss bridges, his type got succeeded in reinforced concrete and become a suitable solution for short-span highway bridges (Troyano, 2003, p.274-278).

B.2 Construction of Modern Bridges

A substantional amount of data is needed at the beginning of the design of a bridge. First of all, close context of the proposed bridge location is explored for gaining a general idea about the site and finding the most suitable place to cross the river or valley. In this preliminary exploration of topographic and hydraulic conditions are examined by various methods, and maps and charts are prepared on this inspections. The topographic conditions such as rocky valley area or wide streams limit the options to a few general possibilities in the beginning of the design process. For instance, a rocky valley area is ideal for an arch bridge while cantilever bridges are for fast-flowing streams.

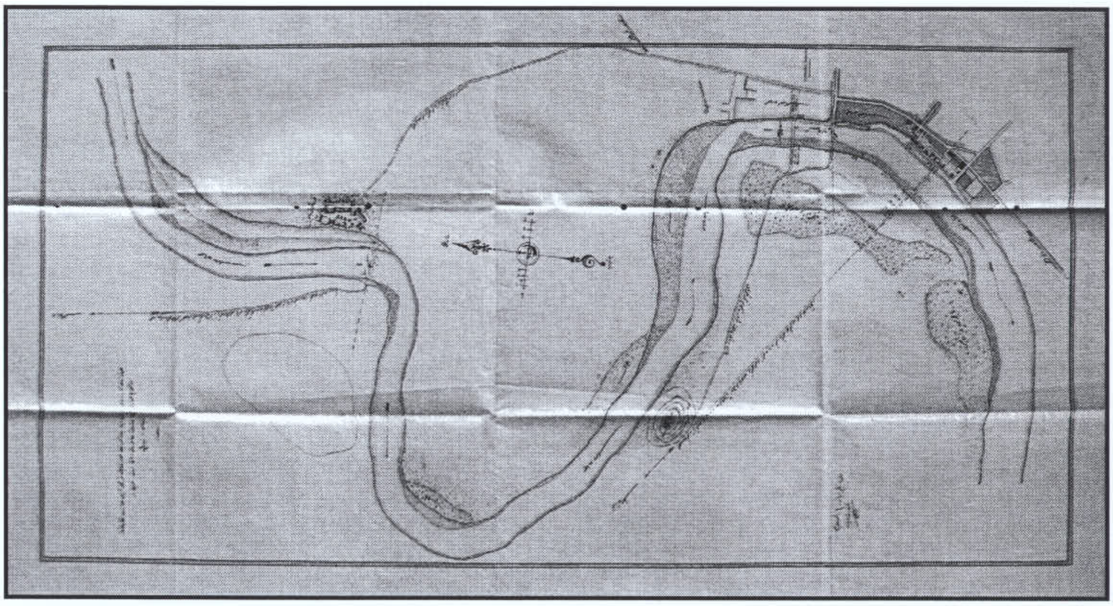


Figure B.7 An index map showing proposed location of the bridge, the alternative sites investigated for Ceyhan Bridge, year 1922. Source: Unclassified material from KGM Fund, Binder No. 2250, State National Archives of Turkey-Republican Archive, Ankara.

In the hydraulic inspection, data related with the river -including the highest flood level, ordinary flood level and low water level; site, shape, slope, and nature of the catchment, intensity and frequency of precipitation in the basin, probability of large trees or rolling debris floating down the stream etc.- are inspected and the results were presented in graphs (fig. 5.8). By these graphs, appropriate height of the decking, maximum strength of the false work and suitable seasons for construction is determined. The other important data is obtained from investigation is the soil conditions by bore holling. The determination of a reasonably accurate soil profile at each of the proposed bridge site is essential for the correct decision on the location, the type of foundation, and accordingly, for the estimation of its cost accurately. Other important inputs are the expected loads, such as seismic loads, wind loads and the density of the traffic, and the local conditions related with the construction process such as availability of building materials, neighboring local producers, and shortest route for transportation of equipments and materials (Köylüoğlu, 1973, pp.2-66).

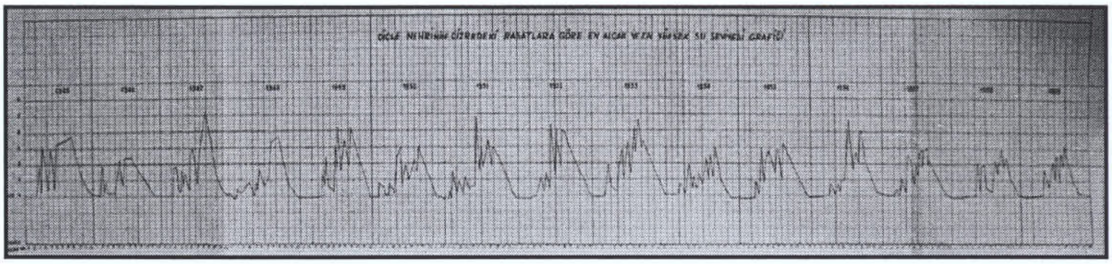


Figure B.8 Chart showing the flow of the river Dicle in data obtained for Cizre Bridge. Source: Unclassified material from KGM fund, Binder No. 1977, National Archives of Turkey-Republican Archives, Ankara.

After defining the underlying principles, the next step is the design and the structural analysis under self weight and traffic loads. In the early phases of the history of modern bridge construction, engineers embraced craft tradition and experimental methods. They built models, load them to failure and replace the broken members with wider sections until the model supported loadings equivalent to a real loads. Because of the major bridge disasters in 19th century, engineers head towards scientific analysis and mathematical formulas on precise simulation of the behaviour to find out more about the structural systems in general. Advances in graphic statics and in the knowledge of the strength of materials were achieved in the second half of the 19th and the 20th centuries. Respectively, the "method of joints," by Whipple, "method of sections" by Ritter, graphical analysis of “bending moments in a cantilever” by Culmann, and analysis of soil mechanics by Terzaghi were the major breakthroughs in the theory of bridge engineering. (DeLony, 1996, pp.1-30 and Özüdoğru, 2003, pp.3-11).

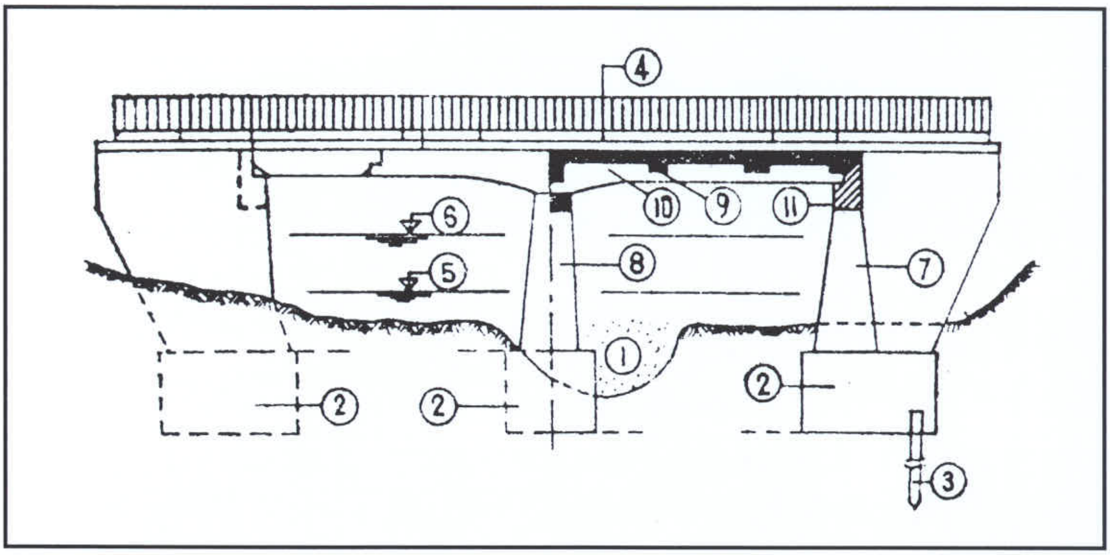


Figure B.9 1.undermining 2.foundation 3.pile 4.slab 5.low water level 6.high water level 7.abutment 8.pier 9.horizontal beam 10.longtituinal beam 11.hinge Source: Köylüoğlu, A., "Karayolu Köprüleri", Tarım ve Köy İşleri Bakanlığı YSE Genel Müdürlüğü Yayın No.131, Ankara, 1973, p.86

Bridge design consists of three related parts: foundations, substructure and superstructure. Depending on the subsoil conditions, hydraulic conditions, and the spanning of proposed superstructure, foundations can be shallow foundations or deep foundations. Shallow foundations are simple footings buried less than 5m depth. Until the advance in foundation engineering in the 19th century which in a way resulted in the increase in depth of foundations,, cofferdams, crude caissons and wooden piles were the only means by which a foundation could be constructed in water. Especially after the invention of hydraulic cement in 1819, the usage of caissons wide spread. A caisson is basically a box which supports the superstructure and transmits the loads onto the subsoil. It can be reinforced concrete, steel, masonry, or timber and vary according to the number of its chambers, the method of its installation, and the method of prefabrication. New piles made from reinforced concrete, steel and later precast and prestressed have high structural strength and wide range of possible dimensions. The precast concrete piles increased the depths up to 15 m and the prestressed concrete piles up to 40 m. Another threshold in deep foundation technology is developments in pile foundations. Unlike a caisson that transmits loads onto the soil, a pile develops a soil resistance around itself. Closely spaced group of piles act as a block where the soil between adjacent piles is dragged down. Depending on the soil that it lays, a pile foundation can be in various sections, in various materials and installed in various techniques. As another effective way to retain soil sheet piles or pile-planks are widely used in Turkey. The steel sheets are vertical elements connected by joints, driven into soil to form a wall. In addition to above mentioned foundations, there are also pontoons serving a kind of floating foundation for specific kind of bridges such as Gazi (Unkapanı) Bridge in 1940.

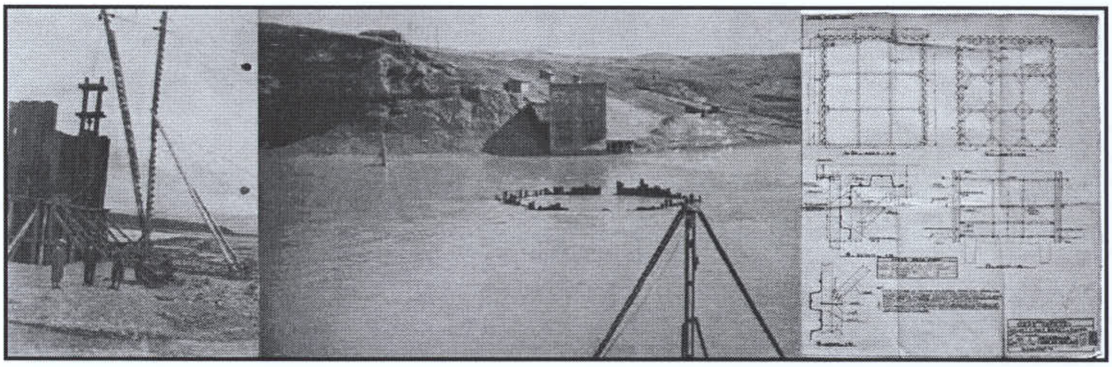


Figure B.10 From right to left: Pile-plank drawings of Cizre Bridge, pile-plank foundation in water in Cizre Bridge, pile-plank sheets while driven into soil in Singeç Bridge construction. Sources: Unclassified material from KGM Fund, Binder No.2367 and 2325, State National Archives of Turkey-Republican Archive, Ankara.

The next step in the construction is the substructure, the portion of the bridge structure below level of the bearing and above the foundation. Its design generally depends on the type, size, and dimensions of the superstructure and the environment. There are mainly two parts of substructure, piers, and the abutments. Piers are the supports, which carry merely the superstructure and transmit the loads to foundations. The other part is the abutments, which are functioning as both a pier and a retaining wall. They support the superstructure and the lateral loads of the soil or rock in the both ends of the bridge span. Other than these parts, in suspension bridge type there are also anchorages where the tension in the cable supported.

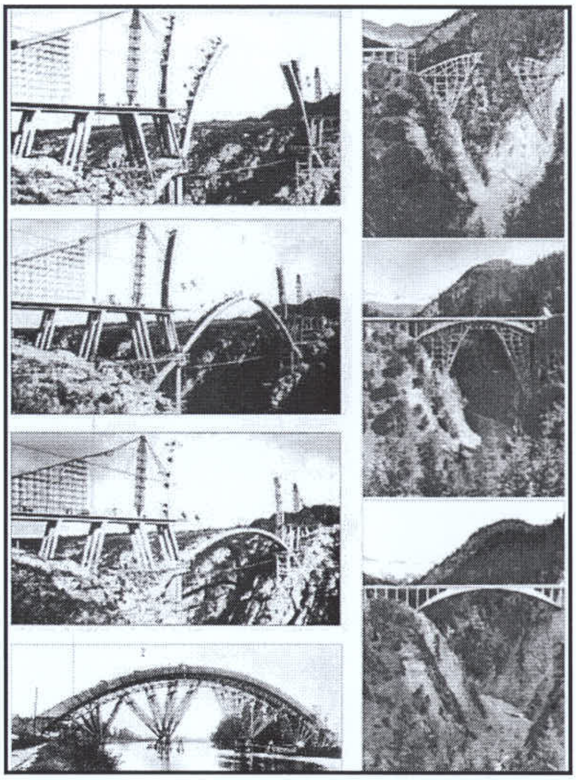


Figure B.11 Various types of centering. Left top three: Centering for River Storms Bridge, South Africa; left bottom: centering for St. Pierre de Vauray, France; right: centering for Salgina-Tobel Bridge-Switzerland. Sources: Troyano, F., "Bridge Engineering", Thomas Telford Publishing, 2003, pp.170, 291, and 333.

The final part in the construction of bridge is the superstructure. Determination of a type for superstructure and the geometry of the bridge depend on various factors especially the span length, availability of multi-span, the method of construction, economical factors, and environmental factors related with the construction. In our country, reinforced concrete cast-in-place simple or continuous span girders, steel plate girders or wooden trusses are preferred especially for small span bridges less than 15m. For larger spans, the main factor determining the superstructure is the cost of construction. In the medium to long span range, concrete slab bridge with box sections or reinforced concrete Gerber bridges become more economical. For longer spans, reinforced concrete bowstring or arch bridges are preferable in Turkey until 1960s. After developments in advanced reinforced concrete systems pre-stressed girders wide spread especially because of their advantages of prefabrication such as qualified production and easiness in construction. For long span bridges, suspension type is more economical.

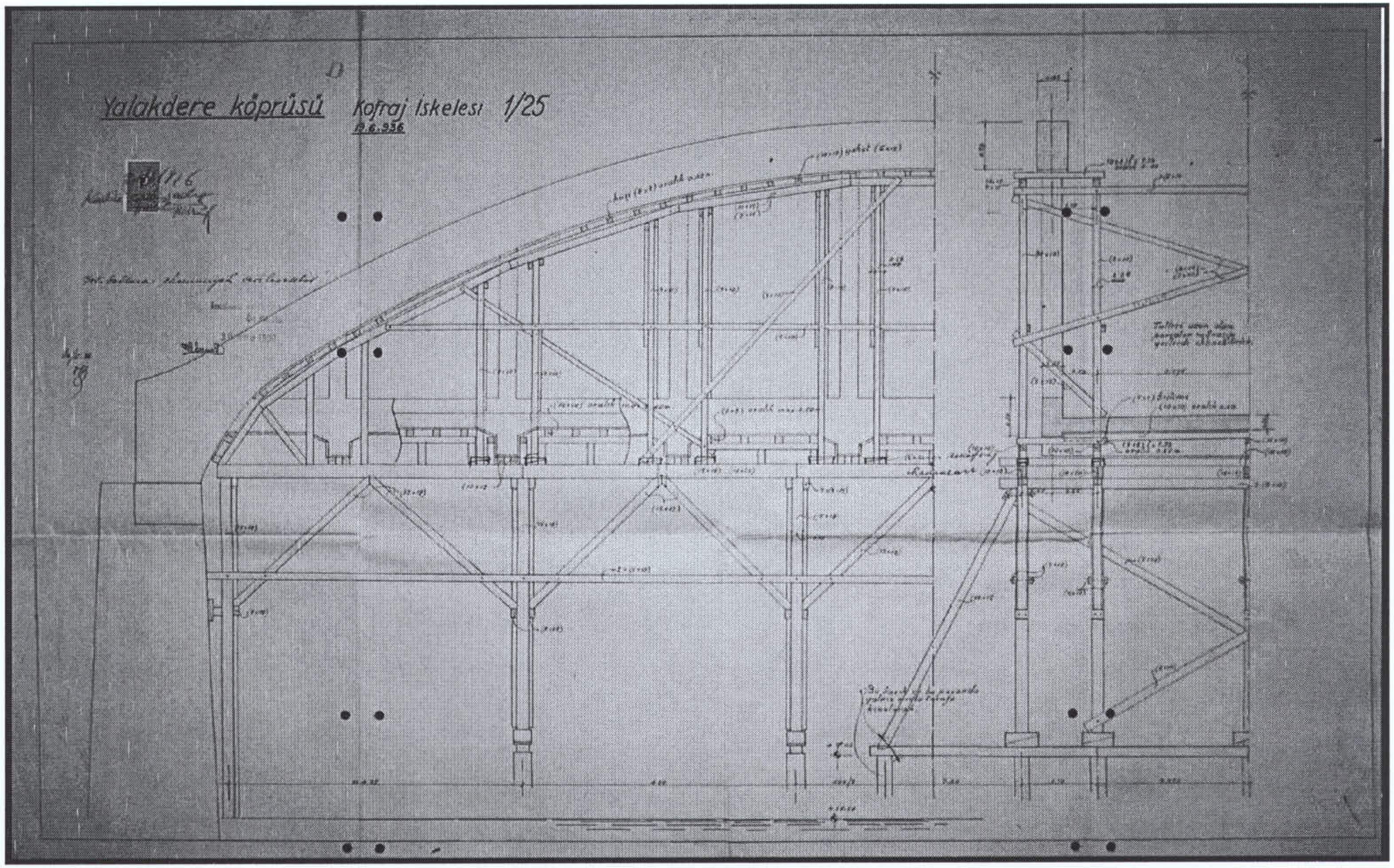


Figure B.12 Centering for Yalakdere Bridge, Source: Unclassified material from State National Archives of Turkey-Republican Archives, KGM Fund, Binder No.2143

The other important factor in determining the superstructure is the availability of conditions for construction of scaffolding. Scaffolding is a temporary structure, usually of timber, erected to support the construction of the permanent bridge, which is impossible to build. If the flow of the water is in reasonable limits, the scaffolding may be designed in beam or arch types with footings on water; if not it may be arch or suspension type centerings as in case of construction of Kömürhan Bridge in 1930. Moreover, some kind of structures such as steel trusses and prefabricated reinforced concrete girders do not required scaffolding. Likewise, in cases of fast-flowing rivers or deep gorges where it is not possible to build scaffolding cantilever truss bridge type is also preferred.

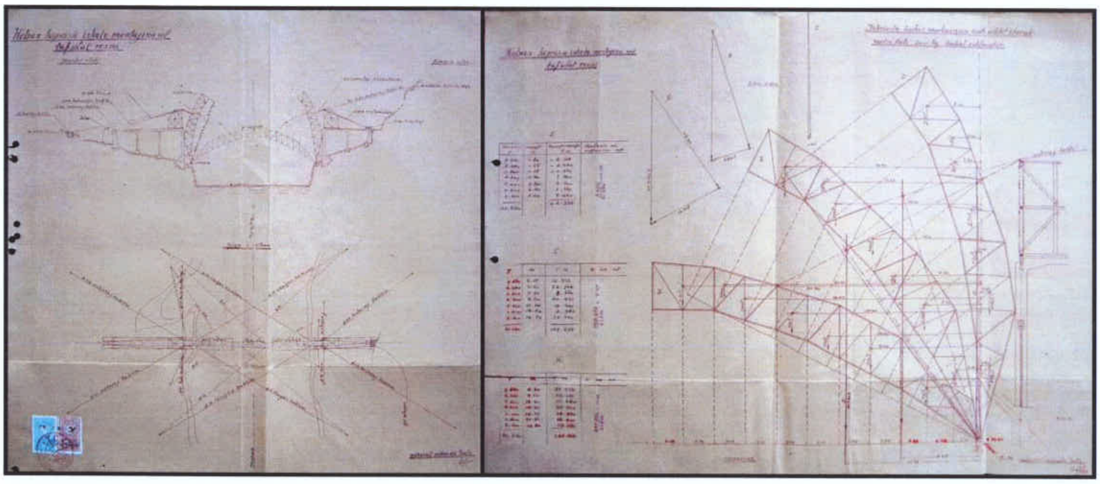


Figure B.13 Drawings showing the design and installation process of the centering of Keban Madeni Bridge. Sources: Unclassified material from KGM Fund, Binder No.2009, State National Archives of Turkey-Republican Archive, Ankara.

Depending on the nature of the crossing, the span required, the materials at hand, and the type of load anticipated, the above mentioned types often combined in composite structures as in cases of Birecik Bridge, Meriç (İpsala) Bridge, and Kazım Dirik Bridge (Edirne) etc.

