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THIS REPORT HAS BEEN PREPARED JOINTLY BY THE FOLLOWING MEMBERS OF THE TURKISH NATIONAL COMMITTEE OF EARTHQUAKE ENGINEERING:

1 Köksal ANADOL : Dipl. Engineer Architedt,
Yapı Merkezi, Barbaros Bulvarı 18/1
Yıldız, Istanbul.

2 Ersin ARIOĞLU : Dipl. Engineer,
Yapı Merkezi, Barbaros Bulvarı 18/1
Yıldız, Istanbul.

3 Emre AYKAR : B.Sc. in Civil Engineering,
Yapı Merkezi, Barbaros Bulvarı 18/1
Yıldız, Istanbul.

4 Alkut AYTUN : Dipl. Engineer,
T.B.T.A.K., Yapı Araştırma Enstitüsü,
Ankara.

9 Erhan ERMUTLU : Dr. Engineer
Directorate of State Hydraulic Works,
Ankara.

12 Aybars GÜRPINAR : Dr. Engineer,
Dept. of Civil Engineering,
Middle East Technical University
Ankara.

13 Muzaffer İPEK : Dr. Engineer,
Institute of Computer Science,
Technical University of Istanbul,
Istanbul.

14 Erhan KARAESMEN : Dr. Engineer,
Dept. of Civil Engineering,
Middle East Technical University
Ankara.

19 Semih TEZCAN : Prof. of Civil Engineering,
Boğaziçi University,
Bebek, Istanbul

21 Rıfat YARAR (Chairman) : Prof. of Civil Engineering,
Technical University of Istanbul,
Istanbul.

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A. SCOPE OF WORK

The Turkish National Committee of Earthquake Engineering, which is founded in February 1971, has been working since then on the problem of earthquake resistant, low-cost housing which is a structural and social problem of development to be primarily dealt with for many years in Turkey. For this purpose, as a first step, the earthquake response of the rural dwellings which always suffer the greatest damages during earthquakes has been investigated.

This book can be considered as one of the necessary publications for further investigations on the subject. It covers mainly statistical information, together with some recommendations to build earthquake resistant, low-cost rural residential houses.

This publication, which includes all the basic information on geography, geology, seismicity, etc., can be accepted as a reference book, necessary for the theoretical and experiemental earthquake investigations in Turkey.

B. INTRODUCTION

Earthquake disasters are among the most serious dangers that threaten mankind.

Towards the middle of this century, between 1926 and 1950, over 350,000 people were killed and total structural damage was estimated to be about 10,000 million US dollars.

Between the same years in Turkey the number of deaths during earthquakes were estimated to be approximately 44,000, and during the last 22 years 3,670. The number of deaths during strong earthquakes may be tremendous, ranging for the most severe ones, from 100,000 to 200,000.

In the future, if no special precautions are taken, a severe earthquake shaking a big city could kill millions. On the other hand, owing to the increase in density of construction, a single earthquake could result in tremendous loss of property.

The task of the earthquake engineering is to take precautions against these catastrophies.

Recently the forecast of earthquakes has aroused much interest among researchers. It must be noted that such a forecast may help to reduce casualties but not substantially the amount of damage.

Some types of earthquakes can be prevented by releasing slowly the stress energy which could possibly cause the rupture of the crust and severe damages. But this procedure is only potentially applicable in a limited number of cases.

Consequently, the real objective with our present possibilities is to design and to build earthquake-resistant structures.

This design and construction have to be realized in terms of economy, which implies an accurate estimate of the seismic risk.

C. METHODS OF INVESTIGATION OF THE EARTHQUAKE ENGINEERING PROBLEMS FOR RURAL HOUSES

Today there is a large variety of problems in the studies in Earthquake Engineering. Especially, from the point of view of rural low-cost houses, some necessary investigations are:

1. More detailed survey of earthquake damages, particularly in relation with soils and foundation,

2. Investigation of frequency of earthquake occurrences on the whole country and of localised regions,
3. To define the ground motion, measure of strong earthquakes including the study of microtremors of localised sites,
4. Study of earthquake damages due to soil condition,
5. Application of stochastic method in Earthquake Engineering, including the simultaneous consideration of physical, economic and social phenomena in engineering,
6. Experimental investigation and theoretical analyses of safety of members and structures,
7. Prevention of earthquake disasters including relief, temporary repairs, rehabilitation.