APPENDIX C

TABLES RELATED WITH THE ROAD BRIDGES (1923 and 1960)

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960. Prepared on the data derived from the State National Archives, the Ministry of Public Works Fund, the KGM archives, the Bayındırlık İşleri Dergisi and KGM Bullettin

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
1	Garzan	Stone	Stone Arch	36,00	1	36,00	1924
2	Riva	RC	RC Fixed-ended Arch	48,00	1	48,00	1925
3	Etlik*	RC	RC Continuous Beam	45,00	3	15,00	1926
4	Ziraat Mektebi*	RC	RC Continuous Beam	45,00	3	15,00	1926
5	M. Kemal Paşa	RC	RC Continuous Beam	118,20	6	20,00	1926
6	Sarayköy	RC	RC Gerber Beam		1	30,00	1927
7	Orman Çiftliği	RC	RC Bowstring	25,00	1	25,00	1927
8	Kirazlık	RC	RC Arch	50,00	1	48,00	1928
9	Arslan	RC	RC Arch	51,00	2	24,00	1929
10	Akçay	RC	RC Arch	199,00	5	35,00	1929
11	Güngörmez	RC	RC Gerber Beam	85,40	5	23,80	1930
12	Kömürhan (İsmet Paşa)	RC	RC Girder		1	109,00	1930
13	Yeşilırmak (Çarşamba)	RC		286,00	7		1930

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
14	Büyük Agonya	Concrete	Concrete Arch	105,00	3	26,00	1931
15	Dalama	Steel	Steel Truss	85,10	3	27,60	1931
16	Ömerli	RC	RC Gerber Beam	72,00	5	20,00	1932
17	Manavgat	Steel	Steel Truss	60,00	1	60,00	1932
18	Bakırçay	RC	RC Arch	52,00	2	26,00	1933
19	Fevzipaşa (İspiroğlu-Çakmak)	RC	RC Arch	54,00	2	27,00	1933
20	Aksu	RC	RC Bowstring	93,30	1	42,00	1933
21	Körkün	RC	RC Fixed-ended arch	25,00	1	25,00	1934
22	Arapsun (Kızılırmak)	RC	RC Gerber Beam	131,30	5	30,00	1934
23	Karabekir	RC	RC Bowstring	32,00	1	32,00	1934
24	Akçağıl	RC	RC Bowstring	70,00	2	35,00	1934
25	Paşur	RC	RC Fixed-ended slab arch	75,10	1	50,40	1934
26	Gezer	-	-	-	-	-	1934
27	Niksar	Wood	Wooden Simple Girder	640,00	-	-	1934
28	Cevizdere	RC	RC Gerber Beam	64,00	3	24,00	1935
29	Elekçi	RC	RC Gerber Beam	64,00	3	24,00	1935

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
30	Anamur	Wood	Wooden Truss	26,80	3	26,80	1935
31	Menemen (Kazım Dirik - Cumurluk - Gediz)	RC	RC Bowstring	162,30	5	31,33	1935
32	Yukarımelet	RC	RC Hinged Arch	106,00	2	53,00	1935
33	Borçka	Steel	Steel Truss	113,00	1	113,00	1935
34	Dalaman köprüsü	RC	RC Bowstring	105,00	3	35,00	1936
35	Göksu	RC	RC Girder	112,00	3	35,00	1936
36	Kemah	Steel	Suspended	53,50	1	53,50	1936
37	Bolaman	RC	RC Girder	65,00	1	65,00	1936
38	Hanifdere	RC					1936
39	Yalakdere	RC	RC Bowstring	46,30	3	22,50	1937
40	Karadere	RC	RC Gerber Beam	28,00	3	28,00	1937
41	Yahyaköy (Yayaköy)	RC	RC Continuous Beam	30,00	3	30,00	1937
42	Sakarya	RC	RC Bowstring	114,70	3	35,00	1937
43	Afrin (Eski Köprü)	RC	RC Arch	54,30	4	36,00	1937
44	Fadlı	RC	RC Girder	54,00	1	36,00	1937
45	Fazlı	RC	RC Girder	36,00	1	36,00	1937

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
46	Ilıç (Kuruçay)	Steel	Steel Truss	60,80	3	36,00	1937
47	Çetinkaya (Kızılırmak-Bafra)	RC	RC Bowstring	251,80 (245,00)	7	36,00	1937
48	Keban Madeni	RC	RC Arch	120,00	6	62,00	1937
49	Ürgüp	RC	RC Continuous Beam	40,00	3	20,00	1938
50	Ürgüp (Damsa)	RC	RC Gerber Beam			20,00	1938
51	İsaköy (Göksu)	RC	RC Hinged Arch	51,40	1	29,10	1938
52	Singeç	RC	RC Fixed-ended Arch	36,00	1	36,00	1938
53	Cipçayı	RC	RC Gerber Beam	40,00	2	20,00	1939
54	Terme	RC	RC Gerber Beam	50,00	3	20,00	1939
55	Tekir	RC	RC Continuous Beam	21,90	1	21,90	1939
56	Akçay	RC	RC Arch	90,00	3	30,00	1939
57	Ergene	RC	RC Bowstring	69,70	4	31,33	1939
58	Miliç	RC	RC Bowstring	32,00	1	31,80	1939
59	Aşağıkale	RC	RC Girder	36,00	1	36,00	1939
60	Gülüşkür	RC	RC Bowstring	180,00	5	36,00	1939
61	Alikaya	RC	RC Hinged Arch	42,00	1	42,00	1939

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
62	Suçatı	RC	RC Hinged Arch	42,00	1	42,00	1939
63	Yukarıkale	RC	RC Girder	63,50	3	43,50	1939
64	Pertek	RC	RC Girder	106,20	1	106,20	1939
65	Ambarçayı	RC	RC Simple Girder				1939
66	Gençlik Park	RC	RC Arch		1		1939
67	Sahnalar (Ergene)	Steel	Steel Truss	39,00	1	38,00	1940
68	Pisyar	RC	RC Arch	50,50	1	44,40	1940
69	Deveres	RC	RC Continuous Beam	82,15	5	16.30	1940
70	Gazi (Unkapanı)	Steel	Pontoon	440,00			1940
71	Seyithan	RC	RC Arch	23,00	1	23,00	1941
72	Merkiçmelen	RC	RC Gerber Beam	130,50	5	30,00	1941
73	Salat	RC		256,00	8	32,00	1941
74	Horasan (Aras)	RC	RC Bowstring	114,00	3	36,00	1941
75	Şehsu	Steel	Steel Truss	70,00	1	70,00	1941
76	Şırzı	Steel	Steel Truss	40,00	1	40,00	1942
77	Ceyhan Demir	Steel	Steel Truss	139,00	4	80,00	1942

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
78	Kozluk	Steel	Steel Truss	40,00	1	40,00	1943
79	Ambarçayı	RC	RC Continuous Beam	94,00	4	26,00	1944
80	Kertil (Yumurtalı)	Stone	Stone Arch	48,40	1	20,00	1945
81	Kavuncu	RC	RC Bowstring	30,00	1	30,00	1945
82	İvyan	RC	RC Gerber Beam	22,00	1	22,00	1946
83	Çağdırış	RC	RC Bowstring	42,00	1	42,00	1946
84	Pazarbaşı	RC	RC Gerber Beam	62,80	3	24,30	1946
85	Ayvalı Tohması	RC		38,90	3	24,60	1947
86	Mameki Demir	Steel	Steel Truss	56,00	1	56,00	1947
87	Küçük Menderes (Beydağ)	RC	RC Bowstring			34,00	1948
88	Teşvikiye	RC	RC Gerber Beam	47,20	2	23,35	1949
89	Hilbeş	RC	RC Gerber Beam	47,40	2	23,50	1949
90	Çeltek (Tersakan)	RC	RC Gerber Beam	59,65	3	24,00	1949
91	Keşiş	RC	RC Gerber Beam	63,75	3	24,00	1949
92	Göksu-2	RC	RC Gerber Beam	88,85	3	34,00	1949
93	Salördek (Kırmızı)	RC	RC gerber slab	47,40m	2	47,40	1949

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
94	Sansa Boğazı (Fırat Demir)	Steel	Steel Truss		3		1949
95	Sındırgı (Simav)	RC	RC Gerber Beam	98,70	5	22,00	1950
96	Aşağırabat	RC	RC Gerber Beam	48,00	2	24,00	1950
97	Bigadiç (Simav)	RC	RC Gerber Beam	251,70	11	24,00	1950
98	Çaycuma (Filyos)	RC	RC Gerber Beam	255,70	11	24,00	1950
99	Göksu	RC	RC Gerber Beam	65,00	3	26,00	1950
100	Dinar	RC	RC Arch		1	27,10	1950
101	Harşit	Wood	suspended	51,80	1	51,80	1950
102	Acı-1	RC	RC Gerber Beam	136,10	7	21,00	1951
103	Uluabat-1	RC	RC Gerber Beam	159,65	9	22,00	1951
104	Çanakçı (Elevidere)	RC	RC Gerber Beam	155,55	7	24,00	1951
105	Turnasuyu	RC	RC Gerber Beam	107,70	5	24,00	1951
106	Harşit	RC	RC Gerber Beam	248,40	10	24,84	1951
107	Zana	RC	RC Gerber Beam	96,50	5	26,50	1951
108	Ağın	RC	RC Fixed-ended Arch	49,00	1	31,00	1951
109	Mameki (Tunceli)	RC	RC Hinged Slab Arch	116,40	1	72,00	1951

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
110	Acı-2	RC	RC Gerber Beam	135,70	7	21,00	1952
111	Üskübü Melen	RC	RC Gerber Beam	100,10	5	22,00	1952
112	Melet	RC	RC Gerber Beam	251,70	11	24,00	1952
113	Gördes	RC	RC Arch	88,95	2	42,00	1952
114	Genç	Steel	Steel Truss	165,00	3	55,00	1952
115	Niksar (Hamidiye)	RC	RC Gerber Beam	191,10	9	22,00	1953
116	Karasu (Sakarya)	RC	RC Gerber Beam	68,00	3	25,00	1953
117	Delice	RC	RC Gerber Beam	64,95	3	26,00	1953
118	Karasu-1	RC	RC Arch	43,30	1	30,00	1953
119	Kuşcuderesi	RC	RC Fixed-ended arch	56,35	1	36,00	1953
120	Irmak Üst Geçit	RC					1953
121	Beylik (Kızılcahamam)	RC	RC Gerber Beam	52,90	3	20,00	1954
122	Obaçay	RC	RC Simple Girder	33,40	3	20,00	1954
123	Sarıköy (Yunusemre)	RC	RC Simple Girder	33,00	3	20,00	1954
124	Kargıcak	RC	RC Gerber Beam	41,55	2	21,00	1954
125	Bostancı-1	RC	RC Gerber Beam	59,40	3	22,00	1954

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
126	Bostancı-2	RC	RC Gerber Beam	80,25	4	22,00	1954
127	Canbolu-1	RC	RC Continuous Beam	188,00	9	22,00	1954
128	Malgaç	RC	RC Gerber Beam	57,10	3	22,00	1954
129	Taşova (Yemişhan)	RC	RC Gerber Beam	124,60	6	22,00	1954
130	Keçihisar	RC	RC Arch	59,70	1	32,00	1954
131	Mendo	RC	RC Fixed-ended slab arch	34,40	1	34,40	1954
132	Mutu	RC	RC Fixed-ended arch	44,00	1	44,00	1954
133	Kütür	RC	RC Arch	60,00	1	60,00	1954
134	Kızılmağara	RC	RC Hinged Arch	64,30	1	61,00	1954
135	Sansa (Karasu)	RC	RC Fixed-ended arch	100,00	1	75,00	1954
136	Deliçay	RC	RC Gerber Beam	52,70	3	20,00	1955
137	Kurtuluş	RC	RC Arch	37,50	1	20,50	1955
138	Deliçay	RC	RC Gerber Beam	59,30	3	22,00	1955
139	Gerede Çayı	RC	RC Gerber Beam	80,50	4	22,00	1955
140	Göynük	RC	RC Gerber Beam	103,15	5	22,00	1955
141	Kurtsuyu	RC	RC Gerber Beam	79,80	4	22,00	1955

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
142	Küçük Menderes (Hüseyinağa)	RC	RC Gerber Beam	80,45	5	22,00	1955
143	Özerli	RC	RC Gerber Beam	59,30	3	22,00	1955
144	Çiftlikburnu	RC	RC Gerber Beam	59,90	3	24,00	1955
146	Bahçe-2	RC	RC Gerber Beam	91,40	4	25,00	1955
147	Bahçeköyaltı-1	RC	RC Gerber Beam	91,40	4	25,00	1955
148	Kille (Kepsut)	RC	RC Gerber Beam	117,80	5	25,00	1955
149	Sedre	RC	RC Gerber Beam	68,00	3	25,00	1955
150	Tefen (Gökçebey)	RC	RC Gerber Beam	141,85	6	25,00	1955
151	Sabuncu	RC	RC Arch	54,70	3	29,50	1955
152	Karasu-1	RC	RC Arch	43,00	1	32,00	1955
153	Hamsu	RC	RC Arch	57,90	3	36,90	1955
154	Çayırhan	RC	RC Arch	105,70	1	42,00	1955
155	Malabadi	RC	RC Fixed-ended arch	87,60	1	56,55	1955
156	Çayköy	RC	RC Fixed-ended arch	62,80	1	60,00	1955
157	Dokuzdolanbaç-1	RC	RC Arch	61,80	1	60,00	1955
158	Çiftekavak	RC	RC Gerber Beam	52,50	3	20,00	1956

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
159	Yeniköy (Mürvetler)	RC	RC Simple Girder	34,00	3	20,00	1956
160	Dualı	RC	RC Gerber Beam	58,60	3	22,00	1956
161	Gelibolu	RC	RC Gerber Beam	98,75	5	22,00	1956
162	İmerhav	RC	RC Gerber Beam	59,40	3	22,00	1956
163	Kargalık	RC	RC Gerber Beam	80,80	4	22,00	1956
164	Kündür	RC	RC Gerber Beam	59,30	3	22,00	1956
165	Rahmanlar	RC	RC Gerber Beam	103,40	5	22,00	1956
166	Feslek	RC	RC Gerber Beam	91,55	4	25,00	1956
167	Gazipaşa	RC	RC Gerber Beam	117,85	5	25,00	1956
168	Kargapınarı (Gilindires)	RC	RC Gerber Beam	49,20	2	25,00	1956
169	Reşadiye	RC	RC Gerber Beam	67,80	3	25,00	1956
170	Simav	RC	RC Gerber Beam	241,20	10	25,00	1956
171	Dergalip	RC	RC Fixed-ended slab arch	98,80	1	60,00	1956
172	Dokuzdolanbaç-2	RC	RC Arch	62,40	1	61,00	1956
173	Mayıslar	RC	RC Arch	87,80	1	62,00	1956
174	Güneysu	RC	RC Arch	70,00	1	70,00	1956

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
175	Birecik	RC	RC Mixed	649,60	20		1956
176	Bozyazı	RC	RC Simple Girder	32,50	3	20,00	1957
177	Batlama	RC	RC Gerber Beam	80,10	4	22,00	1957
178	Karasu	RC	RC Gerber Beam	80,50	4	22,00	1957
179	Kermi	RC	RC Gerber Beam	59,65	3	22,00	1957
180	Cemalpaşa (Savrun)	RC	RC Gerber Beam	67,80	3	24,00	1957
181	Silifke	RC	RC Gerber Beam	81,10	3	30,00	1957
182	Hasanlar (Ballık)	RC	RC Fixed-ended arch	77,10	1	53,00	1957
183	Gördes Çayı (Hanya)	RC	RC Simple Girder	33,25	3	20,00	1958
184	Büyükmelen (Avlıyan)	RC	RC Gerber Beam	61,80	3	22,50	1958
185	Dragon	RC	RC Gerber Beam	118,00	5	25,00	1958
186	İzmit Araç Üst Geçit	RC	RC Continuous Beam	61,20	2	34,70	1958
187	Meriç (İpsala Hudud)	RC	RC Gerber Beam	447,50	20		1958
188	Civil	RC	RC Gerber Beam	52,75	3	20,00	1959
189	Sogucaksu	RC	RC Simple Girder	33,50	3	20,00	1959
190	Şehit Arif D.D.Y Üst Geçit	RC	RC Simple Girder	23,30	3	20,00	1959

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
191	Telhöyük D.D.Y Üst Geçit	RC	RC Slab	23,60	3	20,00	1959
192	Hamzabey	RC	RC Simple Girder	34,40	3	20,50	1959
193	Büyükengeçe	RC	RC Simple Girder	31,75	3	20,70	1959
194	Değirmendere	RC	RC Simple Girder	31,70	3	20,70	1959
195	Sesiğ	RC	RC Gerber Beam	58,60	3	22,00	1959
196	Fırat-1	RC	RC Gerber Beam	68,00	3	25,00	1959
197	Fırat-2	RC	RC Gerber Beam	68,00	3	25,00	1959
198	Hamide	RC	RC Gerber Beam	190,10	8	25,00	1959
199	Tabakhane (Salhane)	RC	RC Arch	31,20	1	30,00	1959
200	Yeni Köprü (Zap)	RC	RC Arch	32,00	1	30,00	1959
201	Setrek-1 (Sultansuyu)	RC	RC Hinged Arch	37,00	1	37,00	1959
202	Ada	RC	RC Simple Girder	33,20	3	20,00	1960
203	Çoruh	RC	RC Gerber Beam	53,00	3	20,00	1960
204	Hasankeyf	RC	RC Simple Girder	32,70	3	20,00	1960
205	Kavaklı (Işıklar)	RC	RC Simple Girder	33,90	3	20,00	1960
206	Kemis (Dışkapı)	RC	RC Gerber Beam	55,60	3	20,00	1960

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
207	Kuruçay	RC	RC Simple Girder	33,40	3	20,00	1960
208	Seyhan	RC	RC Simple Girder	171,30	9	20,00	1960
209	Uludere	RC	RC Simple Girder	20,70	1	20,00	1960
210	Kofuğun	RC	RC Simple Girder	20,70	1	20,70	1960
211	Bayat	RC	RC Gerber Beam	59,10	3	22,00	1960
212	Demirkapı-1	RC	RC Frame	23,20	1	22,00	1960
213	D.D.Y. Üst Geçit	RC	RC Slab	61,20	5	22,30	1960
214	Alakır	RC	RC Gerber Beam	106,70	5	22,50	1960
215	Dodurga (Kızılırmak)	RC	RC Gerber Beam	106,70	5	22,50	1960
216	Hoşrik Suyu	RC	RC Gerber Beam	48,00	3	22,50	1960
217	Karasu	RC	RC Gerber Beam	83,00	4	22,50	1960
218	Köprülü	RC	RC Gerber Beam	61,70	3	22,50	1960
219	Peri (Akpazar)	RC	RC Continuous Beam	102,95	5	22,50	1960
220	Şana	RC	RC Gerber Beam	62,10	3	22,50	1960
221	Yanbolu	RC	RC Gerber Beam	61,70	3	22,50	1960
222	Cevizdere	RC	RC Gerber Beam	68,00	3	25,00	1960

Table C.1 Structural types, materials, and spans of the road bridges built between 1923 and 1960 (continued).

	Name of the Bridge	Material	Type	Total length (meters)	Number of spans	Span (meters)	Date of Construction
224	Körkün	RC	RC Gerber Beam	68,60	3	25,00	1960
225	Murat	RC	RC Gerber Beam	140,80	6	25,00	1960
226	Şeytandere	RC	RC Gerber Beam	90,80	4	25,00	1960
227	Bayat-1	RC	RC Simple Girder	32,25	2	25,70	1960
228	Devegeçidi	RC	RC Gerber Beam	80,80	3	30,00	1960
229	Emirali (Çınarlıdere)	RC	RC Simple Girder	48,40	3	30,00	1960
230	Gediz-1	RC	RC Gerber Beam	81,20	3	30,00	1960
231	Zeytinlik (Sirya)	RC	RC Hinged Arch	88,20	1	67,50	1960

** Etlik and Ziraat Mektebi bridges were added to the list due to their importance although they were spanning less than 20 meters.*

Table C.2 List of contractors who built bridges spanning more than twenty meters between 1923 and 1960. Prepared on the data derived from the State National Archives, the Ministry of Public Works Fund, the KGM archives, the Bayındırlık İşleri Dergisi and KGM Bullettin

Bridge Contractors	Bridges	Date of Action	Places of Action	Type
Keşfiyat ve İnşaat Türk Anonim Şirketi (German capital)	Riva Bridge	1925	Istanbul	RC
Fahrettin Celal Bey	Etlik Bridge	1926	Ankara	RC
Müt. Tahsin Bey	Orman Çiftliği Bridge	1927	Ankara	RC
İsmail Hakkı Bey	Akçay Bridge	1929	Aydın	RC
Çankırılı Hacıbayramoğlu Mustafa Bayram Bey	1-Tüney Bridge 2-Afatlar Bridge	1931-1936	Ankara	RC
Nidgvist ve Holm Anonim Şirketi	Kömürhan (İsmet Paşa) Bridge	1930	Malatya	RC
Müt. Reşit Bey	Yeşilırmak (Çarşamba) Bridge	1930	Samsun	RC
Sadık Diri ve Ferruh Atav	Ömerli Bridge	1932	Istanbul	RC
Flender Şirketi (Agent Ali Nuri Bey and partner)	Manavgat Bridge (superstructure)	1932	Antalya	Steel
İzmirli Hayri Bey (adına vekilleri Jozef Bey ve Müh. Şeref Bey)	Manavgat Bridge (substructure)	1932	Antalya	RC
Ankara İnşaat İdarei Fenniyesi (A partnership between Mehmet Galip ve Fescizade İbrahim Galip Şirketi and Erzurumlu Nafiz)	1-Menemen (Kazım Dirik) Bridge 2-Fevzipaşa Bridge	1933-1935	İzmir, Sinop	RC
Kadirizade Hayri ile müteahhit Muhtar Arbatlı ve şeriki Samets Şirketi	Arapsun (Kızılırmak) Bridge	1934	Nevşehir	RC
Müt. Mehmet Nurettin	Gömleksiz (Onuncu Yıl) Bridge	1934	Ankara	RC
Müh. Vehbi Behçet ve Müt. Behçet Beyler	Akçağıl Bridge	1934	Sivas	RC
Müt. Osman ve Enver Beyler	Niksar Bridge	1934	-	Wooden frame
Muhtar Arbatlı ve şeriki Samets Bey	1-Çayırdere Bridge 2-Soğukcadere Bridge 3-Aşağıkale Bridge 4-Yukarıkale Bridge 5-Sahnalar (Ergene) Bridge 6-Hanifidere Bridge 7-Karabekir Bridge	1934-1940	Kırklareli, Sivas, Kars, Bursa, Ankara	RC

Table C.2 List of contractors who built bridges spanning more than twenty meters between 1923 and 1960 (continued)

Bridge Contractors	Bridges	Date of Action	Places of Action	Type
Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	1-Sakarya Bridge 2-Bolaman Bridge 3-Güngörmez Bridge 4-Aksu Bridge 5-Bakırçay Bridge 6-Akçaova Bridge 7-Cevizdere Bridge 8-Curidere Bridge 9-Elekçi Bridge 10-Dalaman Bridge 11-Yahyaköy Bridge 12-Namnam Bridge 13-Ergene Bridge 14-Yalakdere Bridge 15-Dalama Bridge 16-Karadere Bridg 17-Çandere Bridge 18-Hacıkamil Bridge 19-Ürgüp Bridge 20-Akçay Bridge 21-Aksu (Maraş) Bridge 22-Alikaya Bridge 23-Ambarçayı Bridge 24-Suçatı Bridge 25-Tekir Bridge 26-Pisyar Bridge 27-Körkün Bridge 28-Yukarımelet Bridge 29-Gezer Bridge 30-Paşur Bridge	1934-1940	Bolu, Balıkesir, Antalya, İzmir, Ordu, Muğla, Tekirdağ, İzmit, Aydın, Çanakkale, Kayseri Samsun, Maraş, Siirt, Adana	RC
Behçet Bey ve Mühendis-Mimar Salim Derin Ortaklığı	Arslan Bridge	1935	Çanakkale	RC
Müh. Hulusi Bey	Anamur Bridge	1935		Wooden frame
Müt. Osman Bey	Borçka Bridge (substructure)	1935	Artvin	Masonry
Müt. Mehmet Hotamış	1-Çubuk Bridge 2-Gedikağzı Bridge 3-Karaboğaz Bridge	1936	Ankara	RC
Müh. Salih Lütfü Baran	Göksu Bridge	1936	Malatya	RC
Müt. Şecaeddin Bey	Karıncadere Bridge	1936	Balıkesir	RC

Table C.2 List of contractors who built bridges spanning more than twenty meters between 1923 and 1960 (continued)

Bridge Contractors	Bridges	Date of Action	Places of Action	Type
Müh. Raşit Börekçi	1-Kemah Bridge 2-Ilıç (Kuruçay) Bridge	1936-1937	Erzincan	Steel
Halid Kurşuncu	Ovaçayı Bridge	1937	Ankara	RC
Müh. Ali Nihad ve Ömer Lütfi Fenni İnşaat Şirketi (İzmir)	Fadlı Bridge	1937	Tokat	RC
Müh. Salih Baran	Keban Madeni Bridge	1937	Elazığ	RC
Müh. Mahmud Hüseyin ve Mustafa Reşit Beyler	1-İnece Bridge 2-Çetinkaya Bridge	1937	Kilis, Samsun	RC
Müh.-Mim. Salim Derin Bey	1-Hanifedere Bridge 2-Karadere Bridge	1937	Bursa	RC
Y. Müh. Fettah Aytaç	Afrin Bridge	1937	Kilis	RC
Baykut İnşaat Kollektif Şirketi ve Ali Necip Singil Ortaklığı	Kavak Bridge	1938	Çanakkale	RC
Hüseyin Altay	Karasu-(Erfelek) Bridge	1938	Sinop	RC
Müt. Sedad Gaziaskeroğlu	Kıvrımçayı Bridge	1938	Kastamonu	RC
Cemal Onaran	Deliçay Bridge	1938	Bursa	Steel
Aral İnşaat Şirketi	1-Gülüşkür Bridge 2-Singeç Bridge 3-Pertek Bridge 4-Alişan Bridge 5-Cipçayı Bridge	1939	Elazığ, Tunceli	RC
Hasan Selahattin Berkeman	Miliç Bridge	1939	Samsun	RC
Müh. J. Acıman	Gençlik Parkı Bridge	1939	Ankara	RC
Y. Müh. Hasan Selahattin Berkeman	Terme Bridge	1939	Samsun	RC
Müt. Ziya Bağlar	Yeşilırmak Bridge	1940	Amasya	RC
Gazi Bridge Consortium	Gazi (unkapanı) Bridge	1940	Istanbul	Steel
Kemal Gençspor	Horasan (Aras) Bridge	1941	Erzurum	RC
Y. Mim. Sururi Savarı ve vekili Mim. İzzet Baysal	Merkiçmelen Bridge	1941	Bolu	RC

Table C.2 List of contractors who built bridges spanning more than twenty meters between 1923 and 1960 (continued)

Bridge Contractors	Bridges	Date of Action	Places of Action	Type
B. Seibert GMBH im Saarbrücken (Agent Fasih Saylan)	Şehsu Bridge (superstructure)	1941	Tunceli	Steel
Müt. Salih Sabri Taşlıcalı	1-Seyithan Bridge 2-Türüşmek Bridge 3-Şehsu Bridge (substructure) 4-Mameki Demir Bridge (substructure)	1941-1947	Tunceli	RC
MAN A.G.	Ceyhan Demir Bridge (superstructure)	1942	Adana	Steel
Dr. Müh. David Parker	1-Kozluk Bridge 2-Şırzı Bridge	1942-1943	Erzincan	Steel
Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	1-Ambarçayı Bridge 2-Kütür Bridge 3-Mameki Bridge 4-Sansa (karasu) Bridge 5-Mutu Bridge 6-Kirazdere Bridge 7-Ceyhan Demir Bridge (substructure)	1942-1956	Erzincan, Tunceli, Kocaeli, Adana	RC
Müt. Sait Merzeci	1-Beylerderesi Bridge 2-Hilbeş Bridge 3-Salördek Bridge	1944-1949	Malatya, Tunceli	RC
Wagner-Biro	Mameki Demir Bridge (superstructure)	1947	Tunceli	Steel
Müh. Ferruh Atav	Büyük Menderes Bridge	1948	Aydın	RC
Süleyman Betin	Sansa Boğazı Bridge	1949	Erzincan	Steel
Muhtar Arbatlı (vekili Dr. Müh. Adnan Arbatlı)	1-Çeltek (Tersakan) Bridge 2-Teşvikiye (Tersakan-2) Bridge 3-Zana Bridge 4-Göksu-2 Bridge	1949-1951	Amasya, Samsun, İçel	RC
Fikret Zeren ve Ahmet Durak	1-Aşağırabat Bridge 2-Dinar Bridge	1950	Afyon	RC
Hamdi Yener	Göksu Bridge	1950	Adıyaman	RC
Müt. Necmi Şahin	Ağın Bridge	1951	Elazığ	RC

Table C.2 List of contractors who built bridges spanning more than twenty meters between 1923 and 1960 (continued)

Bridge Contractors	Bridges	Date of Action	Places of Action	Type
Y. Müh. Ali Cumalı	Gördes Bridge	1952	Manisa	RC
T.C. Demiryolları ve Limanlar Reisliği	Genç Group of Bridges	1952	Bingöl	Steel
Y. Müh. Vehbi Doğan	Irmak Üst Geçit Bridge	1953	Ankara	RC
Güven-İş Kollektif Şirketi (Şefik Dündar ve Osman Mörel)	Bostancı-2 Bridge	1954	Balıkesir	RC
İzzet Odabaşıoğlu	Kızılmağara Bridge	1954	Erzincan	RC
Müt. Nasri Kaya	Malabadi Bridge	1955	Diyarbakır	RC
Müt. Orhan Çobanoğlu	Sabuncu Bridge	1955	Kilis	RC
Amaç Ticaret Türk Anonim Şti.	Birecik Bridge	1956	Birecik	RC
Y. Müh. Bekir Bora	Mayıslar Bridge	1956	Eskişehir	RC
Y. Müh. Orhan Çobanoğlu	Dergalip Bridge	1956	Siirt	RC
Y. Müh. Ali Cumalı	Gördes Bridge	1952	Manisa	RC
Yol Köprü Kollektif Şirketi (vekili Fikret Yüksel)	Güneysu Bridge	1956	Rize	RC
Yapı Kollektif Ortaklığı Şti. (Şahabettin Hacıoğlu)	Silifke Bridge	1957	İçel	RC
İnşaat ve İthalat Limited Şirketi	1-Hasanlar Bridge 2-Büyükmelen Bridge	1957-1958	Düzce	RC
Nurhayr İnşaat Limited Şirketi	Setrek Bridge	1959	Malatya	RC
Sedat Baycan, Süleyman Betin ve İzzet Bellikan	Zeytinlik (Sirya) Bridge	1960	Artvin	RC

Table C.3 List of foreign contractors and their local agents who attended bids and built bridges spanning more than twenty meters between 1923 and 1960. Prepared on the data derived from the State National Archives, the Ministry of Public Works Fund, the KGM archives, the Bayındırlık İşleri Dergisi and KGM Bullettin.

Company	Country	Year	Agent	Submitted Tenders	Obtained Contracts
Nidgvist ve Holm Anonim Şirketi	Sweden	1930	Eng. Sigürd Gjersiel	Kömürhan Bridge	Kömürhan Bridge
Christiyani et Nielsen	-	1930	-	Kömürhan Bridge	-
Fried. Krupp A.G.	Germany	1932	Dielmann et Bill	Manavgat, Borçka, Gazi, and Bosporus Bridges	Gazi (Unkapanı) Bridge Consortium
Flander A.G.	Germany	1932	Ali Nuri ve şeriki	Manavgat, and Borçka Bridges	Manavgat Bridge
Deutz-Humboldt Mashinenbau Anstalt	Germany	1932	Hans Frank	Manavgat Bridge	-
Kölsch & Fölzer A.G.	Germany	1932	Eng. Süha Fazlı	Manavgat Bridge	-
The international shipbuilding and engineering Co. Ltd., and Danziger Werft und Bigenbahnwerketütten Aktiengesellschaft, Danzig	Germany	1933	Sodet Keşfiyat ve İnşaat TAŞ.	Borçka Bridge	-
Anciens Etablissement Skoda Fab. – plezen	Czechoslo-vakia	1933	Karel Anders and Dr. Cudi Nusrat Bey (İtimat Kollektif Şirketi)	Borçka Bridge	Borçka Bridge
Magyar waggon és Gépgyar	-	1933	-	Borçka Bridge	-
Christoph & Unmack Aktiengesellschaft (Nissky O.L)	-	1933	-	Borçka Bridge	-
Waddell and Hardesty Consulting Engineers-NY	America	1934	-	Gazi (Unkapanı) Bridge	-
Gutehoffnungshütte Oberhausen A.G.	Germany	1935	-	Kemah, and Ilıç Bridges	-
Dortmunder UNION	Germany	1937	-	Gazi (Unkapanı) Bridge	Gazi Bridge Consortium
G.H.H. Werk Sterkrade	Germany	1937	-	Gazi (Unkapanı) Bridge	Gazi Bridge Consortium

Table C.3 List of foreign contractors and their local agents who attended bids and built bridges spanning more than twenty meters between 1923 and 1960 (continued).

Company	Country	Year	Agent	Submitted Tenders	Obtained Contracts
MAN Maschinenfabrik-Augsburg Nürnberg A.G.	Germany	1938	Hugo Hermann	Ceyhan Demir, Gazi, Kemah and Ilıç Bridges	Ceyhan Demir, and Gazi (Unkapanı) Bridge (Consortium Leader)
B. Seibert G.M.B.H Saarbrücken-Stahlhochbau Stahlbrickenbau	Germany	1938	Fasih Saylan	Şehsu, and Ceyhan Demir Bridge	Şehsu Bridge
Louis Eilers Fabrik Fuer Eisen-Hoch und brückenbau-Hannover	Germany	1938	Alfred Schwarz	Ceyhan Demir Bridge	-
Dortmunder brückenbau C. H. Jucho –Dortmund	Germany	1938	Official Istanbul Agency	Ceyhan Demir Bridge	-
Beuchelt & Co. Brückenbau und Stahlbau Beton- und Tiefbau-Grünberg	Germany	1938	Mehmet Vasfi Gürer	Ceyhan Demir Bridge	-
Vays und Feraytag Aksiyengezelşaft	Germany	1938	-	Ceyhan Demir Bridge	-
Robert W. Hunt Co. London (Controlling)	England	1938	-	-	Borçka, and Ceyhan Demir Bridges
Witkovitzer Bergbau Fabrikası	Czechoslov akia	1939	Alfred Schwarz	Şırzı and Kozluk Bridges	Şırzı and Kozluk Bridges
Steelmaker NY. Co.	America	1946	Koç Anonim şti.	Mameki Demir Bridge	-
Waagner-Biro Aktiengessellschaft – Wien	avusturya	1946	Akun Türk Anonim şti.	Mameki Demir Bridge	Mameki Demir Bridge
Baume et Wrpent	Belgium	1946	Osman Taşçıoğlu	Mameki Demir Bridge	-
Antonio Badoni Co.	Italy	1946	Oklar Limited Şirketi	Mameki Demir	-
Morrison-Knudsen Co. Inc.	America	1969		Bosporus Bridge	

Table C.4 List of foreign masters worked in bridge constructions spanning more than twenty meters between 1923 and 1960. Prepared on the data derived from the State National Archives, the Ministry of Public Works Fund, the KGM archives, the Bayındırlık İşleri Dergisi and KGM Bullettin

Name	Country	Year	Mastership	Firm	Bridge Constructions Attended
Haus Efendi	-	1931	Driller	The Ministry of Public Works	Aksu Bridge
Engineer Harhof	-	1932	Engineer	Flander Co.	Manavgat and various railway bridges
Engineer Balaj	Hungary	1935	Engineer	The Ministry of Public Works	Keban Madeni and Kömürhan Bridges
Andraş oğlu Turi-Antal	Hungary	1935	ironworks	Müteahhit Muhtar Bey	Karabekir Bridge
Yanuş oğlu Scheider	Hungary	1935	Scaffolding	Müteahhit Muhtar Bey	Karabekir Bridge
İstayko Canof	Bulgaria	1935	Scaffolding	Müteahhit Muhtar Bey	Karabekir Bridge
Architect Jozef	Bulgaria	1935	Architect	Müteahhit Salih Bey	Keban Madeni Bridge
İvan oğlu Kulu	Bulgaria	1936	Ironworks and scaffolding	SaFerHa	Sakarya Bridge
M. İstanyanof oğlu Yorgi	Bulgaria	1936	Ironworks and scaffolding	SaFerHa	Bolaman and Sakarya Bridges
Sava Nidelko oğlu Dimitri	Bulgaria	1936	Ironworks and scaffolding	SaFerHa	Dalaman Bridge
İvan Danof oğlu Istefan	Bulgaria	1937	Carpenter and Falsework	Aral İnşaat Ltd. Şti	Pertek, Singeç, Gülüşkür Bridges
Angelof oğlu Raco	Bulgaria	1937	Carpenter and Falsework	Aral İnşaat Ltd. Şti	Pertek, Singeç, Gülüşkür Bridges
Cinisto oğlu Evengenio Vianovita	Italy	1937	Ironworks	Aral İnşaat Ltd. Şti	Pertek, Singeç, Gülüşkür Bridges
Anton Jeager	Germany	1938	Mounter	MAN	Ceyhan demir Bridge
Wilhem Lustenberger	Germany	1938	Mounter	MAN	Ceyhan demir Bridge
Ferdinand Zvonarich	Germany	1938	Mounter	MAN	Ceyhan demir Bridge
Philip Knap	Germany	1938	Mounter	MAN	Ceyhan demir Bridge
Arthur Hjellström	Sweden	1938	Mounter	MAN	Ceyhan demir and Gazi Bridges

Table C.4 List of foreign masters worked in bridge constructions spanning more than twenty meters between 1923 and 1960 (continued)

Name	Country	Year	Mastership	Firm	Bridge Constructions Attended
Todorof İvanavof oğlu Pether	Bulgaria	1938	Carpenter	SaFerHa	Aksu, Suçatı, Tekir and Alikaya Bridges
Kavaliyef oğlu Raçer	Bulgaria	1938	Scaffolding	SaFerHa	Aksu, Suçatı, Tekir and Alikaya Bridges
Motef Yonkoff oğlu Simeon	Bulgaria	1938	Ironworks	SaFerHa	Aksu, Suçatı, Tekir and Alikaya Bridges
Nedefkof oğlu Sarçef	Bulgaria	1939	Ironworks	SaFerHa	Aksu, Suçatı, Tekir and Alikaya Bridges
Todor Stoyanof oğlu Peu Todoroff	Bulgaria	1939	Ironworks and scaffolding	SaFerHa	Aksu, Suçatı, Tekir and Alikaya Bridges
Massimo Moro	Italy	1941	Mounter	B. Seibert G.M.B.H Saarbrücken-Stahlhochbau Stahlbrickenbau	Şehsu Bridge
Georges Waters	England	1952	Operator of pile driver	Amaç Ticaret T.A.Ş.	Birecik Bridge

Table C.5 Total list of road bridges arragend in chronological order. Prepared on the data derived from the State National Archives, Ministry of Public Works Fund, the KGM Archives, the Bayındırlık İşleri Dergisi and Kgm Bulletin

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
1	1924	Garzan	Bitlis	Diyarbakır-Bitlis	Garzan	Stone	Stone Arch	36	1	36		
2	1925	Riva	İstanbul	Beykoz-Ömerli	Bozhane	RC	RC Fixed-ended Arch	48	1	48	İnşaat Turk Anonim Şirketi (Sociéte Anonyme Turque d'Etudes et d'Entreprises Urbaines Constantinople)	
3	1926	Etlik*	Ankara	Ankara-Etlik	Etlik	RC	RC Continuous Beam	45	3	15	Fahrettin Celal Bey	
4	1926	Ziraat Mektebi*	Ankara	Ankara-Dışkapı		RC	RC Continuous Beam	45	3	15	Fahrettin Celal Bey	
5	1926	M. Kemal Paşa	Bursa	Karacabey-Susurluk	M.Kemal Paşa	RC	RC Continuous Beam	118,2	6	20		
6	1927	Sarayköy	Denizli	Nazilli-Denizli	Menderes	RC	RC Gerber Beam		1	30		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
7	1927	Orman Çiftliği	Ankara	Ankara		RC	RC Bowstring	25	1	25	Tahsin Bey	
8	1928	Kirazlık	Bartın	Bartın-Safranbolu	Kocaırmak	RC	RC Arch	50	1	48		
9	1929	Arslan	Zonguldak	Ereğli-Devrek	Arslan	RC	RC Arch	51	2	24		
10	1929	Akçay	Aydın	Nazilli-Bozdoğan	Akçay	RC	RC Arch	199	5	35	İsmail Hakkı Bey	201302,68
11	1930	Güngörmez	Balıkesir	Çanakkale-Balıkesir	Güngörmez	RC	RC Gerber Beam	85,4	5	23,8	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
12	1930	Kömürhan (İsmet Paşa)	Malatya	Elazığ-Malatya	Fırat	RC	RC Girder		1	109	Nidgvist & Holm Anonim Şirketi	
13	1930	Yeşilırmak (Çarşamba)	Samsun	Samsun-Terme	Dicle	RC		286	7		Reşit bey	186222
14	1931	Büyük Agonya	Çanakkale	Çanakkale-Balıkesir	Agonya	Concrete	Concrete Arch	105	3	26		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
15	1931	Dalama	Aydın	Aydın-Çine	Dalama	Steel	Steel Truss	85,1	3	27,6	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
16	1932	Ömerli	İstanbul	Üsküdar-Şile	Ömerli	RC	RC Gerber Beam	72	5	20	Sadık Diri & Ferruh Atav İnşaat Kollektif Şirketi	
17	1932	Manavgat	Antalya	Antalya-Manavgat	Manavgat	Steel	Steel Truss	60	1	60	Flender A.G. (steel superstructure) & İzmirli Hayri Bey (masonry substructure)	
18	1933	Bakırçay	İzmir	İzmir-Bergama	Bakırçay	RC	RC Arch	52	2	26	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	41540,55
19	1933	Fevzipaşa (İspiroğlu-Çakmak)	Sinop	Sinop-Kastamonu	Gökırmak	RC	RC Arch	54	2	27	Ankara İnşaat İdare-i Fenniyesi (Eng. Mehmet Galip, Fescizade İbrahim Galip & Erzurumlu Nafiz Co.)	

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
20	1933	Aksu	Antalya	Antalya-Manavgat	Aksu	RC	RC Bowstring	93,3	1	42	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
21	1934	Körkün	Adana	Adana-Karisalı	Körkün	RC	RC Fixed-ended arch	25	1	25	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
22	1934	Arapsun (Kızılırmak)	Nevşehir	Kırşehir-Nevşehir	Kızılırmak	RC	RC Gerber Beam	131,3	5	30	Kadirizade Hayri & Ahmet Muhtar ve şeriki Samets Şirketi	67533
23	1934	Karabekir	Ankara	Ankara-Çorum	Delice	RC	RC Bowstring	32	1	32	Muhtar Arbatlı ve şeriki Samets	16,5
24	1934	Akçağıl	Sivas	Suşehri-Niksar	Kelkit	RC	RC Bowstring	70	2	35	Eng. Vehbi Behçet & Behçet	69147
25	1934	Paşur	Siirt	Siirt-Diyarbakır	Başur	RC	RC Fixed-ended slab arch	75,1	1	50,4	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
26	1934	Gezer	Siirt	Siirt-Diyarbakır	Gezer						Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
27	1934	Niksar	Tokat	Tokat-Niksar-Ünye	Kelkit	Wood	Wooden Simple Girder	640			Osman & Enver beyler	6326,04
28	1935	Cevizdere	Ordu	Ordu-Samsun	Cevizdere	RC	RC Gerber Beam	64	3	24	kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	36000
29	1935	Elekçi	Ordu	Ordu-Samsun	Elekçi	RC	RC Gerber Beam	64	3	24	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	32 000
30	1935	Anamur	Mersin	Anamur-Kılindire	Anamur	Wood	Wooden Truss	26,8	3	26,8	Eng. Hulusi	10699
31	1935	Menemen (Kazım Dirik - Cumurluk - Gediz)	İzmir	İzmir-Bergama	Gediz	RC	RC Bowstring	162,3	5	31,33	Ankara İnşaat İdare-i Fenniyesi (Eng. Mehmet Galip, Fescizade İbrahim Galip & Erzurumlu Nafiz Co.)	163144,31

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
32	1935	Yukarımelet	Ordu	Ordu-Mesudiye		RC	RC Hinged Arch	106	2	53	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
33	1935	Borçka	Artvin	Hopa-Kars	Borçka	Steel	Steel Truss	113	1	113	Anciens Etablissement Skoda Fab.	77400
34	1936	Dalaman köprüsü	Muğla	Muğla-Fethiye	Dalaman	RC	RC Bowstring	105	3	35	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	60458
35	1936	Göksu	Malatya	Besni-Adıyaman	Göksu	RC	RC Girder	112	3	35	Eng. Salih Baran	52290
36	1936	Kemah	Erzincan	Erzincan-Kemaliye	Fırat	Steel	Suspended	53,5	1	53,5	Eng. Raşit Börekçi	42292
37	1936	Bolaman	Ordu	Ordu-Fatsa	Bolaman	RC	RC Girder	65	1	65	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	47040

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
38	1936	Hanifdere	Gaziantep	Kilis-Islahiye	Hanifdere	RC						23935
39	1937	Yalakdere	İzmit	Kocaeli-İzmir	Yalakdere	RC	RC Bowstring	46,3	3	22,5	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	17800
40	1937	Karadere	Bursa	Balıkesir-Bandırma	Karadere	RC	RC Gerber Beam	28	3	28	Eng. Arch. Salim Derin	37940
41	1937	Yahyaköy (Yayaköy)	Balıkesir	Balıkesir-M. Kemal Paşa	Simav	RC	RC Continuous Beam	30	3	30	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	53068,75
42	1937	Sakarya	Bolu	Adapazarı-Bolu	Sakarya	RC	RC Bowstring	114,7	3	35	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	68090
43	1937	Afrin (Eski Köprü)	Kilis	Kilis-Islahiye	Afrin	RC	RC Arch	54,3	4	36	Eng. Fettah Aytaç	23933