With some other items, these problems are being investigated all over the world. However, among those, safety problem is the most important one.

Structural safety under earthquake loads has to be dealt with according to the general safety principles used for other types of loads.

According to economical criteria one engineering objective is to minimise the total long-term cost of providing earthquake resistance and repairing damage, both resistance and damage being considered in a very broad sense.

The modern principles of structural safety cannot be applied without accurate information of these two types of characteristics.

The statistical estimate of seismic loads requires a quantitative definition of the seismicity of the regions.

For this purpose, information of the historical occurrence of earthquakes has to be combined with the information gathered on geophysics, geology and soil mechanics of the region.

In a given seismic region, investigation made on the probability of occurrence of earthquakes with a magnitude higher than 11 must be considered.

On the other hand, for evaluating earthquake loads, seismic vibrations have to be idealised and defined by a convenient number of parameters. The theory of stochastic processes provides the most powerful means for obtaining this idealisation.

The statistical distribution of the intensity of the earthquakes in a given region being defined as above, has to be combined with the statistical distribution of the responses of the structures, to give rise to the definition of the statistical distribution of seismic loads.

This last distribution is the one to be used in the design.

In general, the statistical distribution of the response of the structure depends on several parameters. For the simple case of linear one degree-of-freedom elastic solid these parameters are the natural period and the damping factor.

Although much work has already been done in this field, more data are still required to obtain satisfactory definition of seismic loads.

To minimise the casualties due to earthquakes we have to define, as accurately as possible, the structural safety and to do this we must continue to work on the items that are mentioned above.

D. A BRIEF REVIEW OF THE EARTHQUAKE INVESTIGATIONS IN TURKEY

The first scientific investigation was made by the Kandilli observatory during the Kırşehir-Yerköy earthquake, which is one of the severe earthquakes which occurred in 1938. Its magnitude was nearly 6 3/4.

Kandilli observatory was essentially established by the Government in 1910 and the Seismology Section was added in 1935.

Preliminary investigations were connecting the earthquake problems, especially the design essential of the buildings against the earthquake loads. The provision for Earthquake Code was first initiated by the Ministry of Public Works just after 1939 Erzincan Earthquake, which was the most disastrous one, ever happened in the last century in Turkey.

The first provisional Earthquake Building Code was prepared by the same Ministry in 1940.

The revised edition of the same Code was published in 1942, with the "Earthquake Zones" map.

In 1944, "The Basic Regulation of Repair in Earthquake Regions" was published by the Ministry of Public Works.

The more scientific and comprehensive earthquake regulation was published in 1948. It was prepared according to the decision taken in the first "Building Congress" which was held in Ankara.

Finally, the Sysmological Institute was established under the administration of the Technical University of Istanbul. This can be described as a very important step toward toward earthquake investigation. This institute was established on March 7th, 1951 according to the agreement between the Turkish Government and UNESCO.

With the activities performed by this Institute itself and the work obtained in the other seismological stations built by this Institute, the instrumental investigations were started.

In 1952 the Geophysical Institute was established in the University of Istanbul.

The main purpose of the Seismological Institute of the Technical University of Istanbul, was to perform the necessary investigations to construct and design earthquake resistant buildings.

In 1953 a revised code, under the name "Regulation for Buildings Constructed in Earthquake Regions" was published.

Up to 1961 no change was made in the earthquake regulations. How-
ever, in this year, by the Ministry o nstruction and Resettlement,
a new revised code under the title "n ion for the Buildings Con-
structed in Disaster Regions" was pub . In this code, design
coefficients were similar to those in ese Earthquake Code.

In 1965 a technical committee was ed by the Ministry of
Reconstruction and Resettlement to re he above mentioned regulation.
In fact, the committee changed the de ssentials and accepted the
importance of the dynamic characteris n the determination of the
lateral load coefficients.

This new provisional code was published in 1968.

During the same meeting a national committee was established to represent Earthquake Engineering in Turkey in the International Earthquake Engineering Association.

From March, 1971, the National Committee of Earthquake Engineering started to take substantial interest in the earthquake problems of Turkey.

Today in Turkey scientific investigations on earthquake engineering are successfully being carried on in many institutions and organisations such as the Technical University of Istanbul, Middle East Technical University, Boğaziçi University, the Earthquake Research Institute attached to the Ministry of Reconstruction and Resettlement and in other State organisations such as Ministry of Public Works and General Directorate of State Water Works, as well as in Chambers of Civil Engineering.