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
44	1937	Fadlı	Tokat	Niksar-Reşadiye	Fadlı	RC	RC Girder	54	1	36	Fenni İnşaat Şirketi - İzmir (Eng. Ali Nihad & Ömer Lütfi)	21027
45	1937	Fazlı	Tokat	Niksar-Reşadiye	Kelkit	RC	RC Girder	36	1	36		21027
46	1937	Ilıç (Kuruçay)	Erzincan	Kemah-Ilıç	Fırat	Steel	Steel Truss	60,8	3	36	Eng. Raşit Börekçi	19457,5
47	1937	Çetinkaya (Kızılırmak-Bafra)	Samsun	Samsun-Bafra	Kızılırmak	RC	RC Bowstring	251,8	7	36	Eng. Mahmut Hüseyin & Mustafa Reşit	221062
48	1937	Keban Madeni	Elazığ	Elazığ-Arapkir	Fırat	RC	RC Arch	120	6	62	Eng. Salih baran	68355
49	1938	Ürgüp	Kayseri	Kayseri-Ürgüp	İncesu	RC	RC Continuous Beam	40	3	20	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	35900

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
50	1938	Ürgüp (Damsa)	Nevşehir		Damsa	RC	RC Gerber Beam			20		
51	1938	İsaköy (Göksu)	İstanbul	Beykoz-Ağva	Göksu	RC	RC Hinged Arch	51,4	1	29,1		43456
52	1938	Singeç	Tunceli	Elazığ-Hozat	Singeç	RC	RC Fixed-ended Arch	36	1	36	Aral İnşaat Şirketi	
53	1939	Cipçayı	Elazığ	Elazığ-Keban Madeni	Cipçayı	RC	RC Gerber Beam	40	2	20	Aral İnşaat Şirketi	68673
54	1939	Terme	Samsun	Samsun-Terme	Terme	RC	RC Gerber Beam	50	3	20	Eng. Hasan Selahattin Berkeman	33601
55	1939	Tekir	Kahramanmaraş	Maraş-Kayseri	Tekirdere	RC	RC Continuous Beam	21,9	1	21,9	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	32314
56	1939	Akçay	Samsun	Terme-Ünye	Akçay	RC	RC Arch	90	3	30	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	57375

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
57	1939	Ergene	Tekirdağ	Muratlı-Büyük Karıştıran	Ergene	RC	RC Bowstring	69,7	4	31,33	Kadirzade Sadık, Halit, Ferruh İnşaat Kollektif Şirketi (SaFerHa)	
58	1939	Miliç	Samsun	Samsun-Terme	Miliç	RC	RC Bowstring	32	1	31,8	Eng. Hasan Selahattin Berkeman	14639
59	1939	Aşağıkale	Sivas	Koyulhisar-Reşadiye	Kelkit	RC	RC Girder	36	1	36	Muhtar Arbatlı ve şeriki Samets	86381
60	1939	Gülüşkür	Elazığ	Elazığ-Palu	Murat	RC	RC Bowstring	180	5	36	Aral İnşaat Şirketi	182631
61	1939	Alikaya	Kahramanmaraş	Maraş-Kayseri	Murat	RC	RC Hinged Arch	42	1	42	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	59167
62	1939	Suçatı	Kahramanmaraş	Maraş-Kayseri	Murat	RC	RC Hinged Arch	42	1	42	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	30786
63	1939	Yukarıkale	Sivas	Koyulhisar-Ordu	Kelkit	RC	RC Girder	63,5	3	43,5	Muhtar Arbatlı ve şeriki Samets	86381

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
64	1939	Pertek	Elazığ	Elazığ-Tunceli	Murat	RC	RC Girder	106,2	1	106,2	Aral İnşaat Şirketi	155818,76
65	1939	Ambarçayı	Diyarbakır	Diyarbakır-Silvan	Ambarçayı	RC	RC Simple Girder				Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	
66	1939	Gençlik Park	Ankara	Gençlik Park	Gençlik Park	RC	RC Arch		1		Eng. J. Acıman	
67	1940	Sahnalar (Ergene)	Kars	Hudut-Kars	Arpaçay	Steel	Steel Truss	39	1	38	Muhtar Arbatlı ve şeriki Samets	36750
68	1940	Pisyar	Siirt	Malabadi-Bitlis	Garzan	RC	RC Arch	50,5	1	44,4	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	63578
69	1940	Deveres	Çankırı	Kastamonu-Çankırı	Deveres	RC	RC Continuous Beam	82,15	5	16.30		36009
70	1940	Gazi (Unkapanı)	İstanbul	İstanbul freeway	Goldenhorn	Steel	Pontoon	440			Gazi Bridge Consortium (MAN A.G. [consortium leader], Fried Krupp A.G., Guteoffnungs-Hütte Werk Sterkrade, and Dortmunder Union Brückenbau A.G.)	1585885,95

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
71	1941	Seyithan	Tunceli	Elazığ-Erzincan	Harcısuyu	RC	RC Arch	23	1	23	Salih Sabri Taşlıcalı	17957
72	1941	Merkiçmelen	Bolu	Bolu-Adapazarı	Küçük Melen	RC	RC Gerber Beam	130,5	5	30	Arch. Sururi Savarı	40113,75
73	1941	Salat	Diyarbakır	Diyarbakır-Cizre		RC		256	8	32		
74	1941	Horasan (Aras)	Erzurum	Trabzon-Iran transit road	Aras	RC	RC Bowstring	114	3	36	Kemal Gençspor	142059
75	1941	Şehsu	Tunceli	Pertek-Malazgirt	Munzur	Steel	Steel Truss	70	1	70	Seibert GMBH im Saarbrücken (steel superstructure) Salih Sabri Taşlıcalı (substructure)	37079
76	1942	Şırzı	Erzincan	Malatya-Erzincan	Fırat	Steel	Steel Truss	40	1	40	Eng. David Parker	41667
77	1942	Ceyhan Demir	Adana	Adana	Ceyhan	Steel	Steel Truss	139	4	80	MAN A.G. (steel superstructure) Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi (substucture) and Ziya Bağlar (RC slab cover)	235237

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
78	1943	Kozluk	Erzincan	Malatya-Erzincan	Kozluk	Steel	Steel Truss	40	1	40	Eng. David Parker	27907
79	1944	Ambarçayı	Adana	Adana-Karisalı	Çakıt	RC	RC Continuous Beam	94	4	26	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	
80	1945	Kertil (Yumurtalı)	Manisa	Akhisar-Sındırgı	Yumurtalı	Stone	Stone Arch	48,4	1	20		
81	1945	Kavuncu	Eskişehir	Sivrihisar-Haymana		RC	RC Bowstring	30	1	30		77698
82	1946	İvyan	Trabzon			RC	RC Gerber Beam	22	1	22		85909
83	1946	Çağdırış	Trabzon	Trabzon-Iran transit road		RC	RC Bowstring	42	1	42		
84	1946	Pazarbaşı	Rize	Rize Costal Road		RC	RC Gerber Beam	62,8	3	24.30		105082
85	1947	Ayvalı Tohması	Malatya	Darende-Hekimhan	Tohma	RC		38,9	3	24,6		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
86	1947	Mameki Demir	Tunceli	Elazığ-Erzincan	Mameki	Steel	Steel Truss	56	1	56	Waagner-Biro (Steel superstructure) Salih Sabri Taşlıcalı (substructure)	
87	1948	Küçük Menderes (Beydağ)	İzmir	Aydın-Muğla	Küçük Menderes	RC	RC Bowstring			34		
88	1949	Teşvikiye	Samsun	Hevza-Merzifon	Tersakan	RC	RC Gerber Beam	47,2	2	23,35	Muhtar Arbatlı	
89	1949	Hilbeş	Tunceli	Tunceli-Mutu	Pülümür	RC	RC Gerber Beam	47,4	2	23,5	Sait Merzeci	491256,07
90	1949	Çeltek (Tersakan)	Amasya	Havza-Amasya	Tersakan	RC	RC Gerber Beam	59,65	3	24	Muhtar Arbatlı	
91	1949	Keşiş	Osmaniye	Kadirli-Andırın	Keşiş	RC	RC Gerber Beam	63,75	3	24		
92	1949	Göksu-2	Mersin	Silifke-Mut	Göksu	RC	RC Gerber Beam	88,85	3	34	Muhtar Arbatlı & Dr. Eng. Adnan Arbatlı	525000
93	1949	Salördek (Kırmızı)	Tunceli	Tunceli-Mutu	Kırmızıdere	RC	RC gerber slab	47,40 m	2	47,4	Sait Merzeci	491256,07

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
94	1949	Sansa Boğazı (Fırat Demir)	Erzincan	Erzincan-Erzurum	Karasu	Steel	Steel Truss		3		Süleyman Betin	90608
95	1950	Sındırgı (Simav)	Balıkesir	Bigadiç-Balıkesir	Simav	RC	RC Gerber Beam	98,7	5	22		
96	1950	Aşağırabat	Tunceli	Tunceli-Elazığ		RC	RC Gerber Beam	48	2	24	Fikret Zeren & Ahmet Durak	227385,88
97	1950	Bigadiç (Simav)	Balıkesir	Balıkesir-Akhisar	Simav	RC	RC Gerber Beam	251,7	11	24		
98	1950	Çaycuma (Filyos)	Zonguldak	Hisarönü-Çaycuma	Filyos	RC	RC Gerber Beam	255,7	11	24		
99	1950	Göksu	Adıyaman	Narlı-Malatya	Göksu	RC	RC Gerber Beam	65	3	26	Hamdi Yener	385507
100	1950	Dinar	Tunceli	Tunceli-Elazığ		RC	RC Arch		1	27,1	Fikret Zeren & Ahmet Durak	227385,88
101	1950	Harşit	Giresun	Giresun Costal Road	Harşit	Wood	suspended	51,8	1	51,8		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
102	1951	Acı-1	Çankırı	Çankırı-Ankara	Acısu	RC	RC Gerber Beam	136,1	7	21		
103	1951	Uluabat-1	Bursa	Balıkesir-Bursa	Uluabat	RC	RC Gerber Beam	159,6 5	9	22		
104	1951	Çanakçı (Elevidere)	Giresun	Tirebolu-Görele	Çanakçı	RC	RC Gerber Beam	155,5 5	7	24		
105	1951	Turnasuyu	Ordu	Ordu-Giresun	Turna	RC	RC Gerber Beam	107,7	5	24		
106	1951	Harşit	Giresun	Tirebolu-Görele	Harşit	RC	RC Gerber Beam	248,4	10	24,84		
107	1951	Zana	Amasya	Amasya-Erbaa	Yeşilırmak	RC	RC Gerber Beam	96,5	5	26,5	Muhtar Arbatlı	
108	1951	Ağın	Elazığ	Elazığ-Ağın	Arapkir	RC	RC Fixed-ended Arch	49	1	31	Necmi Şahin	
109	1951	Mameki (Tunceli)	Tunceli	Elazığ-Mutu	Munzur	RC	RC Hinged Slab Arch	116,4	1	72	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
110	1952	Acı-2	Çankırı	Çankırı-Ankara	Acısu	RC	RC Gerber Beam	135,7	7	21		
111	1952	Üskübü Melen	Düzce	Akçakoca-Düzce	Melen	RC	RC Gerber Beam	100,1	5	22		
112	1952	Melet	Ordu	Ordu-Giresun	Melet	RC	RC Gerber Beam	251,7	11	24		
113	1952	Gördes	Manisa	Gördes-Köprübaşı	Kum	RC	RC Arch	88,95	2	42	Eng. Ali Cumalı	
114	1952	Genç	Bingöl	Bingöl-Diyarbakır	Murat	Steel	Steel Truss	165	3	55	T.C. Demiryolları ve Limanlar Reisliği	
115	1953	Niksar (Hamidiye)	Tokat	Niksar-Tokat	Kelkit	RC	RC Gerber Beam	191,1	9	22		
116	1953	Karasu (Sakarya)	Sakarya	Adapazarı-Karasu	Sakarya	RC	RC Gerber Beam	68	3	25		
117	1953	Delice	Yozgat	Çerikli-Yozgat	Delice	RC	RC Gerber Beam	64,95	3	26		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
118	1953	Karasu-1	Muş	Muş-Bitlis	Karasu	RC	RC Arch	43,3	1	30		
119	1953	Kuşcuderesi	Elazığ	Elazığ-Bingöl	Kuşcu	RC	RC Fixed-ended arch	56,35	1	36		
120	1953	Irmak Üst Geçit	Ankara	Elmadağ-Kırıkkale		RC					Eng. Vehbi Doğan	
121	1954	Beylik (Kızılcahamam)	Ankara	Kızılcahamam-Ankara	Kocaçay	RC	RC Gerber Beam	52,9	3	20		
122	1954	Obaçay	Antalya	Alanya-Gazipaşa	Obaçayı	RC	RC Simple Girder	33,4	3	20		
123	1954	Sarıköy (Yunusemre)	Eskişehir	Mihalıçcık-Sivrihisar	Porsuk	RC	RC Simple Girder	33	3	20		
124	1954	Kargıcak	Antalya	Alanya-Gazipaşa	Kargıcak	RC	RC Gerber Beam	41,55	2	21		
125	1954	Bostancı-1	Balıkesir	Balıkesir-Akhisar	Üzümcü	RC	RC Gerber Beam	59,4	3	22		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
126	1954	Bostancı-2	Balıkesir	Balıkesir-Akhisar	Kille	RC	RC Gerber Beam	80,25	4	22	Güven-İş Kollektif Şirketi (Şefik Dündar & Osman Mörel)	
127	1954	Canbolu-1	Bursa	Balıkesir-Zeytinbağı	Simav	RC	RC Continuous Beam	188	9	22		
128	1954	Malgaç	Aydın	Aydın-Nazilli	Malgaç	RC	RC Gerber Beam	57,1	3	22		
129	1954	Taşova (Yemişhan)	Amasya	Taşova-Alpasrlan	Yeşilırmak	RC	RC Gerber Beam	124,6	6	22		
130	1954	Keçihisar	Kastamonu	Ereğli-Devrek		RC	RC Arch	59,7	1	32		
131	1954	Mendo	Bingöl	Karakoçan-Bingöl	Mendo	RC	RC Fixed-ended slab arch	34,4	1	34,4		
132	1954	Mutu	Erzincan	Elazığ-Erzurum		RC	RC Fixed-ended arch	44	1	44	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	996441,63
133	1954	Kütür	Erzincan	Elazığ-Erzurum		RC	RC Arch	60	1	60	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	995441,63

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
134	1954	Kızılmağara	Erzincan	Başköy-Mercan	Karasu	RC	RC Hinged Arch	64,3	1	61	İzzet Odabaşıoğlu	
135	1954	Sansa (Karasu)	Erzincan	Erzincan-Erzurum	Karasu	RC	RC Fixed-ended arch	100	1	75	Sadık Diri & Halit Köprücü İnşaat Kollektif Şirketi	997441,63
136	1955	Deliçay	Mersin	Adana-İskenderun	Deliçay	RC	RC Gerber Beam	52,7	3	20		
137	1955	Kurtuluş	Ordu	Fatsa-Ordu	Kurtuluş	RC	RC Arch	37,5	1	20,5		
138	1955	Deliçay	Hatay	İçel-Adana	Deliçay	RC	RC Gerber Beam	59,3	3	22		
139	1955	Gerede Çayı	Karabük	Gerede-İsmetpaşa	Gerede	RC	RC Gerber Beam	80,5	4	22		
140	1955	Göynük	Bingöl	Bingöl-Muş	Göynük	RC	RC Gerber Beam	103,1 5	5	22		
141	1955	Kurtsuyu	Mersin	Silifke-Mut	Kurtdere	RC	RC Gerber Beam	79,8	4	22		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
142	1955	Küçük Menderes (Hüseyinağa)	İzmir	Selçuklu-Ödemiş	Küçük Menderes	RC	RC Gerber Beam	80,45	5	22		
143	1955	Özerli	Hatay	Adana-İskenderun	Özerli	RC	RC Gerber Beam	59,3	3	22		
144	1955	Çiftlikburnu	Aydın	Koçarlı-Aydın		RC	RC Gerber Beam	59,9	3	24		
146	1955	Bahçe-2	Sivas	Niksar-Suşehri	Kelkit	RC	RC Gerber Beam	91,4	4	25		
147	1955	Bahçeköyaltı-1	Tokat	Niksar-Suşehri	Kelkit	RC	RC Gerber Beam	91,4	4	25		
148	1955	Kille (Kepsut)	Balıkesir	Balıkesir-Kavacık	Kille	RC	RC Gerber Beam	117,8	5	25		
149	1955	Sedre	Antalya	Alanya-Gazipaşa	Sedre	RC	RC Gerber Beam	68	3	25		
150	1955	Tefen (Gökçebey)	Zonguldak	Devrek-Çaycuma	Filyos	RC	RC Gerber Beam	141,85	6	25		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
151	1955	Sabuncu	Kilis	Kilis-Hassa	Sabun	RC	RC Arch	54,7	3	29,5	Eng. Orhan Çobanoğlu	223406,18
152	1955	Karasu-1	Bilecik	Sakarya-Bilecik	Karasu	RC	RC Arch	43	1	32		
153	1955	Hamsu	Bilecik	Sakarya-Bilecik	Hamsu	RC	RC Arch	57,9	3	36,9		
154	1955	Çayırhan	Ankara	Nallıhan-Beypazarı	Sarıyar Baraj	RC	RC Arch	105,7	1	42		
155	1955	Malabadi	Diyarbakır	Silvan-Kozluk	Batman	RC	RC Fixed-ended arch	87,6	1	56,55	Nasri Kaya	
156	1955	Çayköy	Eskişehir	Sarıcakaya-Söğüt	Sakarya	RC	RC Fixed-ended arch	62,8	1	60		
157	1955	Dokuzdolanbaç-1	Tokat	Erbaa-Reşadiye	Kelkit	RC	RC Arch	61,8	1	60		
158	1956	Çiftekavak	Rize	İyidere-Rize	Çiftekavak	RC	RC Gerber Beam	52,5	3	20		
159	1956	Yeniköy (Mürvetler)	Balıkesir	Bandırma-Darıca	Mürvetler	RC	RC Simple Girder	34	3	20		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
160	1956	Dualı	Şanlıurfa	Viranşehir-Ş.Urfa	Cürcüp	RC	RC Gerber Beam	58,6	3	22		
161	1956	Gelibolu	Muğla	Marmaris-Muğla	Balançay	RC	RC Gerber Beam	98,75	5	22		
162	1956	İmerhav	Artvin	Artvin-Şavşat	Şartuk	RC	RC Gerber Beam	59,4	3	22		
163	1956	Kargalık	Antalya	Korkuteli-Elmalı	Kargalık	RC	RC Gerber Beam	80,8	4	22		
164	1956	Kündür	Tokat	Niksar-Suşehri	Kelkit	RC	RC Gerber Beam	59,3	3	22		
165	1956	Rahmanlar	İzmir	Selçuklu-Ödemiş	Rahmanlar	RC	RC Gerber Beam	103,4	5	22		
166	1956	Feslek	Aydın	Nazilli-Sarayköy	Feslek	RC	RC Gerber Beam	91,55	4	25		
167	1956	Gazipaşa	Antalya	Gazipaşa-Anamur	Delice	RC	RC Gerber Beam	117,8 5	5	25		
168	1956	Kargapınarı (Gilindires)	Mersin	Mersin-Silifke	Gilindires	RC	RC Gerber Beam	49,2	2	25		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
169	1956	Reşadiye	Tokat	Niksar-Suşehri	Kelkit	RC	RC Gerber Beam	67,8	3	25		
170	1956	Simav	Balıkesir	Balıkesir-Susurluk	Simav	RC	RC Gerber Beam	241,2	10	25		
171	1956	Dergalip	Siirt	Siirt-Eruh	Botan	RC	RC Fixed-ended slab arch	98,8	1	60	Eng. Orhan Çobanoğlu	
172	1956	Dokuzdolanbaç-2	Tokat	Erbaa-Reşadiye	Kelkit	RC	RC Arch	62,4	1	61		
173	1956	Mayıslar	Eskişehir	Eskişehir-Sarıcakaya	Sakarya	RC	RC Arch	87,8	1	62	Eng. Bekir Bora	
174	1956	Güneysu	Rize	Güneysu-Büyükdere	Güneysu	RC	RC Arch	70	1	70	Yol Köprü Kollektif Şirketi (Fikret Yüksel)	
175	1956	Birecik	Şanlıurfa	G. Antep-Ş. Urfa	Fırat	RC	RC Mixed	649,6	20		Amaç Ticaret Türk Anonim Şti.	2008520,92
176	1957	Bozyazı	Mersin	Silifke-Anamur	Bozyazı	RC	RC Simple Girder	32,5	3	20		
177	1957	Batlama	Giresun	Ordu-Giresun	Batlama	RC	RC Gerber Beam	80,1	4	22		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
178	1957	Karasu	Gaziantep	Yavuzeli-Ardahan	Karasu	RC	RC Gerber Beam	80,5	4	22		
179	1957	Kermi	Şanlıurfa	Viranşehir-Ş.Urfa	Kermi	RC	RC Gerber Beam	59,65	3	22		
180	1957	Cemalpaşa (Savrun)	Osmaniye	Kazan-Kadirli	Savrun	RC	RC Gerber Beam	67,8	3	24		
181	1957	Silifke	Mersin	Mersin-Silifke	Göksu	RC	RC Gerber Beam	81,1	3	30	Yapı Kollektif Ortaklığı (Şahabettin Hacıoğlu)	
182	1957	Hasanlar (Ballık)	Düzce	Düzce-Yığlıca		RC	RC Fixed-ended arch	77,1	1	53	İnşaat & İthalat Limited Şti.	
183	1958	Gördes Çayı (Hanya)	Manisa	Akhisar-Gördes	Gördes	RC	RC Simple Girder	33,25	3	20		
184	1958	Büyükmelen (Avlıyan)	Düzce	Hendek-Düzce	Melen	RC	RC Gerber Beam	61,8	3	22,5	İnşaat & İthalat Limited Şti.	
185	1958	Dragon	Mersin	Silifke-Antalya	Dragon	RC	RC Gerber Beam	118	5	25		
186	1958	İzmit Araç Üst Geçit	İzmit	İzmit-İstanbul		RC	RC Continuous Beam	61,2	2	34,7		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
187	1958	Meriç (İpsala Hudud)	Edirne	Turkey-Greece Border	Meriç	RC	RC Gerber Beam	447,5	20			
188	1959	Civil	Ordu	Ordu-Giresun	Civil	RC	RC Gerber Beam	52,75	3	20		
189	1959	Sogucaksu	Antalya	Antalya-Serik	Soğukcasu	RC	RC Simple Girder	33,5	3	20		
190	1959	Şehit Arif D.D.Y Üst Geçit	Gaziantep	G. Antep-K. Maraş		RC	RC Simple Girder	23,3	3	20		
191	1959	Telhöyük D.D.Y Üst Geçit	Gaziantep	G. Antep-K. Maraş		RC	RC Slab	23,6	3	20		
192	1959	Hamzabey	Bursa	Yenişehir-İnegöl	Gökçesu	RC	RC Simple Girder	34,4	3	20,5		
193	1959	Büyükengeçe	Çanakkale	Çanakkale-Balıkesir	Engece	RC	RC Simple Girder	31,75	3	20,7		
194	1959	Değirmendere	Çanakkale	Çanakkale-Balıkesir	Değirmendere	RC	RC Simple Girder	31,7	3	20,7		
195	1959	Sesiğ	Şanlıurfa	Ş. Urfa-Viranşehir	Sesik	RC	RC Gerber Beam	58,6	3	22		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
196	1959	Fırat-1	Erzincan	Erzincan-Çağlayan	Karasu	RC	RC Gerber Beam	68	3	25		
197	1959	Fırat-2	Erzincan	Erzincan-Çağlayan	Küçük Fırat	RC	RC Gerber Beam	68	3	25		
198	1959	Hamide	Osmaniye	Osmaniye-Kadirli	Ceyhan	RC	RC Gerber Beam	190,1	8	25		
199	1959	Tabakhane (Salhane)	Balıkesir	Çanakkale-Edremit		RC	RC Arch	31,2	1	30		
200	1959	Yeni Köprü (Zap)	Hakkari	Van-Yüksekova	Zap	RC	RC Arch	32	1	30		
201	1959	Setrek-1 (Sultansuyu)	Malatya	Darende-Malatya	Sultansuyu	RC	RC Hinged Arch	37	1	37	Nurhayr İnşaat Limited Şirketi	
202	1960	Ada	Samsun	Samsun-Havza	Ada	RC	RC Simple Girder	33,2	3	20		
203	1960	Çoruh	Erzurum	Erzurum-Rize	Çoruh	RC	RC Gerber Beam	53	3	20		
204	1960	Hasankeyf	Kilis	Kilis-Hassa	Hasankeyf	RC	RC Simple Girder	32,7	3	20		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
205	1960	Kavaklı (Işıklar)	Aydın	Karacasu-Tavas	Işıklar	RC	RC Simple Girder	33,9	3	20		
206	1960	Kemis (Dışkapı)	Sivas	Hafik-Celalli	Kızılırmak	RC	RC Gerber Beam	55,6	3	20		
207	1960	Kuruçay	Denizli	Uşak-Çivril	Kurudere	RC	RC Simple Girder	33,4	3	20		
208	1960	Seyhan	Adana	Adana-Ceyhan	Seyhan	RC	RC Simple Girder	171,3	9	20		
209	1960	Uludere	Kahramanmaraş	Ağabeyli-Çağlıyanıcedit	Uludere	RC	RC Simple Girder	20,7	1	20		
210	1960	Kofuğun	Trabzon	Vakfikebir-Akçaabat	Kofuğun	RC	RC Simple Girder	20,7	1	20,7		
211	1960	Bayat	Çorum	Çankırı-İskilip	Bayat	RC	RC Gerber Beam	59,1	3	22		
212	1960	Demirkapı-1	Isparta	Isparta-Ağlasun		RC	RC Frame	23,2	1	22		
213	1960	D.D.Y. Üst Geçit	Kahramanmaraş	K. Maraş-Türkoğlu		RC	RC Slab	61,2	5	22,3		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
214	1960	Alakır	Antalya	Finike-Kumluca	Alakır	RC	RC Gerber Beam	106,7	5	22,5		
215	1960	Dodurga (Kızılırmak)	Çorum	Osmancık-Dodurga	Kızılırmak	RC	RC Gerber Beam	106,7	5	22,5		
216	1960	Hoşrik Suyu	Erzurum	Aşkale-Tercan	Tuzçayı	RC	RC Gerber Beam	48	3	22,5		
217	1960	Karasu	Erzurum	Aşkale-Tercan	Karasu	RC	RC Gerber Beam	83	4	22,5		
218	1960	Köprülü	Hakkari	Hakkari-Zap	Zap	RC	RC Gerber Beam	61,7	3	22,5		
219	1960	Peri (Akpazar)	Elazığ	Kovancılar-Tunceli	Peri Suyu	RC	RC Continuous Beam	102,95	5	22,5		
220	1960	Şana	Trabzon	Trabzon-Yomra	Şana	RC	RC Gerber Beam	62,1	3	22,5		
221	1960	Yanbolu	Trabzon	Yomra-Araklı	Yanbolu	RC	RC Gerber Beam	61,7	3	22,5		
222	1960	Cevizdere	Ordu	Samsun-Ordu	Cevizdere	RC	RC Gerber Beam	68	3	25		