1. EARTHQUAKE RESPONSE OF DIFFERENT TYPES OF HOUSES IN TURKEY

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1.1 SEISMIC ACTIVITY OF TURKEY

1.1.1. General

Turkey is situated in a region which unites Asia and Europe. The peninsula called the Asia Minor today , is a land which witnessed great historical events. Topographically Asia Minor stretches between two mountain ranges along the Black Sea and the Mediterranean. These two mountain ranges are connected to each other by Anatolian Plateau which has an average height of one thousand meters. The country covers an area of 1500 km. in length and 650 km. in width.

Turkey lies on the Alpine Belt which is one of the active seismic belts of the world. This belt starts from Burma, passes through Himalaya Mountains, Iran, Turkey and reaches to Balkan countries and Mediterranean Sea, then over Italy and Sicily extends to West Mediterranean and Atlantic and terminates probably in Azore Islands. Activity of the region is very high. This belt contains most of the shallow shocks and all of the intermediate shocks of the world outside the Circum Pacific Belt. Generally no shocks deeper than 300 km. occur in this region (1).

Seismicity of Turkey is fairly high compared to other active regions of the Alpide Belt. Further, following the 1939 Erzincan Earthquake, a prominent increase is observed in the activity of Anatolia and this activity is still lasting with the recent earthquakes of 1966 Varto, 1967 Adapazarı-Mudurnu Valley, 1970 Gediz, 1971 Burdur and 1971 Bingöl.

1.1.2. Numerical Data

The records about historical earthquakes of Asia Minor dates back to fairly old ages compared to many other countries. These records are utilised as an important source of information in the seismic studies.

In 1952, N. Pınar and Lahn published the "Descriptive Catalogue of Turkish Earthquakes" (2). This catalogue contains very valuable information about the earthquakes in Turkey. The oldest record reported is in the year 11 C.A. In addition, the catalogue contains useful information about the geological structure.

In 1960, N. Öcal introduced a study "Catalogue of Turkish Earthquakes with Intensity $I_0 \geqslant$ VII until 1850" containing data about earthquakes occurred in the period 11-1850 C.A. (3). Another study of N. Öcal in the same year entitled "Seismicity of Turkey and Earthquake Geography" includes a catalogue of earthquakes for the period 1850-1960 (4). The writer published also a further study entitled "Catalogue of Earthquakes in Turkey for the period 1960-1964".

In 1967, K. Ergin, U. Güçlü and Z. Uz published "A Catalogue of Earthquakes for Turkey and Surrounding Area" (6). This catalogue includes all the earthquakes known to occur in the years 11-1964 C.A. Instrumental data obtained from various sources are included and the catalogue furnishes most complete and detailed information. In 1971, K. Ergin, U. Güçlü and G. Aksay published another catalogue titled: "A Catalogue of Earthquakes of Turkey and Surrounding Area, 1965-1970" (7).

Apart from the historical earthquakes, information about the instrumentally recorded recent shocks may be found in the following publications:

1- 1903-1949 Seismicity of the Earth and Associated Phenomena (1).

2- 1936-1958 International Seismological Summary.

3- 1946-1962 Bulletin Mensual, BCIS.

4- 1962- Détérmination Préliminaire, BCIS.

5- 1962- Preliminary Determination of Epicenters, USCGS.

The information given in these publications have been already compiled in Ref.s (6) and (7).

First of all a seismicity study should be based on uniform data about the past earthquakes. The catalogues mentioned above contain valuable information necessary for the seismicity studies. The longer the time span of the catalogue, reliable are the results arrived.

In view of the fact that the accumulation of instrumental data is confined merely to the present century, the period of 70 years should not be regarded long enough for geophysical considerations. Further, in many countries seismological observations started only a short time ago. For example, first seismological observations started only a short time ago, in 1928 at the Kandilli Seismological Station. For a long period, only one station was recording the earthquakes in Turkey. In 1952, Seismological Institute (Recently, Institute of Earth Sciences) of Technical University of Istanbul was established. Its seismological stations in Istanbul and Cine became operational in 1956 and later another station was put into operation in Kastamonu in 1958. In 1966, two more stations were added,

one in the Middle East Technical University, Ankara and the other in Raman. Finally, with the last station established in 1966 in the Atatürk University, Erzurum, the number of stations operated by the institute became six. The development of a new seismological network of a limited nature as outlined above, explains why no local instrumental data is available for many important earthquakes occurred in the first decades of the XXth century. For this reason, it is unavoidable to depend to a large extent on the earthquake catalogues of Turkey in order to study the seismicity of Turkey covering a long period.