Table C.5 Total list of road bridges arragend in chronological order. (continued)

	Date of Construction	Name of the Bridge	Location	Roadway	Stream	Material	Type	Total length (metres)	Number of spans	Span (metres)	Constructor	Cost (TL.)
223	1960	Gediz-2	Uşak	Kula-Uşak	Gediz	RC	RC Gerber Beam	90,85	4	25		
224	1960	Körkün	Adana	Saltaşı-Çatalan	Seyhan	RC	RC Gerber Beam	68,6	3	25		
225	1960	Murat	Muş	Malazgirt-Nurettin	Murat	RC	RC Gerber Beam	140,8	6	25		
226	1960	Şeytandere	Kırklareli	Pınarhisar-Kırklareli	Ergene	RC	RC Gerber Beam	90,8	4	25		
227	1960	Bayat-1	Çorum	Çankırı-İskilip		RC	RC Simple Girder	32,25	2	25,7		
228	1960	Devegeçidi	Diyarbakır	Diyarbakır-Ergani	Devegeçidi	RC	RC Gerber Beam	80,8	3	30		
229	1960	Emirali (Çınarlıdere)	Tekirdağ	Tekirdağ-Hayrabolu	Çaydere	RC	RC Simple Girder	48,4	3	30		
230	1960	Gediz-1	Manisa	Kula-Uşak	Gediz	RC	RC Gerber Beam	81,2	3	30		
231	1960	Zeytinlik (Sirya)	Artvin	Artvin-Erzurum	Çoruh	RC	RC Hinged Arch	88,2	1	67,5	Sedat Baycan, Süleyman Betin & İzzet Bellikan	989671,16

APPENDIX D

MAP SHOWING ROAD BRIDGE CONSTRUCTION (1923-1960)

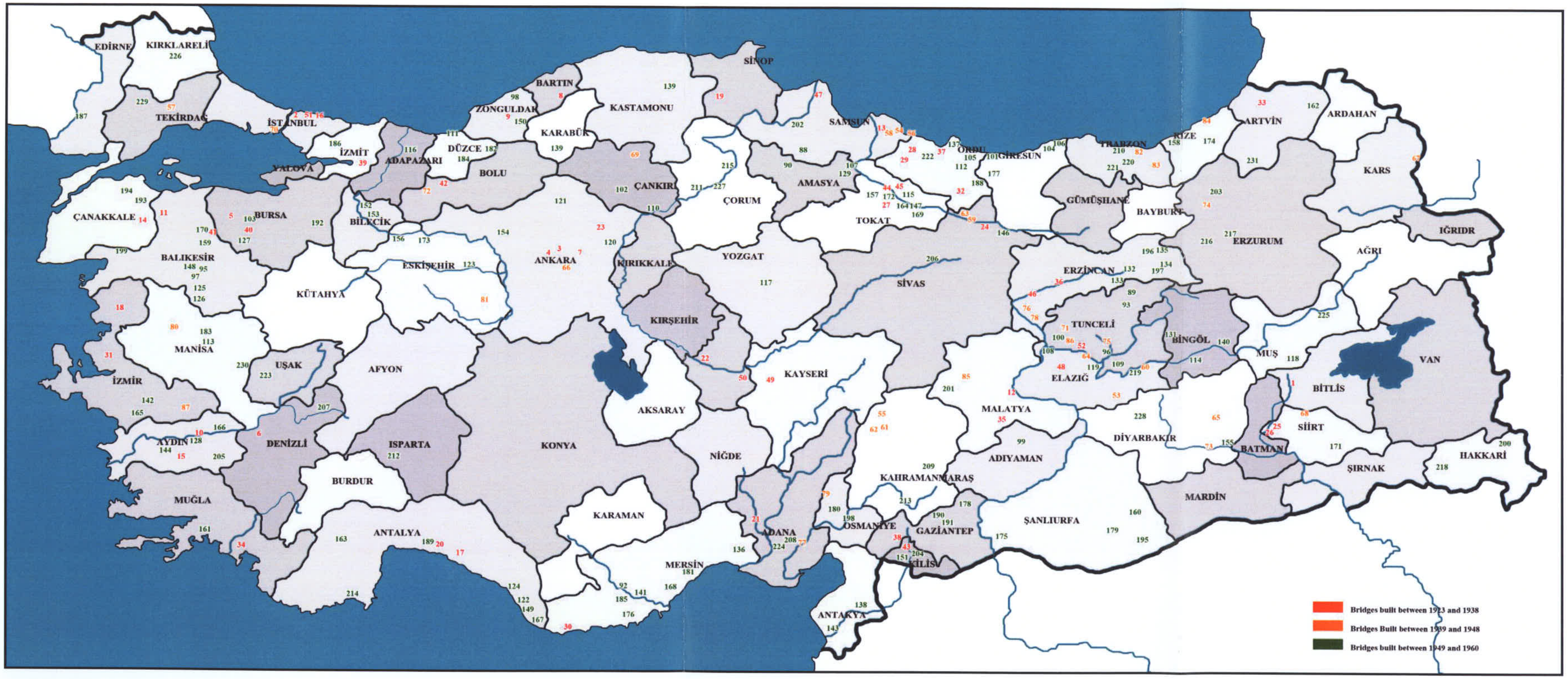


Figure D.1 Map showing road bridges built in Turkey between 1923 and 1960. Prepared on the data from the table C3

.

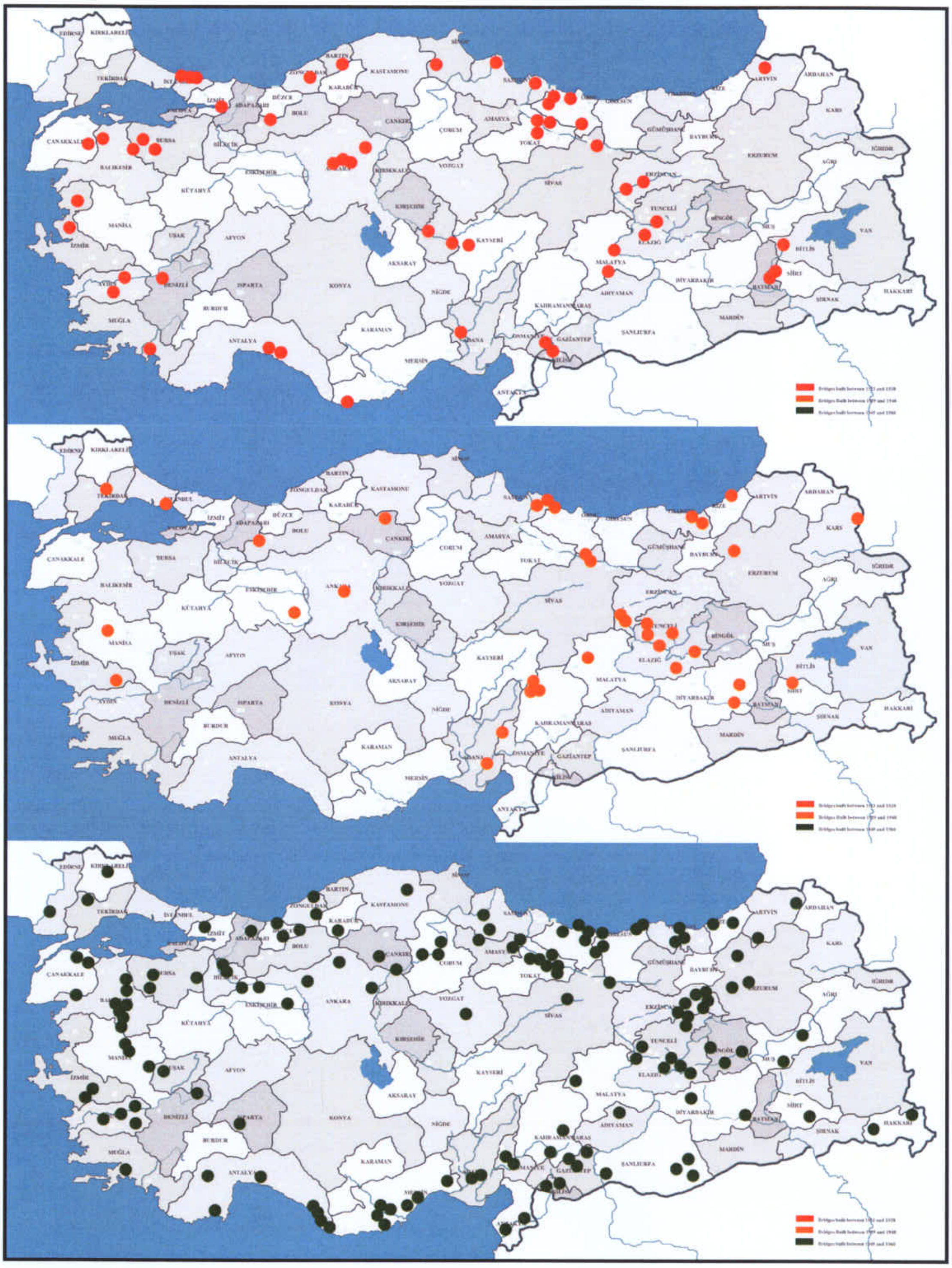


Figure D.2 Distribution of road bridges built in (up to down) 1923-1938, 1939-1948 and 1949-1960

APPENDIX E

TABLE ON ROADS IN THE OTTOMAN EMPIRE (1881-1908)

Table E.1 Original of the table showing the roads in the Ottoman Empire between 1881 and 1908, from 1908 development plan. Source: "Noradunkyan Efendi'nin Nafıa Projesi", Ticaret ve Nafıa Nezareti, 1324 [1908], p.18.

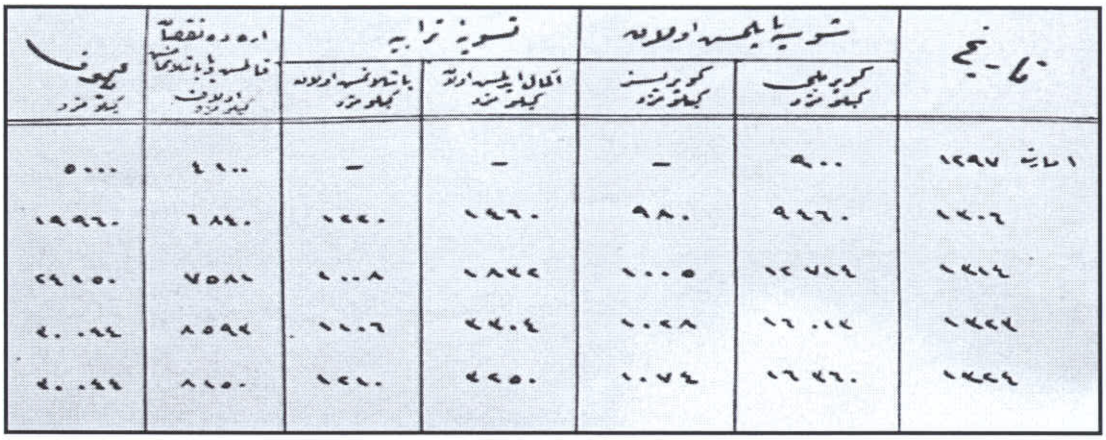


Table E.2 Transcription of the table showing the roads in the Ottoman Empire between 1881 and 1908, from 1908 development plan.

Date		1297 (1881)	1306 (1890)	1314 (1898)	1323 (1907)	1324 (1908)
Paved road	With bridges (km)*	900	9.460	12.714	16.013	16.360
	Without bridges (km)*	-	980	1.005	1.028	1.074
Unimproved road	Completed (km)	-	1.460	1.732	3.304	3.250
	Under construction (km)	-	1.220	1.008	1.106	1.210
Fragmentary (km)		4.100	6.840	7.581	8.593	8.150
Total (km)		5.000	19.960	24.150	30.044	30.044

** There is no further explanation on the meaning of phrase "with and without bridges" in the original text. Nevertheless, it is quite possible that the phrase designates the roads, which had not completed yet and the function of the road were maintained by rafts as in case of Birecik (author's note).*

APPENDIX F

TABLE ON FUTURE DEMAND FOR TECHNICAL WORKFORCE (1967-1982)

Table F.1 Original of the table on estimated numbers of technicians, engineers, and artisans for 1967, 1970, 1977 and 1982 in the second development plan for five years. Source: Türkiye Mühendislik Haberleri, Rüzgarlı Matbaa, Ankara: Agu. 1955, p.18

	Meslek	1967	1970	1977	1982
Talep	Mühendis	25 500	33 700	63 200	94 800
Arz	»	16 900	20 800	31 900	39 000
Açık	»	8 600	12 900	31 300	55 800
Talep	Teknisyen	42 600	60 400	142 500	261 400
Arz	»	35 900	40 400	54 600	72 200
Açık	»	6 700	20 000	87 900	189 200
Talep	Sanatkâr	1 387 000	1 782 900	2 894 600	4 129 700
Arz	»	1 286 000	1 391 400	1 761 200	2 263 700
Açık	»	101 000	337 500	1 133 400	1 666 000

(Kaynak: İkinci Beş Yıllık Kalkınma Plânı)

Table F.2 Translation of the table on estimated numbers of technicians, engineers, and artisans for 1967, 1970, 1977 and 1982 in the second development plan for five years.

Profession		1967	1970	1977	1982
Demand	Engineer	25 500	33 700	63 200	94 800
Supply	"	16 900	20 800	31 900	39 000
Deficiency	"	8 600	12 900	31 300	55 800
Demand	Technician	42 600	60 400	142 500	261 400
Supply	"	35 900	40 400	54 600	72 200
Deficiency	"	6 700	20 000	87 900	189 200
Demand	Artisan	1 387 000	1 782 900	2 894 600	4 129 700
Supply	"	1 286 000	1 392 400	1 761 200	2 263 700
Deficiency	"	101 000	337 500	1 133 400	1 666 000

APPENDIX G

MAP OF ROADS AND RAILWAYS IN 1920

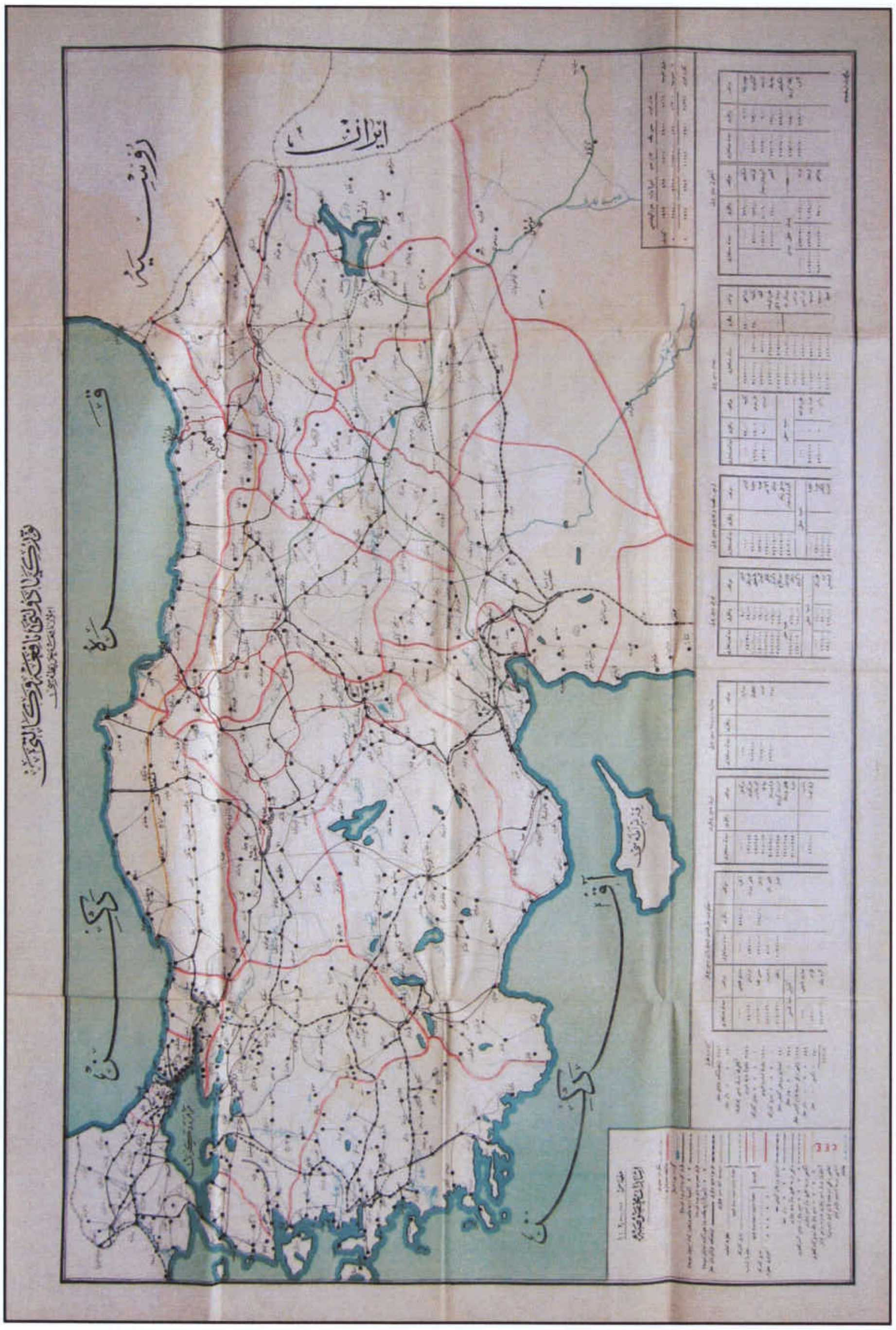


Figure G. Map of roads and railways in 1920. Source. Türkiye Devleti Nafia Vekaleti Umur-u Nafia Projesi, 1339 (1920).

APPENDIX H

SELECTED DOCUMENTS ON ROAD BRIDGE CONSTRUCTION (1923-1960)

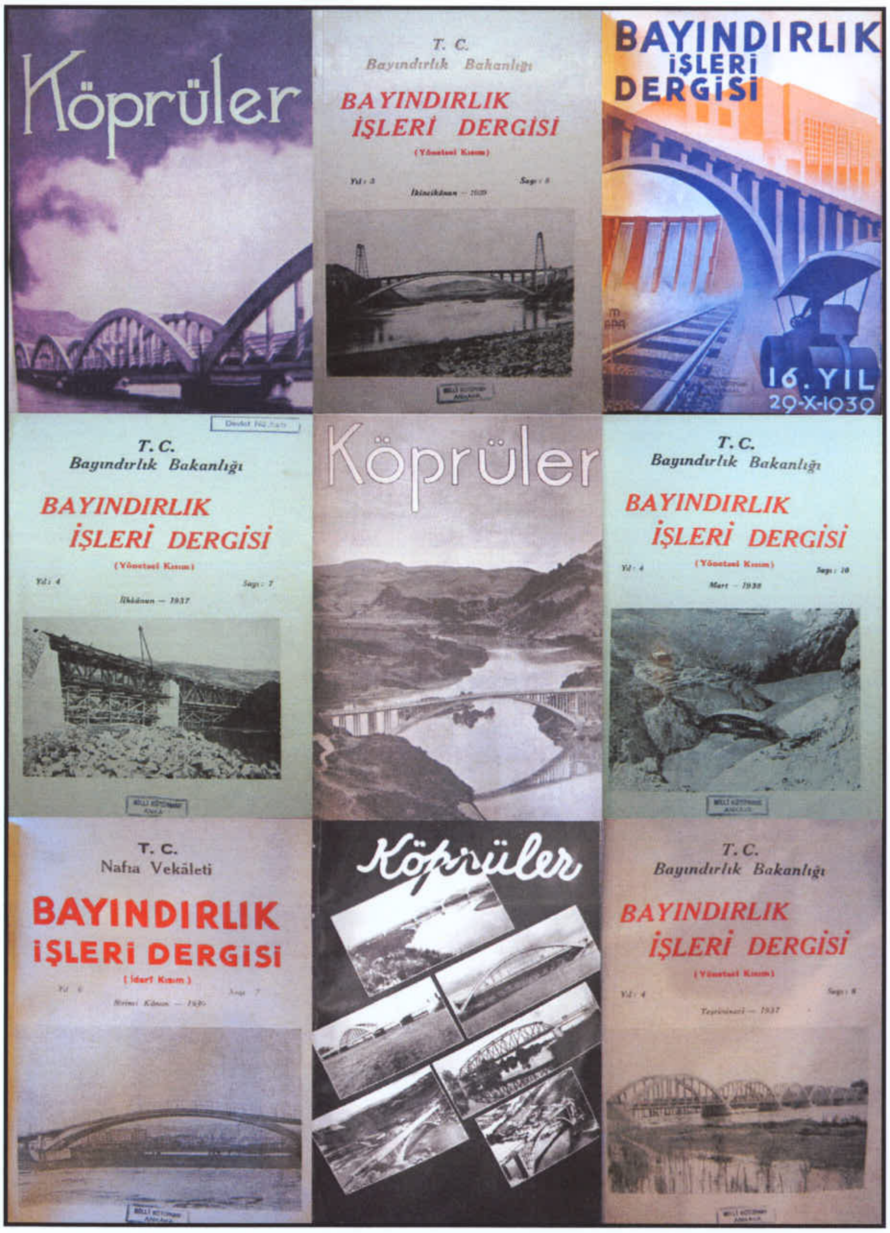
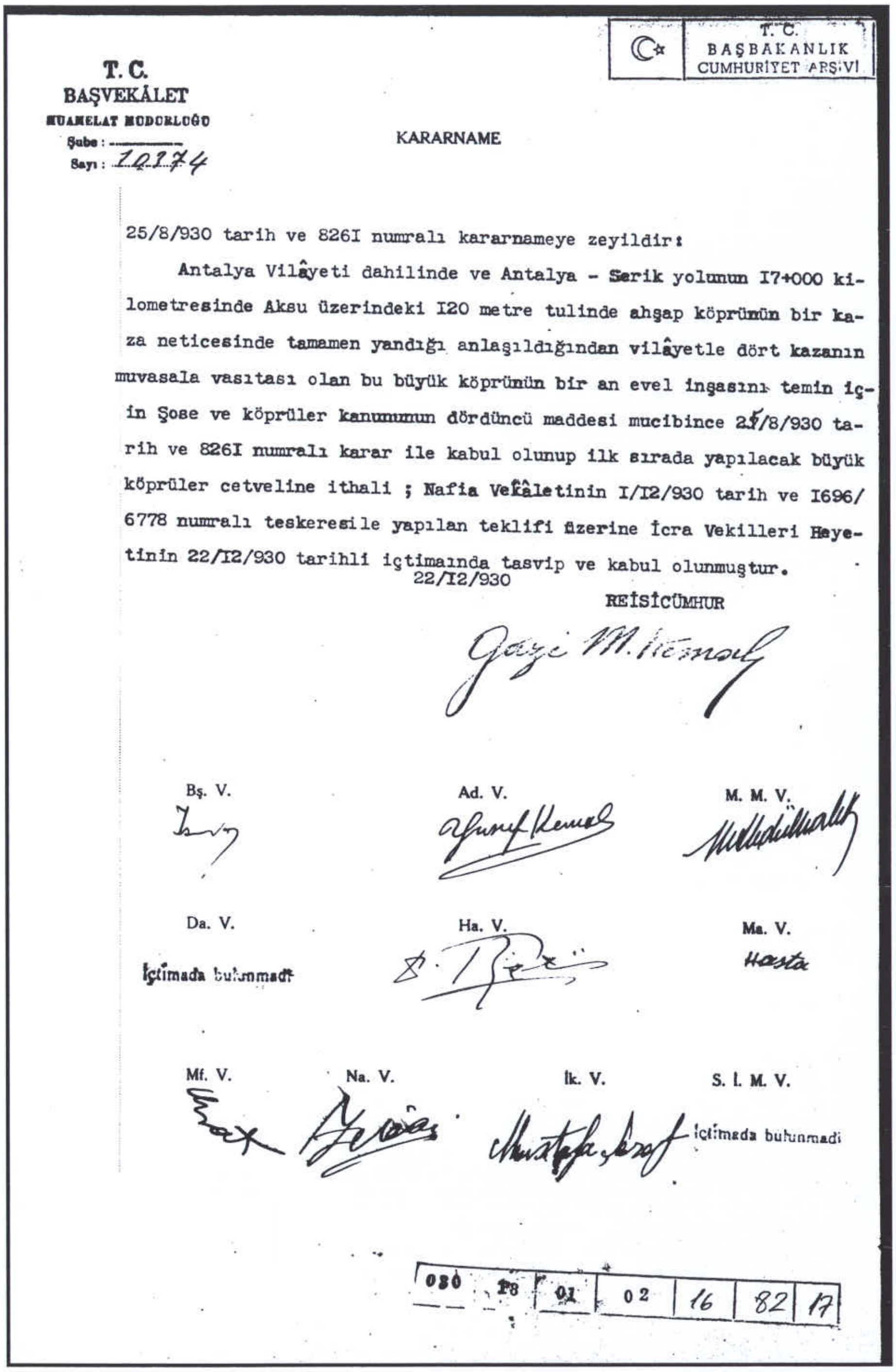


Figure H.1 Various covers from Nafia İşleri Dergisi, circa 1930.



T. C.
BAŞVEKÂLET
MUAMELAT MÜDÜRLÜĞÜ
Şube :
Sayı : 10274

T. C.
BAŞBAKANLIK
CUMHURİYET ARŞİVİ

KARARNAME

25/8/930 tarih ve 826I numralı kararnameye zeyildir:

Antalya Vilâyeti dahilinde ve Antalya - Serik yolunun I7+000 kilometresinde Aksu üzerindeki I20 metre tulinde ahşap köprünün bir kaza neticesinde tamamen yandığı anlaşıldığından vilâyetle dört kazanın muvasala vasıtası olan bu büyük köprünün bir an evel inşasını temin için Şose ve köprüler kanununun dördüncü maddesi mucibince 25/8/930 tarih ve 826I numralı karar ile kabul olunup ilk sırada yapılacak büyük köprüler cetveline ithali ; Nafia Vekâletinin I/I2/930 tarih ve I696/6778 numralı teskeresile yapılan teklifi üzerine İcra Vekilleri Heyetinin 22/I2/930 tarihli içtimaında tasvip ve kabul olunmuştur.

22/I2/930

REİSİCÜMHUR

Gazi M. Kemal

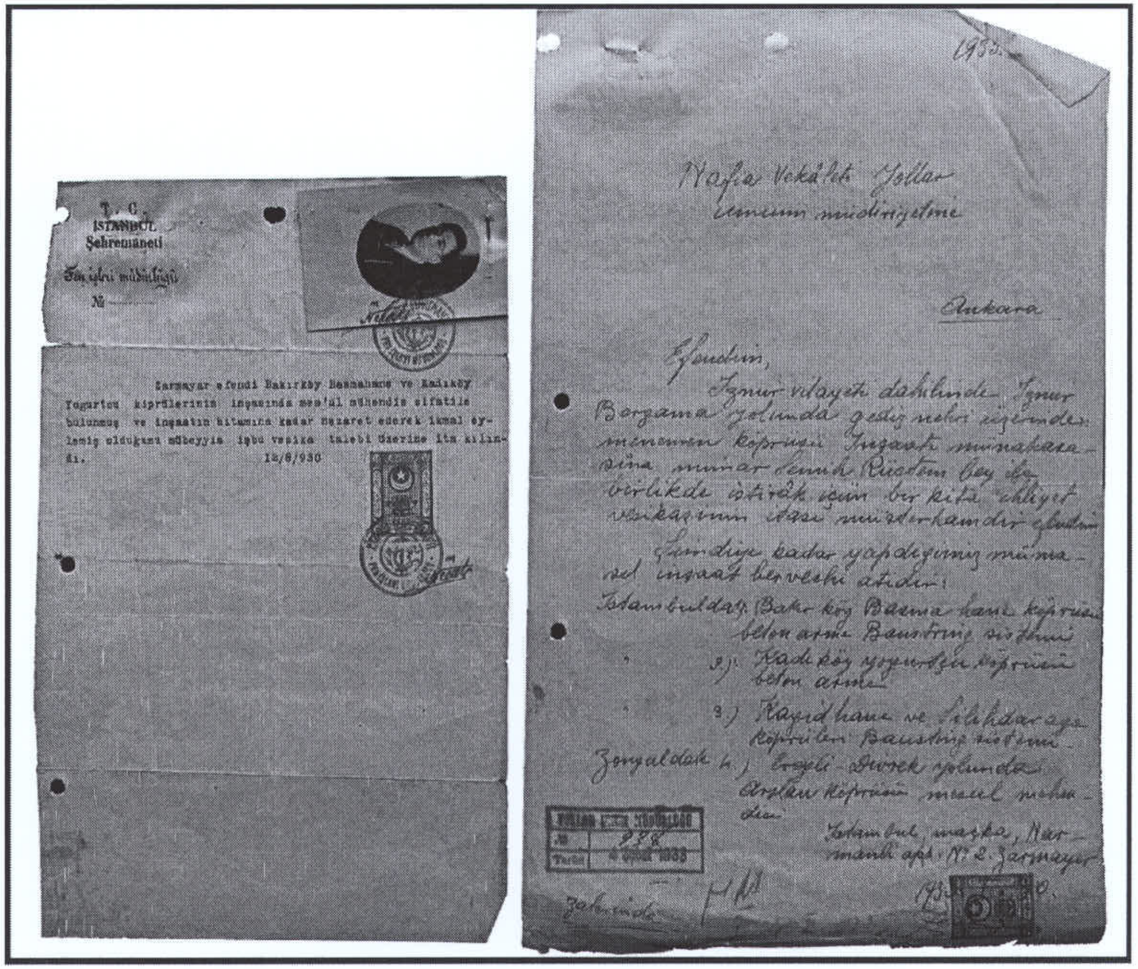
Bş. V. | Ad. V. | M. M. V.

Da. V. İçtimada bulunmadı | Ha. V. | Ma. V. Hasta

Mf. V. | Na. V. | İk. V. | S. İ. M. V. İçtimada bulunmadı

080 18 01 02 16 82 17

Figure H.2 Presidential decree on construction of Aksu Bridge signed by Gazi Mustafa Kemal., Source: State National Archives-Republican Archives, Binder no: 080.18.01.02.16.82.17



T. C.
İSTANBUL
Şehremaneti
Fen işleri müdürlüğü
№

Zarmayar efendi Bakırköy Basmahane ve Kadıköy Yoğurtcu köprülerinin inşaatında mesul mühendis sıfatile bulunmuş ve inşaatın hitamına kadar nezaret ederek ikmal eylemiş olduğunu mübeyyin işbu vesika talebi üzerine ita kılındı.
12/8/930

Nafia Vekâleti Yollar
Umum müdiriyetine

Ankara

Efendim,

İzmir vilayeti dahilinde İzmir Bergama yolunda gediz nehri üzerinde menemen köprüsü inşaatı münakasasına mimar Semih Rüstem bey ile birlikte iştirak için bir kıta ehliyet vesikasının itası müsterhamdır efendim.

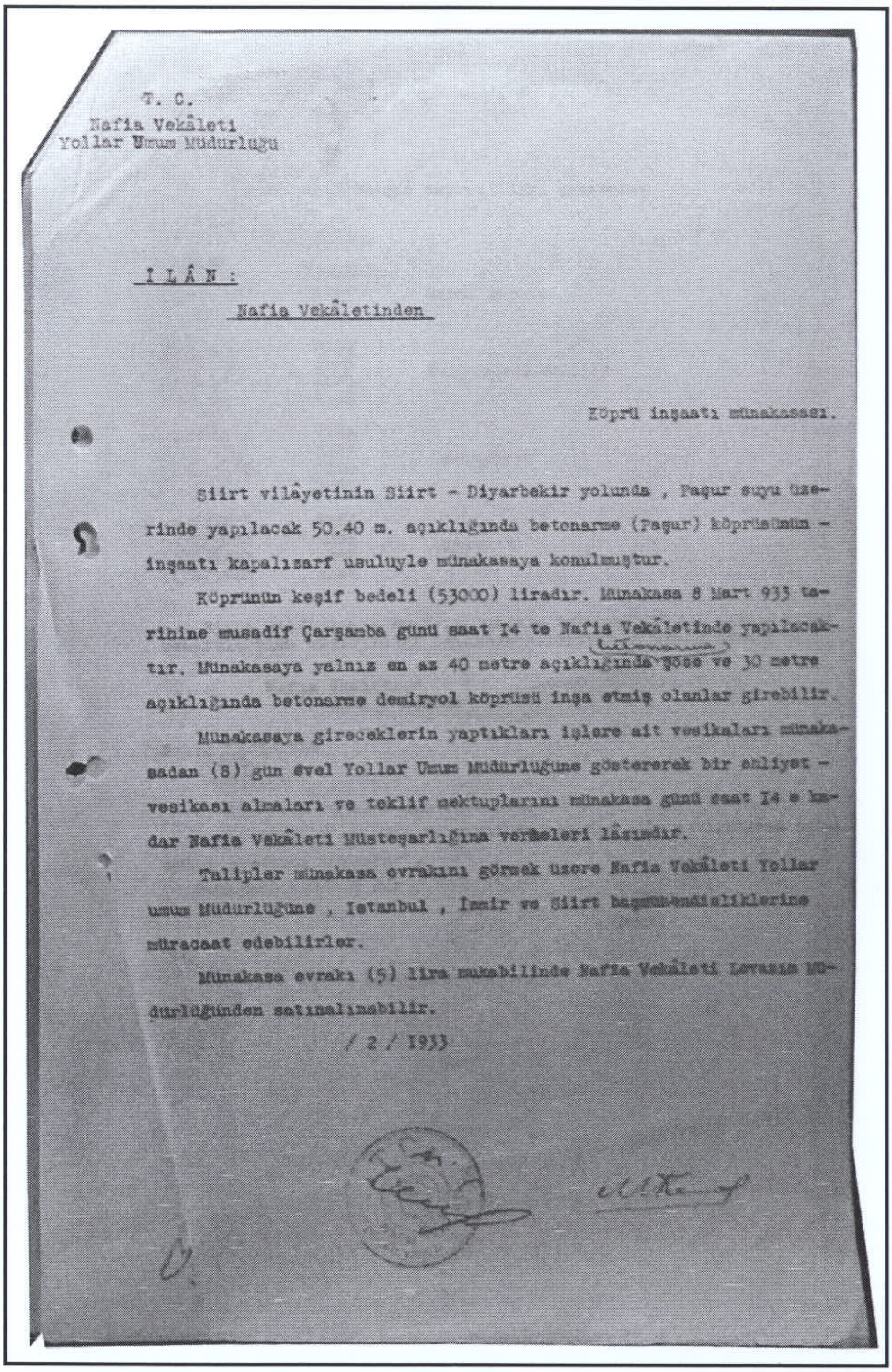
Şimdiye kadar yaptığımız mümasil inşaat berveçhi atidir:

İstanbulda 1) Bakırköy Basmahane köprüsü beton arme Baustring sistemi
2) Kadıköy yoğurtçu köprüsü beton arme
3) Kağıdhane ve Silihdarağa köprüleri Baustring sistemi
Zonguldak 4) Ereğli Devrek yolunda Arslan köprüsü mesul mühendisi

İstanbul, maçka, Harmanlı apt. № 2. Zarmayer

№ 938

Figure H.3 Petition of a contractor for document of certificate of proficiency, 1930. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2020



T. C.
Nafia Vekâleti
Yollar Umum Müdürlüğü

İ L Â N :

Nafia Vekâletinden

Köprü inşaatı münakasası.

Siirt vilâyetinin Siirt - Diyarbekir yolunda , Paşur suyu üzerinde yapılacak 50.40 m. açıklığında betonarme (Paşur) köprüsünün - inşaatı kapalızarf usuluyle münakasaya konulmuştur.

Köprünün keşif bedeli (53000) liradır. Münakasa 8 Mart 933 tarihine musadif Çarşamba günü saat I4 te Nafia Vekâletinde yapılacaktır. Münakasaya yalnız en az 40 metre açıklığında şose ve 30 metre açıklığında betonarme demiryol köprüsü inşa etmiş olanlar girebilir.

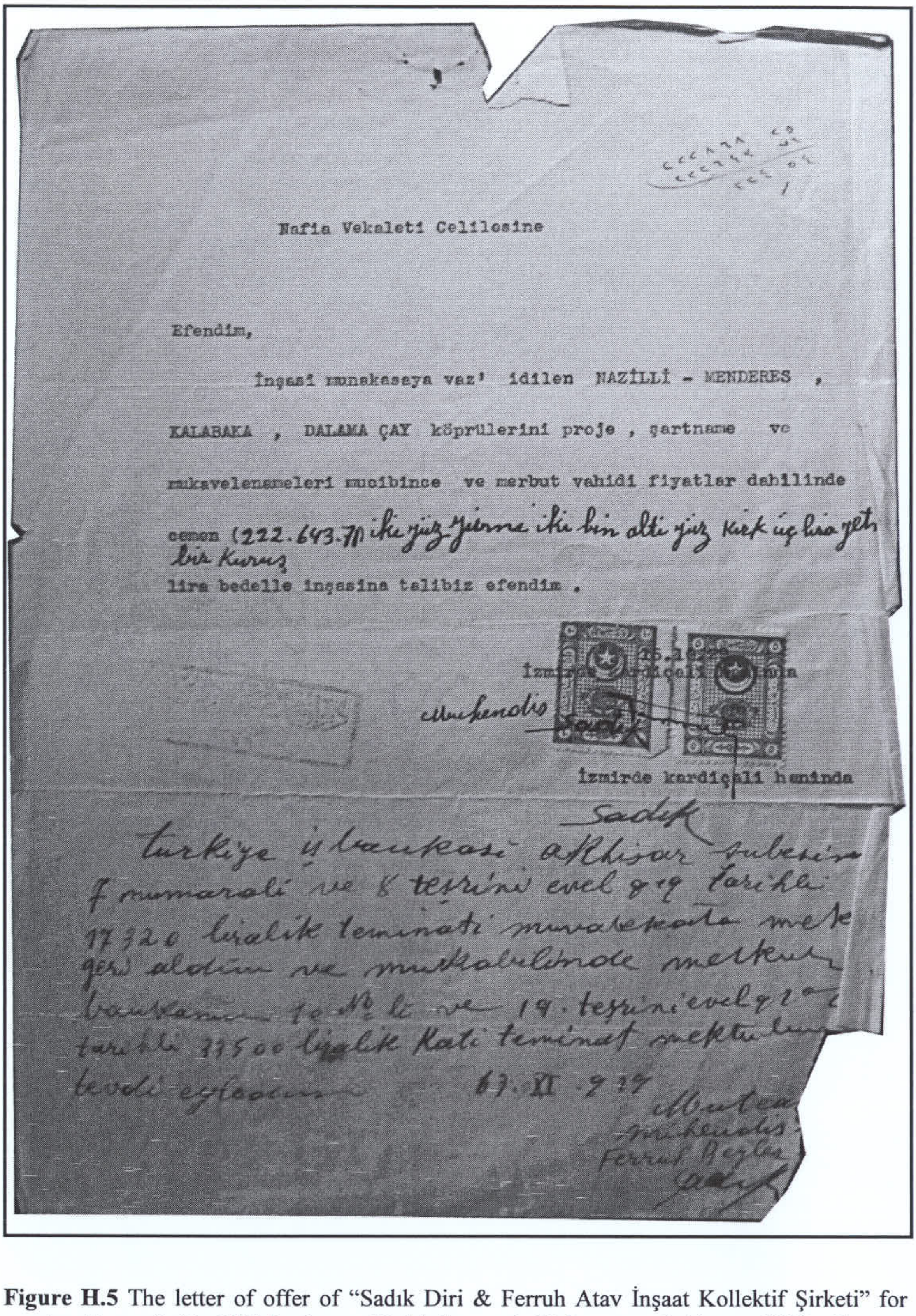
Münakasaya gireceklerin yaptıkları işlere ait vesikaları münakasadan (8) gün evel Yollar Umum Müdürlüğüne göstererek bir ehliyet - vesikası almaları ve teklif mektuplarını münakasa günü saat I4 e kadar Nafia Vekâleti Müsteşarlığına vermeleri lâzımdır.

Talipler münakasa evrakını görmek üzere Nafia Vekâleti Yollar umum Müdürlüğüne , İstanbul , İzmir ve Siirt başmühendisliklerine müracaat edebilirler.

Münakasa evrakı (5) lira mukabilinde Nafia Vekâleti Levazım Müdürlüğünden satınalınabilir.