1.1.3. Seismic Activity in the Last Fifty Years

For the purpose of illustrating the degree of seismicity of Turkey in the Alpide Belt, the earthquakes of the last fifty years are listed chronologically in Table 1. The Table comprises 51 shocks with intensity VII and greater. Thus, on the average, one destructive earthquake occurred every year in Turkey in the past 50 years. Out of these 51 shocks, 14 were of intensity VII(MM), 15 of intensity VIII, 11 of intensity IX, 10 of intensity X and 1 of intensity XI.

1.1.4. Studies concerning the Seismicity of Turkey

In 1959, S. Omote and M. İpek, both members of Seismological Institute of Technical University Istanbul, published a study on the seismicity of Turkey (8). The data for this study was taken from Refs. (1), (2) and also from Seismometrical Bulletins. In this work, only the earthquakes of last one hundred years (1859-1958) were considered and two epicenter maps, for macroseismic and for instrumental data were presented. Finally all epicenters were included on a third map.

The curves derived for Japan by Kawasumi in expressing the variation of the intensity in relation to the epicentral distance were used, in order to determine the intensity of an earthquake at a locality. Thus, it has been possible to reveal the frequencies of different intensities at different localities, assuming uniform geological conditions. Three frequency maps were presented for intensity V and greater, for intensity VII and greater, and for intensity IX and greater. In addition, maximum intensity map was introduced showing maximum intensities experienced at any locality.

In his study of "Seismicity of Turkey and Earthquake Geography", N. Öcal classified the earthquakes of one hundred and ten years (1850-1960) into four groups and prepared epicenter maps (4). Further, he presented a map of equal energy lines obtained on the basis of released energy per unit area per unit time. He also submitted frequency maps for intensities V-VI and for intensities VII-VIII. He submitted table and diagram for the variation of total energy released and square root of the energy with respect to time. As it was mentioned already, his work includes an earthquake catalogue covering the time interval 1850-1960.

In 1963, Ministry of Reconstruction and Resettlement published the "Seismic Zoning Map of Turkey" as an appendix to the existing seismic code (Appendix 1, Fig.1). This map was prepared on the basis of the destruction of the past earthquakes and superficial geology and divided the country into three seismic regions. The remaining areas were considered without seismic danger. The seismic coefficient to be used for each region is given in the code.

Prior to his book in 1968 entitled "Seismicity of the European Area, Part 1" (9), V. Karnik published in 1964, one phase of his study on the seismicity of Europe (10).

Parameters characterising the seismicity of a region are magnitude, intensity and frequency. Gutenberg and Richter introduced the following equation between the frequency and magnitude

$$\log N = a + b \quad (8-M) \qquad (1)$$

which became the fundamental relation of statistical sesimology (1). Some writers use the form

$$\log N = a' - bM \qquad (2)$$

In these equations a and a' are constants which depend on the period of observation, size of the investigated area and on the level of seismicity. The coefficient b is more stable and characterises only the seismic activity.

Karnik, using the time interval of 1901-1955 and taking the earthquakes of intensity $I_0 \geqslant VI$, divided Europe into 39 seismic zones (Fig. 2). The border lines are crossing the places with minimum number of epicenters, so that they should not divide the natural tectonic units. The intention was to group the epicenters of earthquakes belonging to the same seismogenetic system. The zones 26 c, 27, 29, 30, 33, 34 and 35 cover Turkey. the values obtained for a and b are given in Table 2 for these seven seismic zones.

The conclusions arrived by V. Karnik at this stage of the study on the seismicity of Turkey have been presented below:

The investigation on the magnitude-frequency relation demonstrated the existence of two characteristic groups of b in the European area,

$$b_1 = 0.95 \pm 0.05 \quad \text{and} \quad b_2 = 0.75 \pm 0.1.$$

The second value is characteristic for the belt extending from Balkan over North Turkey to East Turkey. The results are valid for $M > 4\text{-}4\ 3/4$. The comparison of the strain release curves reveals some relations between the activities in neighbouring zones. This phenomenon is most evident along the North Anatolian fault intersecting the regions 27, 29, 33 and 34. The movement started in 1930 in the region 34 (May 6, 1930, $M = 7.3$, 37.0° N, 44.0° E) and continued with the strongest shock of the area on December 26, 1939 Erzincan Earthquake in the region 33 ($M = 8.0$, 39.7° N, 39.7° E). The activity in the region 29 followed by a series of strong earthquakes in 1942-1944 (December 20, 1949, $M = 7.0$, 40.7° N, 36.6° E, November 26, 1943, $M = 7.3$, 41.4° N, 33.8° E, February 1, 1944, $M = 7.3$, 41.5° N. 32.4° E) which demonstrate also a westward shift of activity. Finally, the region 27 became active in 1953 (March 18, 1953, $M = 7.5$, 40.1° N, 27.3° E). The total length of the seismogenetic fault is about 1650 km. The velocity of migration of epicenters is increasing with time until 1944 and then seems to decrease (50-145-60 km/year). All earthquakes have been accompanied by strike-slip movements, the northern part being shifted to the west.

In 1965, M. İpek, Z. Uz, U. Güçlü prepared a statistical study entitled "Seismic Regions of Turkey with respect to Seismological Data" (11). In this study, using fifteen macroseismically observed earthquakes, the relation

$$M = 0.592\ I_o + 1.63 \qquad (3)$$

was established between magnitude and epicentral intensity for the purpose of determining magnitudes of historical earthquakes (Fig. 3).

In the study, all earthquakes in the period of 11-1964 C.A. have been taken into consideration. For the six regions shown in Fig.4, relations were established between magnitude and cumulative frequency and also between intensity and cumulative frequency. The results of the investigation have been summarized in Table 1.3. Since the time interval and the regions are different than those considered in the study of V. Karnik, the coefficients obtained are also different. Table 3 shows that the most active regions are I and VI, the least active region is V.

Further, the variation of intensity with respect to epicentral distance has been studied and the relation

$$I = I_o + 3.58 - 3.33 \log \Delta \qquad (4)$$

has been obtained. This equation has been used for the determination of intensity distribution of an earthquake on a geologically uniform ground. A maximum intensity map was obtained by applying this formula to the earthquakes of the past 1953 years (Fig.5). Since the actual lives of buildings are much shorter, e.g. approximately 75 years, the results of seismic activity of 1953 years have been modified to give the maximum intensities in 75 years and the results are shown in Fig.6. Since in the foregoing maps, uniform geology was assumed, equal intensity zones are separated by circles. In reality, the geology differs very much from one place to another, as a result, isoseismal lines are not concentric circles. Besides, it has been assumed at the beginning, that the geology is to be considered as a second factor. Finally, by connecting the zones of Fig.5 another map was presented as a proposal to Seismic Zoning Map of Turkey (Fig. 7).

· Turke

"A Catalogue of Earthquakes for y and Surrounding Area" published in 1967 contains epicenter maps in general and isoseismal r for several important earthquakes. Some of the maps given in this ca logue may be regarded as the best documents to demonstrate the seism character of Turkey. Fig.8 is another map published by the same Inst which illustrates all the earthquakes in the interval 11-1964.

In 1969, A. Tabban studied the tectonic character of Turkey a computed the seismic energy released in the period 1960-1964 (12). I addition, similar to the maps given in Ref. 8, frequency maps are pre ed for intensities VII, VIII, IX, X, XI(MM) and a maximum intensity m This study was later enlarged and subsequently published by Ministry Reconstruction and Resettlement (13).

Further, in a research entitled "Seismic Character of Turkey Graphics", Tabban computed maximum displacements in 89 important poin of settlement produced by 27 major earthquakes of magnitude 6 or more occurred in 1900-1969 (14).

In 1970, based on the results of his previous researches and "Tectonic Map of Turkey" and "Seismotectonic Map of Turkey" published MTA (Mineral Research and Exploration Institute of Turkey) Tabban als proposed (15) a new "Seismic Zoning Map of Turkey". In this map, Tab divided the country into five risk zones. The regionalization is in accordance with the principles agreed in UNESCO meeting of 1965 in

1.1.5. Conclusion

As it is described clearly, the records about historical earthquakes of Turkey which are gathered in different catalogues date back to fairly old ages. These records, however, are not complete and should not be considered without defect. Present situation of seismological network in Turkey is far from being satisfactory. In the recent years, important developments have been achieved in increasing the number of stations. As far as great earthquakes are concerned, they are equally recorded by th stations throughout the world. So, the seismometric bulletins published by these stations furnish reliable data for epicentre determinations. In addition, from the standpoint of earthquakes, geology of Turkey is subject to closer and expensive research and investigation.