/ 2 / I933

Figure H.4 Announcement for tender of Paşur Bridge, 1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2266



Nafia Vekaleti Celilesine

Efendim,

İnşası münakaşaya vaz' idilen NAZİLLİ - MENDERES , KALABAKA , DALAMA ÇAY köprülerini proje , şartname ve mukavelenameleri mucibince ve merbut vahidi fiyatlar dahilinde cemen (222.643.71) iki yüz yirmi iki bin altı yüz kırk üç lira yetmiş bir kuruş lira bedelle inşasına talibiz efendim .

15.10.29
İzmirde Kardiçali hanında

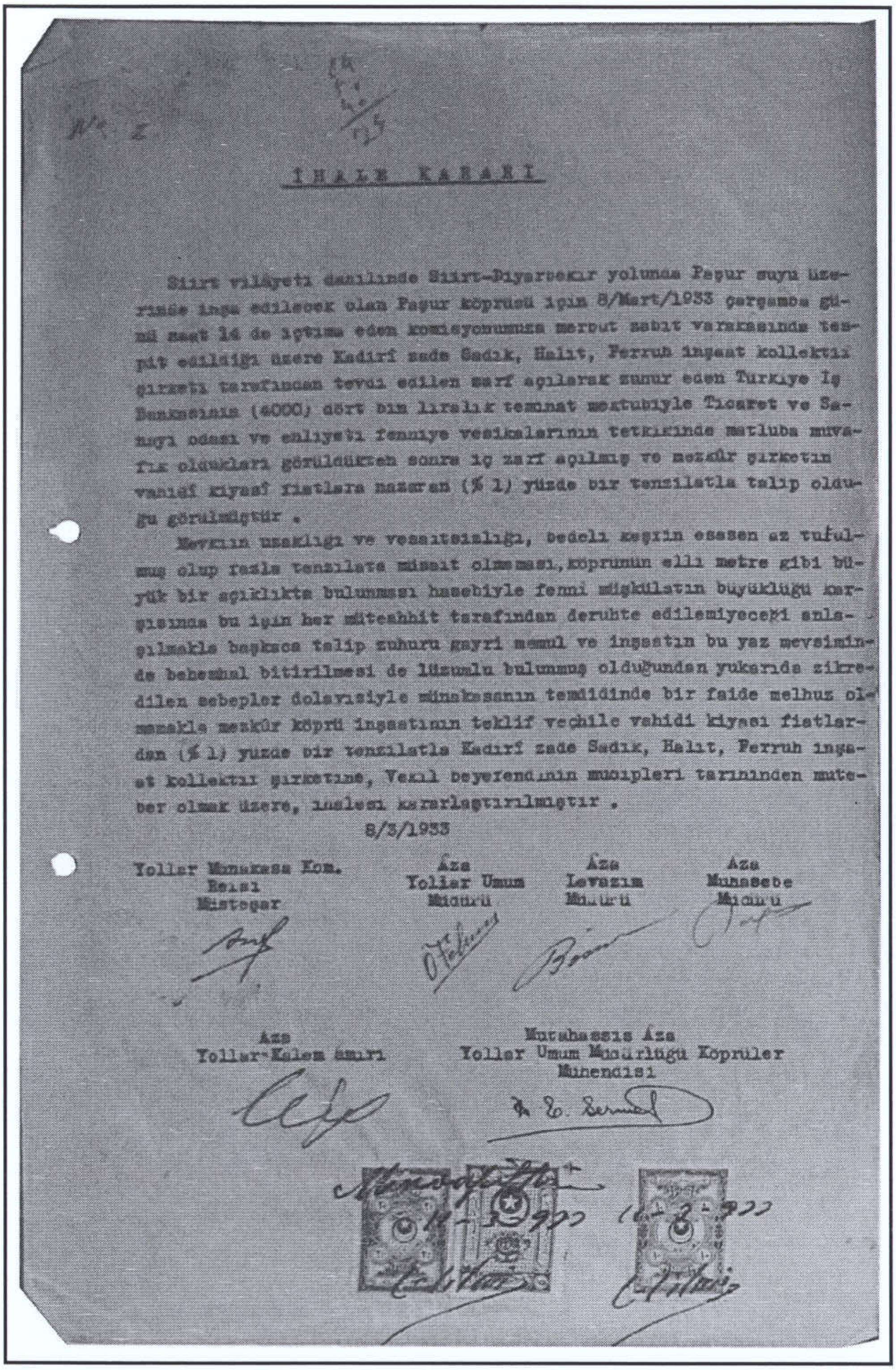
Mühendis
Sadık

İzmirde kardiçali hanında
Sadık

türkiye iş bankası akhisar şubesinin 7 numaralı ve 8 teşrinievel 929 tarihli 17320 liralık teminatı muvakkata mektubunu geri aldım ve mukabilinde merkez bankasının 10 No lu ve 19 teşrinievel 929 tarihli 33500 liralık kati teminat mektubunu tevdi eyledim 17.XI.929

Müteahhit
Mühendis
Ferruh Beyler
Sadık

Figure H.5 The letter of offer of "Sadık Diri & Ferruh Atav İnşaat Kollektif Şirketi" for construction of Nazilli-Menderes, Kalabaka and Dalamaçay bridges, 1929. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 1870



İHALE KARARI

Siirt vilâyeti dahilinde Siirt-Diyarbekir yolunda Paşur suyu üzerinde inşa edilecek olan Paşur köprüsü için 8/Mart/1933 çarşamba günü saat 14 de içtima eden komisyonumuza merbut sabit varakasında tespit edildiği üzere Kadirî zade Sadık, Halit, Ferruh inşaat kollektif şirketi tarafından tevdi edilen zarf açılarak zuhur eden Türkiye İş Bankasının (4000) dört bin liralık teminat mektubiyle Ticaret ve Sanayi odası ve ehliyeti fenniye vesikalarının tetkikinde matluba muvafık oldukları görüldükten sonra iç zarf açılmış ve mezkûr şirketin vahidi kıyasî fiatlara nazaran (% 1) yüzde bir tenzilatla talip olduğu görülmüştür .

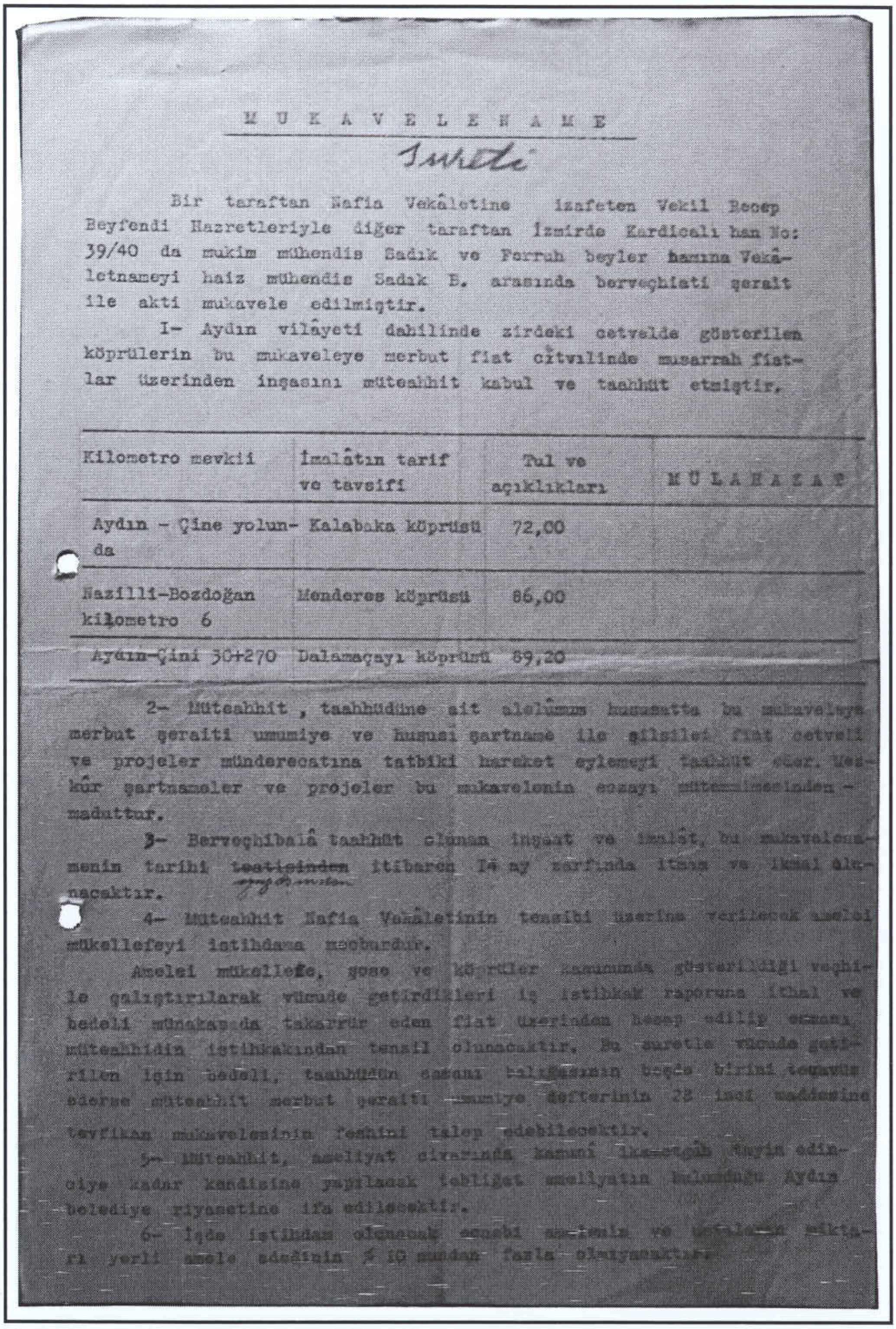
Mevkiin uzaklığı ve vesaitsizliği, bedeli keşfin esasen az tutulmuş olup fazla tenzilata müsait olmaması, köprünün elli metre gibi büyük bir açıklıkta bulunması hasebiyle fenni müşkülatın büyüklüğü karşısında bu işin her müteahhit tarafından deruhte edilemiyeceği anlaşılmakla başkaca talip zuhuru gayri memul ve inşaatın bu yaz mevsiminde behemehal bitirilmesi de lüzumlu bulunmuş olduğundan yukarıda zikredilen sebepler dolayısiyle münakasanın temdidinde bir faide melhuz olmamakla mezkûr köprü inşaatının teklif vechile vahidi kıyası fiatlardan (% 1) yüzde bir tenzilatla Kadirî zade Sadık, Halit, Ferruh inşaat kollektif şirketine, Vekil beyefendinin mucipleri tarihinden muteber olmak üzere, ihalesi kararlaştırılmıştır .

8/3/1933

Yollar Münakasa Kom. Reisi Müsteşar	Âza Yollar Umum Müdürü	Âza Levazım Müdürü	Âza Muhasebe Müdürü

Âza Yollar Kalem âmiri	Mütehassıs Âza Yollar Umum Müdürlüğü Köprüler Mühendisi

Figure H.6 Award document of the tender of Paşur Bridge, 1933. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2266



M U K A V E L E N A M E

Sureti

Bir taraftan Nafia Vekâletine izafeten Vekil Recep Beyfendi Hazretleriyle diğer taraftan İzmirde Kardicali han No: 39/40 da mukim mühendis Sadık ve Ferruh beyler namına Vekâletnameyi haiz mühendis Sadık B. arasında berveçhiati şerait ile akti mukavele edilmiştir.

I- Aydın vilâyeti dahilinde zirdeki cetvelde gösterilen köprülerin bu mukaveleye merbut fiat cetvelinde musarrah fiatlar üzerinden inşasını müteahhit kabul ve taahhüt etmiştir.

Kilometro mevkii	İmalâtın tarif ve tavsifi	Tul ve açıklıkları	M U L A H A Z A T
Aydın - Çine yolunda	Kalabaka köprüsü	72,00	
Nazilli-Bozdoğan kilometro 6	Menderes köprüsü	86,00	
Aydın-Çini 30+270	Dalamaçayı köprüsü	89,20	

2- Müteahhit, taahhüdüne ait alelûmum hususatta bu mukaveleye merbut şeraiti umumiye ve hususi şartname ile silsilei fiat cetveli ve projeler münderecatına tatbiki hareket eylemeyi taahhüt eder. Mezkûr şartnameler ve projeler bu mukavelenin eczayı mütemmimesinden madudtur.

3- Berveçhibalâ taahhüt olunan inşaat ve imalât, bu mukavelenamenin tarihi ~~teatisinden~~ [illegible] itibaren 14 ay zarfında itmam ve ikmal olunacaktır.

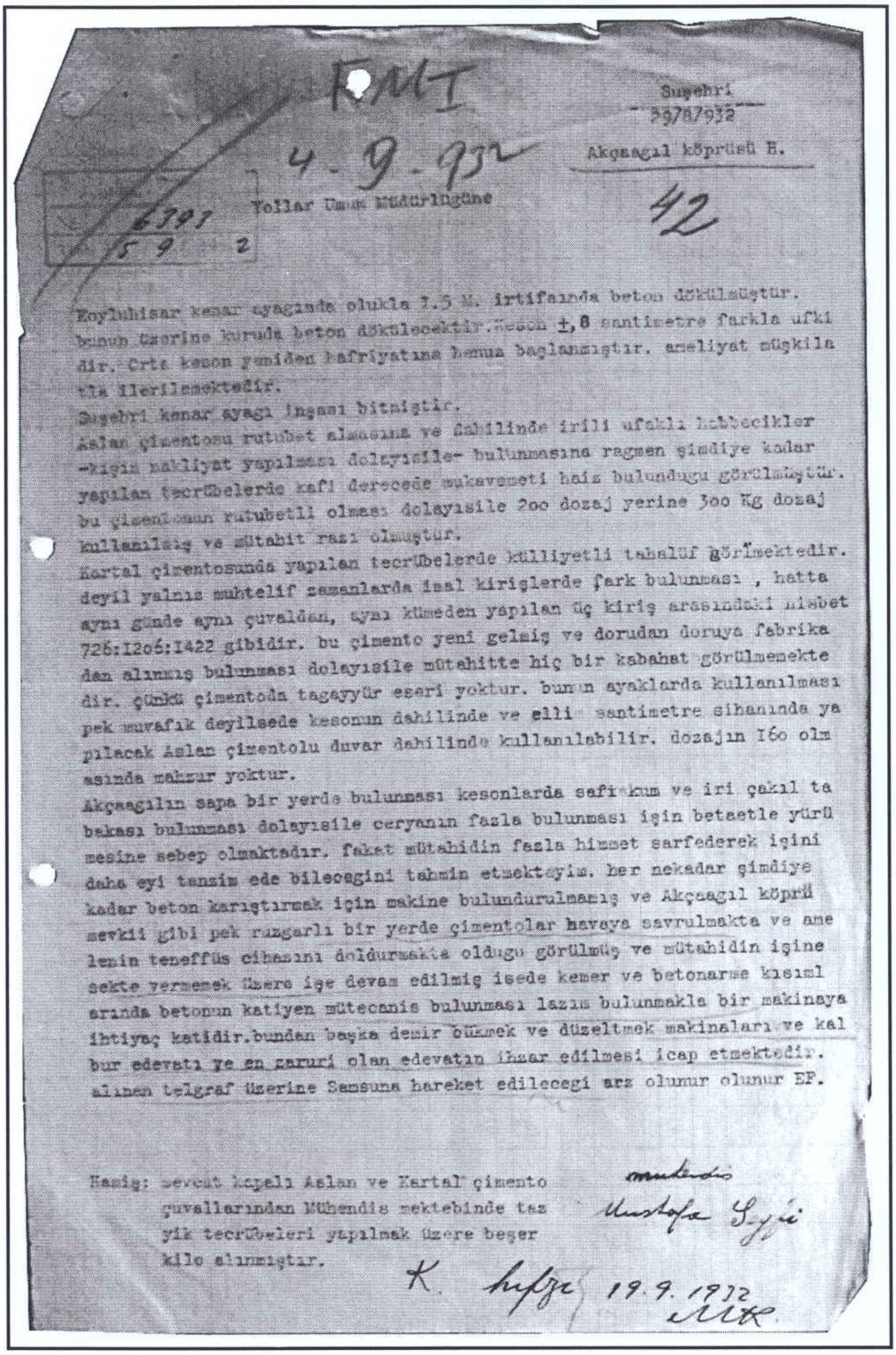
4- Müteahhit Nafia Vekâletinin tensibi üzerine verilecek amelei mükellefeyi istihdama mecburdur.

Amelei mükellefe, şose ve köprüler kanununda gösterildiği veçhile çalıştırılarak vücude getirdikleri iş istihkak raporuna ithal ve bedeli münakasada takarrür eden fiat üzerinden hesap edilip esmanı müteahhidin istihkakından tenzil olunacaktır. Bu suretle vücude getirilen işin bedeli, taahhüdün esmanı [illegible] beşte birini tecavüz ederse müteahhit merbut şeraiti umumiye defterinin 28 inci maddesine tevfikan mukavelenamenin feshini talep edebilecektir.

5- Müteahhit, ameliyat civarında kanuni ikametgâh tayin edinciye kadar kendisine yapılacak tebligat ameliyatın bulunduğu Aydın belediye riyasetine ifa edilecektir.

6- İşde istihdam olunacak ecnebi amelenin ve [illegible] miktarı yerli amele adedinin % 10 undan fazla olmıyacaktır.

Figure H.7 Part of the contract for construction of Kalabaka, Menderes, Dalamaçay bridges, 26.11.1929. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 1870



FMI

4-9-932

Suşehri
29/8/932

Akçaagıl köprüsü H.

6797
5 9 2

Yollar Umum Müdürlüğüne

42

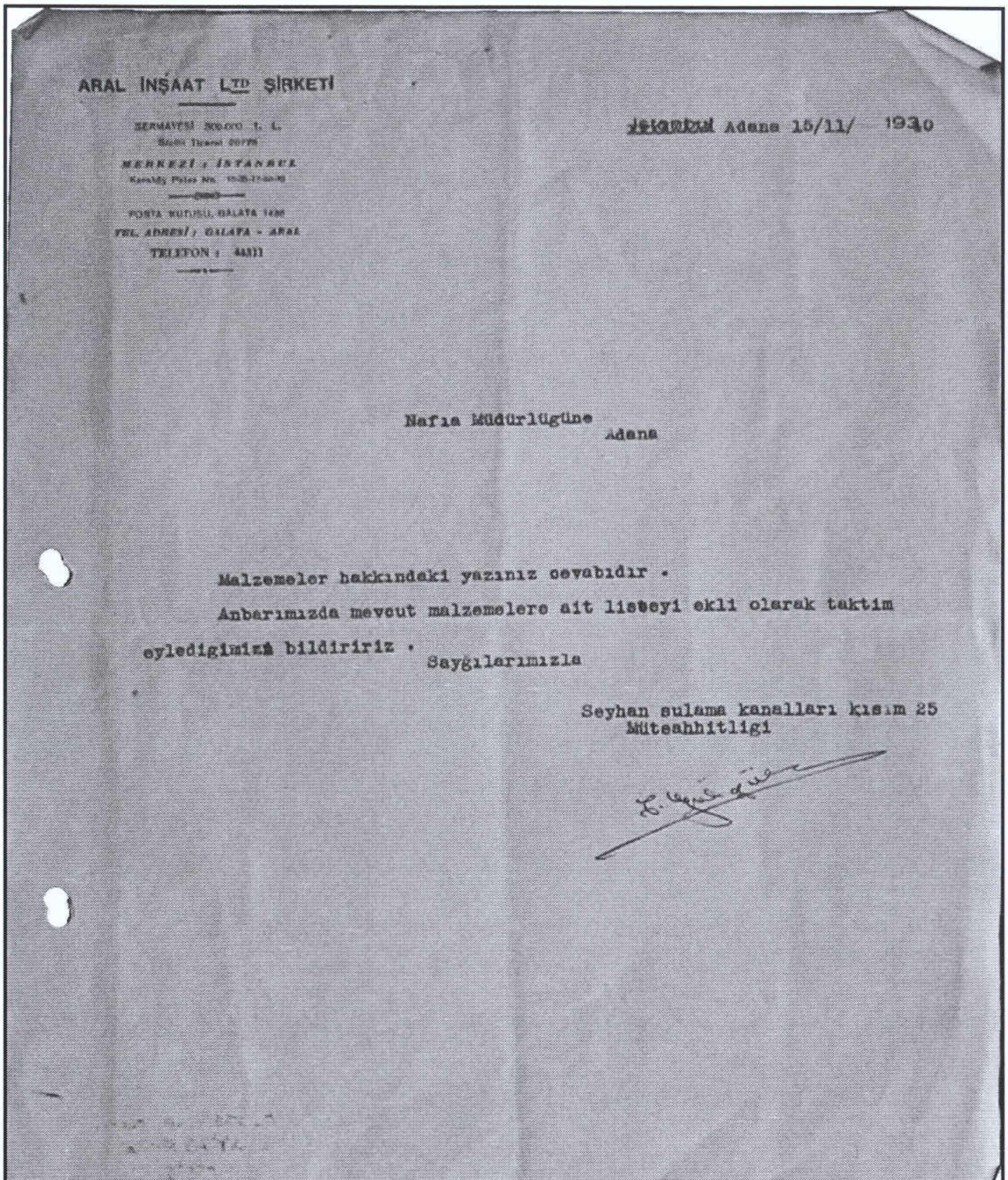
Koyluhisar kenar ayagında olukla 1.5 M. irtifaında beton dökülmüştür.
bunun üzerine kuruda beton dökülecektir. keson ±,8 santimetre farkla ufki
dir. Orta keson yeniden hafriyatına henuz başlanmıştır. ameliyat müşkila
tla ilerilemektedir.
Suşehri kenar ayagı inşası bitmiştir.
Aslan çimentosu rutubet almasına ve dahilinde irili ufaklı habbecikler
-kişin nakliyat yapılması dolayısile- bulunmasına ragmen şimdiye kadar
yapılan tecrübelerde kafi derecede mukavemeti haiz bulundugu görülmüştür.
bu çimentonun rutubetli olması dolayısile 2oo dozaj yerine 3oo Kg dozaj
kullanılmış ve mütahit razı olmuştur.
Kartal çimentosunda yapılan tecrübelerde külliyetli tahalüf görülmektedir.
deyil yalnız muhtelif zamanlarda imal kirişlerde fark bulunması , hatta
aynı günde aynı çuvaldan, aynı kümeden yapılan üç kiriş arasındaki nisbet
726:12o6:1422 gibidir. bu çimento yeni gelmiş ve dorudan doruya fabrika
dan alınmış bulunması dolayısile mütahitte hiç bir kabahat görülmemekte
dir. çünkü çimentoda tagayyür eseri yoktur. bunun ayaklarda kullanılması
pek muvafık deyilsede kesonun dahilinde ve elli santimetre sihanında ya
pılacak Aslan çimentolu duvar dahilinde kullanılabilir. dozajın 16o olm
asında mahzur yoktur.
Akçaagılın sapa bir yerde bulunması kesonlarda safi kum ve iri çakıl ta
bakası bulunması dolayısile ceryanın fazla bulunması işin betaetle yürü
mesine sebep olmaktadır. fakat mütahidin fazla himmet sarfederek işini
daha eyi tanzim ede bilecegini tahmin etmekteyim. her nekadar şimdiye
kadar beton karıştırmak için makine bulundurulmamış ve Akçaagıl köprü
mevkii gibi pek ruzgarlı bir yerde çimentolar havaya savrulmakta ve ame
lenin teneffüs cihazını doldurmakta oldugu görülmüş ve mütahidin işine
sekte vermemek üzere işe devam edilmiş isede kemer ve betonarme kısıml
arında betonun katiyen mütecanis bulunması lazım bulunmakla bir makinaya
ihtiyaç katidir. bundan başka demir bükmek ve düzeltmek makinaları ve kal
bur edevatı ve en zaruri olan edevatın ihzar edilmesi icap etmektedir.
alınan telgraf üzerine Samsuna hareket edilecegi arz olunur olunur EF.