Seismicity of Turkey has been studied by many investigators so far, however, in consideration of modern knowledge and new methods, all numerical data available have not been yet evaluated as a whole. For this reason, although mainlines of seismic zones of Turkey are already known, the important question of what magnitude or intensity are expected within a certain period in a particular region is unanswered. Some recent earthquakes happened contrary to our present knowledge. For example the epicentre of Bartın Earthquake of September 3, 1968 with magnitude 5.7 is in the zone of no seismic risk according to the "Seismic Zoning Map of Turkey". The epicentre of Gediz Earthquake of March 28, 1970 with magnitude 7.4 on the average is in the 2. degree seismic zone, 4 km north of this point however is 3. degree seismic zone and 20 km. east is the zone of no seismic risk. These events clearly demonstrate that instead of studying the problem of seismicity of Turkey from different angles such as damage ratio, seismology and geology, it is necessary to evaluate all the pertinent

numerical data as a whole. Naturally, this goal may be realized only through coordinated cooperation among engineers, seismologists and geologists. In relation with the geology there is difficulty. The study of surface geology with consideration of seismic activity is insufficient to discover the seismogenetic systems, instead, the knowledge about the deeper geological structure is required. This is only possible through expensive borings and geophysical investigations. The seismotectonics which is a common branch of geology and seismology made great progress in the U.S.S.R. where many correlations were revealed among geological structure, faults and seismic activity. These studies have been successfully applied in the preparation of seismotectonic maps of some seismically active regions of U.S.S.R. (16), (17). Better understanding of the seismic character of Turkey is only possible after coordination of such a multidisciplinary study to improve the existing seismotectonic map and to prepare reliable seismic zoning maps extending to the stage of microzoning.

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(1.1) TABLO 1

SON 50 YIL İÇİNDE VUKU BULAN ÖNEMLİ DEPREMLER

(1.1) Table 1

Major Earthquakes in the Last 50 Years

TARİH Date	MAKROSİSMİK DATA Macroseismic Data			ALETSEL DATA Instrumental Data		
	(N)	(E)	I_o	(N)	(E)	M
9.8.1912	40.65	27.2	X	40 1/2	27.0	7 3/4
3.10.1914	37.7	30.4	IX	38	30	7.1
7.8.1925	38.07	30.2	IX	38	30 1/2	5 3/4
31.3.1928	38.1	27.4	VIII	38	27	6 1/4
4.1.1935	40.5	27.5	IX	40 1/2	27 1/2	6 1/4
19.4.1938	39.6	33.7	X	39.5	33.7	6 3/4
22.9.1939	39.05	26.8	IX	39	26.9	6 1/2
21.11.1939	39.7	40.4	VII	39.7	39.7	-
26.12.1939	39.74	39.5	XI	39.7	39.7	8.0
20.2.1940	38.39	35.5	IX	-	-	-
15.11.1942	39.23	28.2	VIII	39.8	29.6	-
21.11.1942	40.33	34.57	VIII	40.6	35.0	-
2.12.1942	-	-	VIII	40.6	35.0	-
11.12.1942	40.8	35.1	VIII	40.6	35.0	-
20.12.1942	40.7	36.8	X	40.7	36.6	7.3
20.6.1943	40.8	30.6	IX	40.8	30.4	6 1/4
26.11.1943	40.7	36.65	X	40.5	34.0	7.6
1.2.1944	40.8	32.2	X	41.5	32.4	7.4
6.10.1944	-	-	X	39.4	26.7	-