Hamiş: mevcut küpelı Aslan ve Kartal çimento
çuvallarından Mühendis mektebinde taz
yik tecrübeleri yapılmak üzere beşer
kilo alınmıştır.

mühendis
Mustafa Şevki

K. hıfzı 19.9.1932
MK

Figure H.8 Report from the control engineer on construction of Akçağıl Bridge, 29.08.1932. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2281



ARAL İNŞAAT LTD ŞİRKETİ

SERMAYESİ ... T. L.

MERKEZİ : İSTANBUL

POSTA KUTUSU, GALATA

TEL. ADRESİ : GALATA - ARAL

TELEFON : 44311

~~İstanbul~~ Adana 15/11/ 1930

Nafıa Müdürlüğüne
Adana

Malzemeler hakkındaki yazınız cevabıdır .

Anbarımızda mevcut malzemelere ait listeyi ekli olarak taktim eylediğimizi bildiririz .

Saygılarımızla

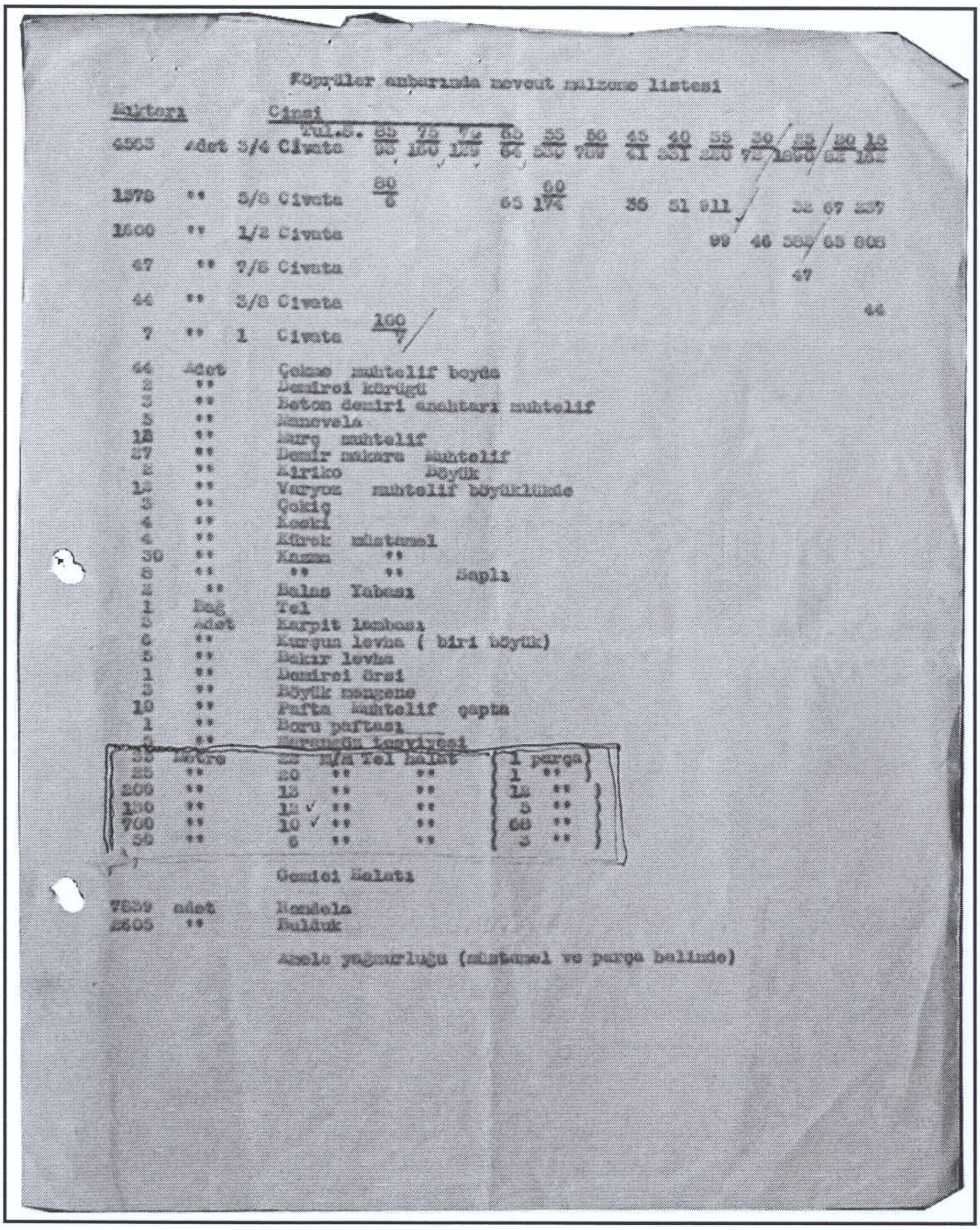
Seyhan sulama kanalları kısım 25
Müteahhitliği

Figure H.9 The list of equipments in the warehouse of Aral Co. during the construction of Pertek Bridge, which was one of the richest building sites of 1930s. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2319

Köprüler anbarında mevcut malzeme listesi

Miktarı		Cinsi
2	Varil	Makina yağı (varilin biri yarım)
3	"	Zift
8	adet	Ving
1	Takım	Santravic ve 2 parça hortumu
1	"	B öyük Ving (dağınık vaziyetde)
3	adet	Çıkal elegi (çerçiveli)
2	"	çakıl elegi teli
1	"	Hortum ince
		No 1 sandık icindeki malzeme
46	adet	Kılavuz $\frac{1\ 1/2}{14}$ $\frac{1\ 1/4}{5}$ $\frac{1}{5}$ $\frac{3/4}{11}$ $\frac{7/8}{3}$ $\frac{3/8}{2}$
6	"	Kılavuz muhtelif çapda (müceddet)
40	"	Matkap " "
6	"	Zımba
3	"	Çakıl
1	"	Teneke makara (komple)
		No 2 sandık icindeki malzeme
6	"	Boru anahtarı muhtelif
46	"	Anahtar "
7	"	Paransız anahtarı
1	"	İngiliz "
4	"	Demir Desteresi
3	"	Kerpetin
3	"	Marangöz desteresi
1	"	Torna vida
1	"	Ege balık sırtı
1	"	göğüs matkabı
2	"	Zımpara taşı (biri küçük)
3	"	Havya
2	"	Çekiç
25	"	Burgu (müstamel)
2	"	Yağdanlık (müstamel)
2	"	Yağ pompası (Müstamel)
1	"	Kılavuz kutusu (Komple)
		No 3 sandık icindeki malzeme
3	"	Burgu böyük (müstamel)
4	"	Hortum bağlağı vidalı (Müceddet)
2	"	Demirci zımbası
1	"	Keski
4	"	Mırç
2	"	Çekme küçük
1	"	Bağçe darağı
6	"	Demirci kıskacı
1	Parça	Zincir 8 metre
3	"	Lastik hortum
1	"	Kayiç (Sargılı)
1	"	Fitil (")
1	adet	G önye (böyük)
		No 4 sandık icinde
1	Takım	Badana tulumbası ve Pompası (Komple)
		No 5 Sandık icinde
2	Teneke	Pompa yağı

Figure H.9 The list of equipments in the warehouse of Aral Co. during the construction of Pertek Bridge (continued)



Köprüler anbarında mevcut malzeme listesi

Miktarı		Cinsi
		Tul.S. 85/93 75/180 7x/129 65/64 55/530 50/789 45/41 40/331 35/220 30/72 25/1890 20/62 15/152
4565	Adet	3/4 Civata
1378	"	5/8 Civata 80/6 65 60/174 36 51 911 32 67 237
1600	"	1/2 Civata 99 46 588 65 808
47	"	7/8 Civata 47
44	"	3/8 Civata 44
7	"	1 Civata 100/7
44	Adet	Çekme muhtelif boyda
2	"	Demirci körügü
3	"	Beton demiri anahtarı muhtelif
5	"	Manevela
18	"	Març muhtelif
27	"	Demir makara muhtelif
2	"	Kiriko Büyük
12	"	Varyoz muhtelif büyüklükde
3	"	Çekiç
4	"	Keski
4	"	Kürek müstamel
30	"	Kazma "
8	"	" " Saplı
2	"	Balns Yabası
1	Bağ	Tel
3	Adet	Karpit lambası
6	"	Kurşun levha (biri büyük)
5	"	Bakır levha
1	"	Demirci örsi
3	"	Büyük mengene
10	"	Pafta muhtelif çapta
1	"	Boru paftası
8	"	Mengenenin tesviyesi
38	Metre	22 M/m Tel halat 1 parça
25	"	20 " " 1 "
200	"	13 " " 12 "
130	"	12 ✓ " " 3 "
700	"	10 ✓ " " 68 "
56	"	8 " " 3 "
		Gemici Halatı
7839	adet	Kondela
2605	"	Bulduk
		Amele yağmurluğu (müstamel ve parça halinde)

Figure H.9 The list of equipments in the warehouse of Aral Co. during the construction of Pertek Bridge (continued)

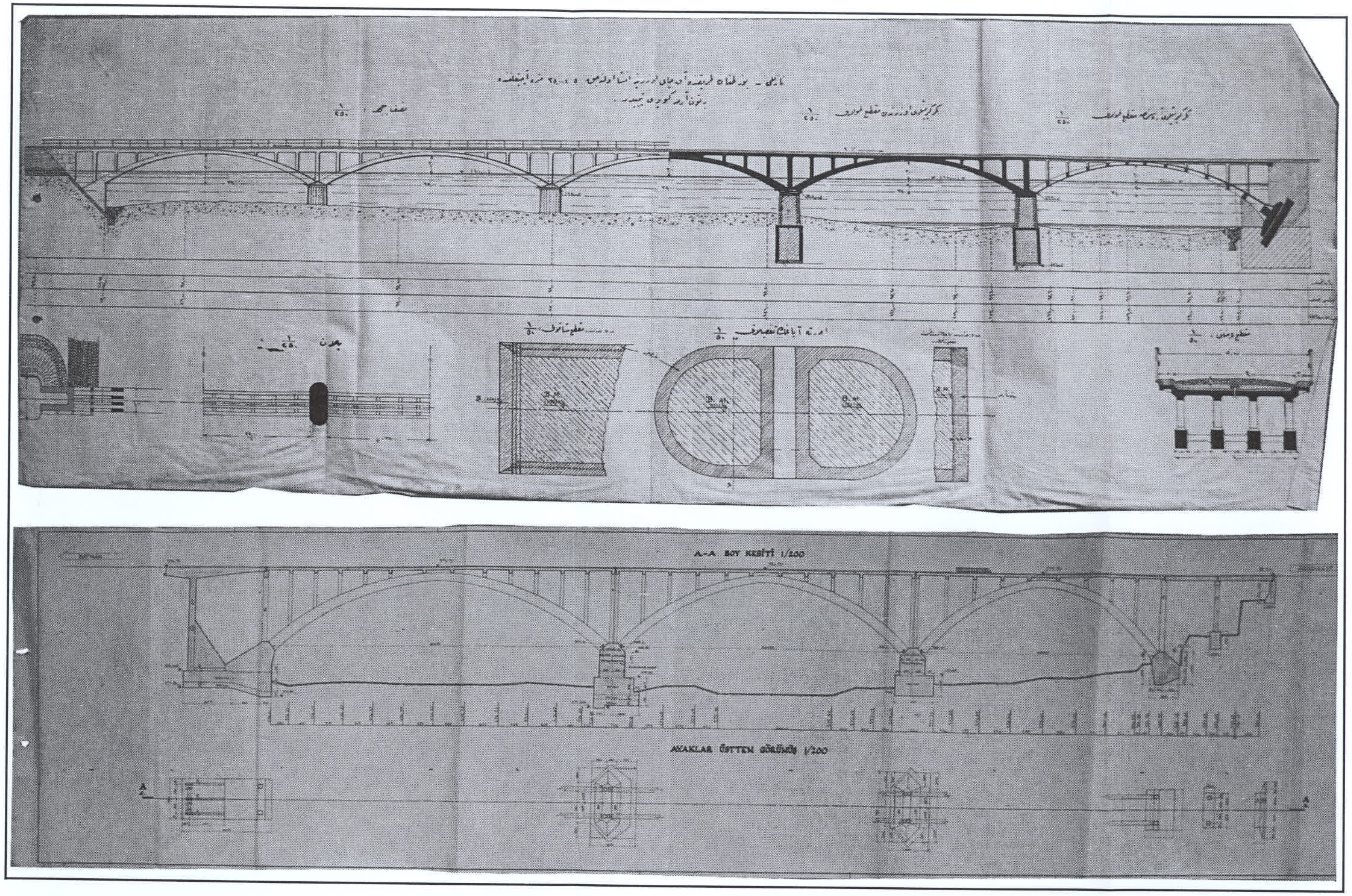


Figure H.10 Reinforced concrete bridge technology had remained almost the same until 1960. Drawings of two reinforced concrete arch bridges Akçay Bridge in 1928 (above) and Hasankeyf Bridge in 1956 (below). Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 9616-1 and 9616-2

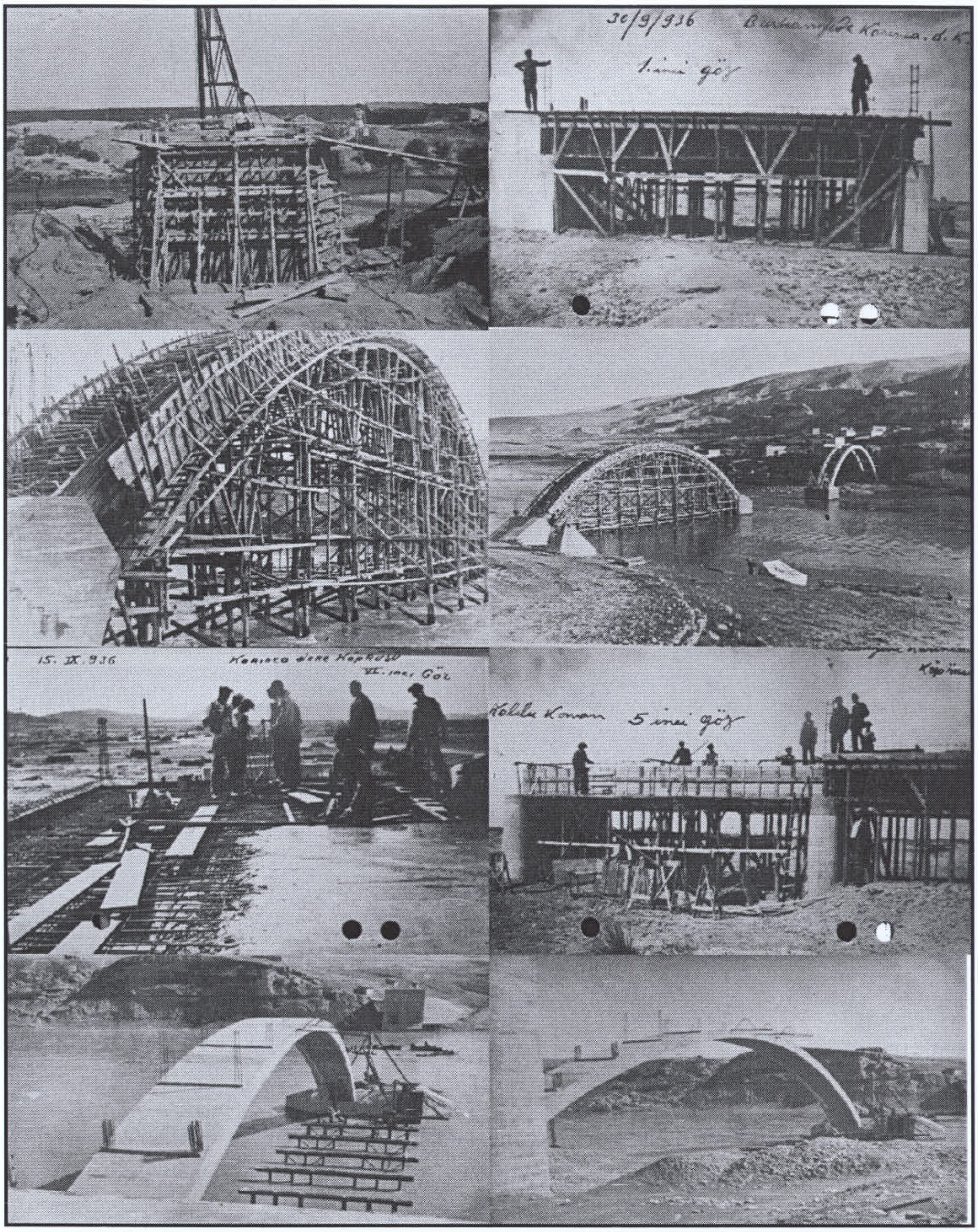


Figure H.11 Various photographs from bridge constructions between 1923 and 1960. Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund

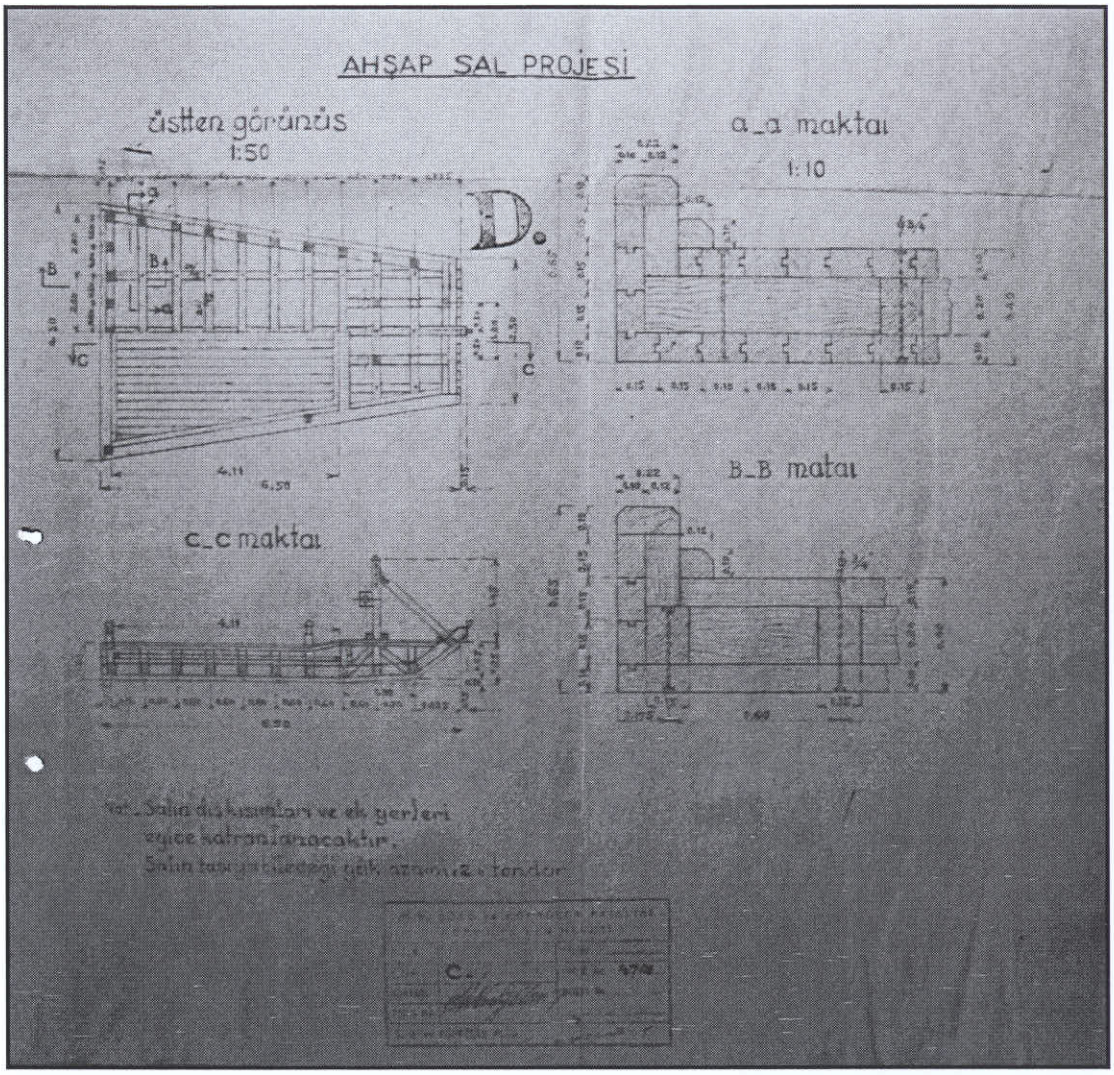


Figure H.12 Drawing for a raft by the Ministry of Public Works, Department of Roads and Bridges Source: Unclassified documents from the State National Archives-Republican Archives, KGM Fund, Binder no: 2319

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2000 – 2003	Freelance	Architect - Designer

FOREIGN LANGUAGES

Advanced English, Intermediate German, Intermediate Ottoman

PUBLICATIONS

Örmecioğlu, H. T., "Erken Cumhuriyet Döneminde Tarımsal Endüstrinin Betonarme Anıtları: Silolar", Dosya 03-Endüstri Mirası, TMMOB Mimarlar Odası Ankara Şubesi, Bülten 45/Kasım 2006, pp. 48-42.

AWARDS

1. Archiprix National Awards for Best Graduation Projects, Honorable mention, 2000.
2. "35m2 House" National Student Competition by Tasarım Review of Architecture, Publishing Prize, 2000 (with Erdim Kumkumoğlu).
3. ITU-TUB International Student Competition, Shared first prize, 1998.

HOBBIES

Creative Writing, Photography, Scuba Diving