TARİH Date	MAKROSİSMİK DATA Macroseismic Data			ALETSEL DATA Instrumental Data		
	(N)	(E)	I_o	(N)	(E)	M
21.7.1945	38.47	43.3	VII	37.5	45.0	-
29.7.1945	38.47	43.3	VII	38.0	43.0	-
20.11.1945	38.47	43.3	VIII	38.0	43.0	-
21.12.1945	38.04	28.85	IX	-	-	-
21.2.1946	38.28	31.7	VIII	38.3	31.8	-
23.7.1949	38.55	26.35	X	38.6	26.3	7
17.8.1949	39.32	40.35	VIII	39.5	40.6	6 3/4
13.8.1951	40.6	33.6	IX	40.8	33.4	6 3/4
3.1.1952	-	-	VII	40	41.6	5.6
22.10.1952	37.04	35.47	VII	37.4	35.8	5
18.3.1953	40	27.4	X	40.0	27.3	7.5
2.5.1953	38.6	26.5	VII	38.6	26.3	5 3/4
16.7.1955	37.5	27	VIII	37.9	27.1	6 3/4
20.2.1956	40	30.21	VIII	39.9	30.4	6 1/4
25.4.1957	36.6	29.2	VIII	36.47	28.56	7
26.5.1957	40.36	31.13	IX	40.67	30.86	7.1
23.5.1961	36.5	28.6	VII	36.8	28.7	6 1/2
4.9.1962	39.9	43.9	VII	40	44	5.5
14.9.1962	39.6	23.3	VII	39.6	28.6	4 1/4
11.3.1963	37.8	29.1	VII	38.1	29.3	5.5
18.9.1963	40.75	29	VIII	40.5	29.1	6
22.11.1963	37.33	29.82	VII	37.33	30.0	4.4
14.6.1964	38.4	38.4	VIII	38.0	38.5	6

TARİH Date	MAKROSİSMİK DATA Macroseismic Data			ALETSEL DATA Instrumental Data		
	(N)	(E)	I_o	(N)	(E)	M
6.10.1964	40.1	27.97	IX	40.3	28.2	6 1/2
19.8.1966	39.1	41.28	IX	39.2	41.6	6.1
22.7.1967	40.6	30.7	X	40.7	30.8	7.5
3.9.1968			VII	41.9	32.3	5.7
28.3.1969			VII	38.6	28.4	6.2
28.3.1970			IX	39.2	29.5	7.4
2.7.1970			VII	38.8	36.7	4.8
12.5.1971			VIII	37.5	29.9	6.2
22.5.1971			VIII	38.8	40.6	6.8

(1.1) TABLO 2

TÜRKİYE'Yİ İÇİNE ALAN ZONLARA AİT (a), (b) KATSAYILARI

(1.İ) Table 2

Coefficients (a), (b) for Regions comprising Turkey

BÖLGE Region	a'	$\bar{a}$	b	(b_c)	AÇIKLAMA (Remarks)
26	7.22	5.65	0.92	(0.85)	M=5-7, h=n.
26(h=i)	(7.22)		(0.92)	(0.6)	M_B=6 1/2 - 7 3/4, M<6 için N düşmektedir. (decrease of N for M<6)
27	4.55	3.82	0.62	(0.6)	M= 5-7 1/2, data çok dağınık. (Data dispersed)
29	4.84	4.02	(0.47)	(0.45)	M= 5-7 1/4, M=6 1/2 için data mevcut değil. (Lack of data for M=6 1/2)
30	(6.57)	5.47	(0.97)	(0.6)	Data çok dağınık. (Large scatter.) M=5 - 6 1/2, (M=5-6)
33	(5.49)	4.66	(0.75)	(0.7)	M=5-7, M=6 3/4 - 8 için data çok dağınık. (Large scatter for M=6 3/4 - 8)
34	4.13	2.95	0.73	(0.75)	M=5-7, data biraz dağınık. (Some dispersion of data)
35	?	-	?	?	N küçük (Small N) (M=5-6)

NOT: n=normal, i=orta, d=derin depremdir.
b_c=kümülatif frekanslarla hesaplanan b değeridir.

(Note: n=normal, i=intermediate, d=deep focus earthquake.)
(b_c=b values computed from cumulative frequencies.)

(1.1) TABLO 3

ŞİDDET MANYİTÜD VE TEKERRÜR SAYILARI ARASINDA BAĞINTI
(11-1964)

(1.1) Table 3

Relation between Intensity, Magnitude and Frequency
(11-1964 C.A.)

BÖLGE Region	MANYİTÜD VE TEKERRÜR SAYISI Magnitude and Frequency	ŞİDDET VE TEKERRÜR SAYISI Intensity and Frequency	DEPREM SAYISI Number of Earthquakes
I	Log N= 6.28 -0.768 M	Log N= 5.12 -0.468 I_o	362
II	Log N= 5.51 -0.644 M	Log N= 4.65 -0.406 I_o	330
III	Log N= 4.37 -0.547 M	Log N= 3.73 -0.353 I_o	65
IV	Log N= 4.94 -0.631 M	Log N= 4.47 -0.452 I_o	89
V	Log N= 4.30 -0.540 M	Log N= 3.82 -0.376 I_o	73
VI	Log N= 5.56 -0.701 M	Log N= 4.46 -0.421 I_o	130
Bütün Bölgeler Beraber (All Regions Together)	Log N= 6.92 -0.800 M	Log N= 5.78 -0.494 I_o	1023

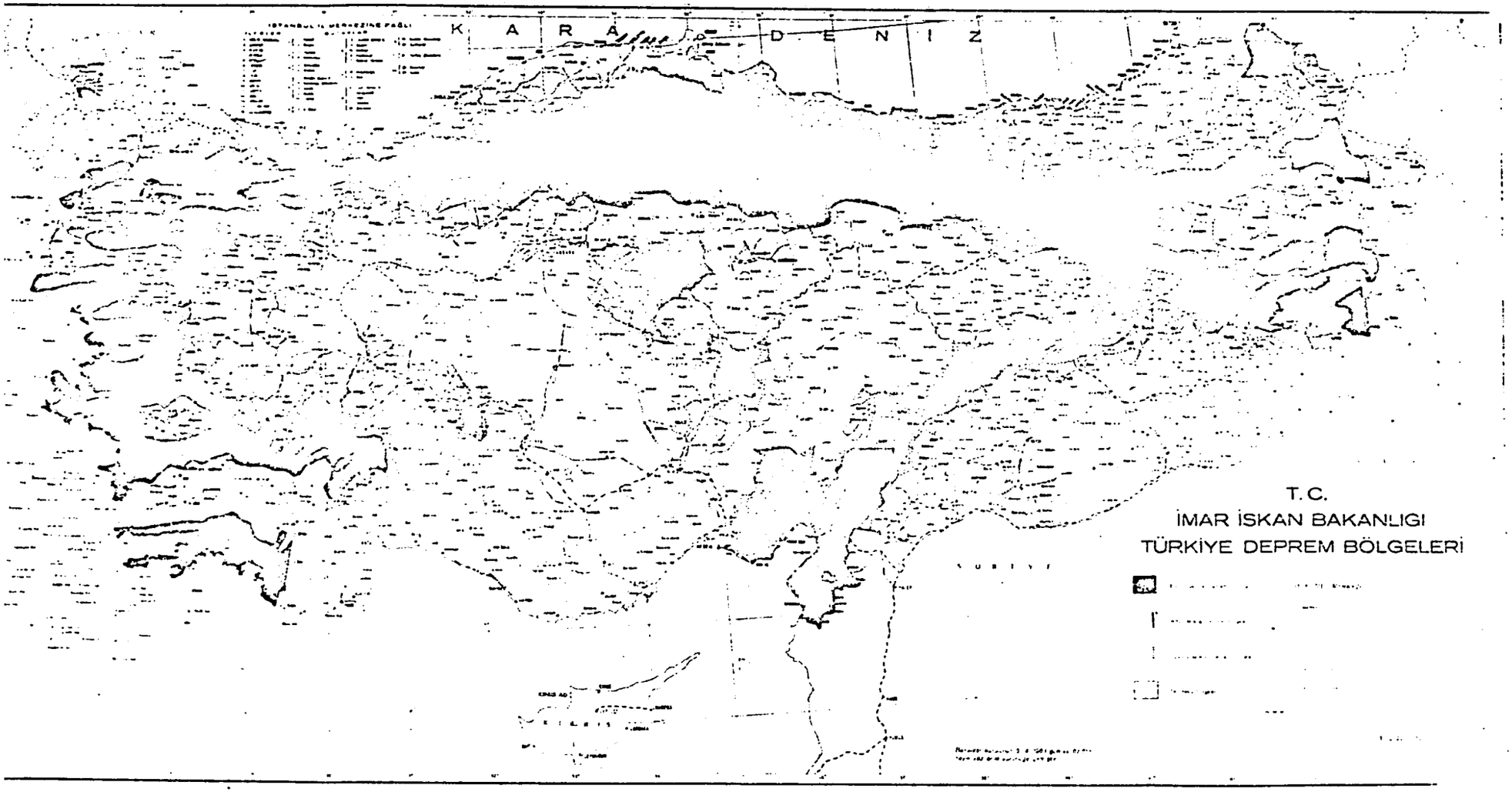
(1.1) TABLO 4

DEPREM ŞİDDETLERİNE TEKABÜL EDEN DEPREM BÖLGELERİ

(1.1) Table 4

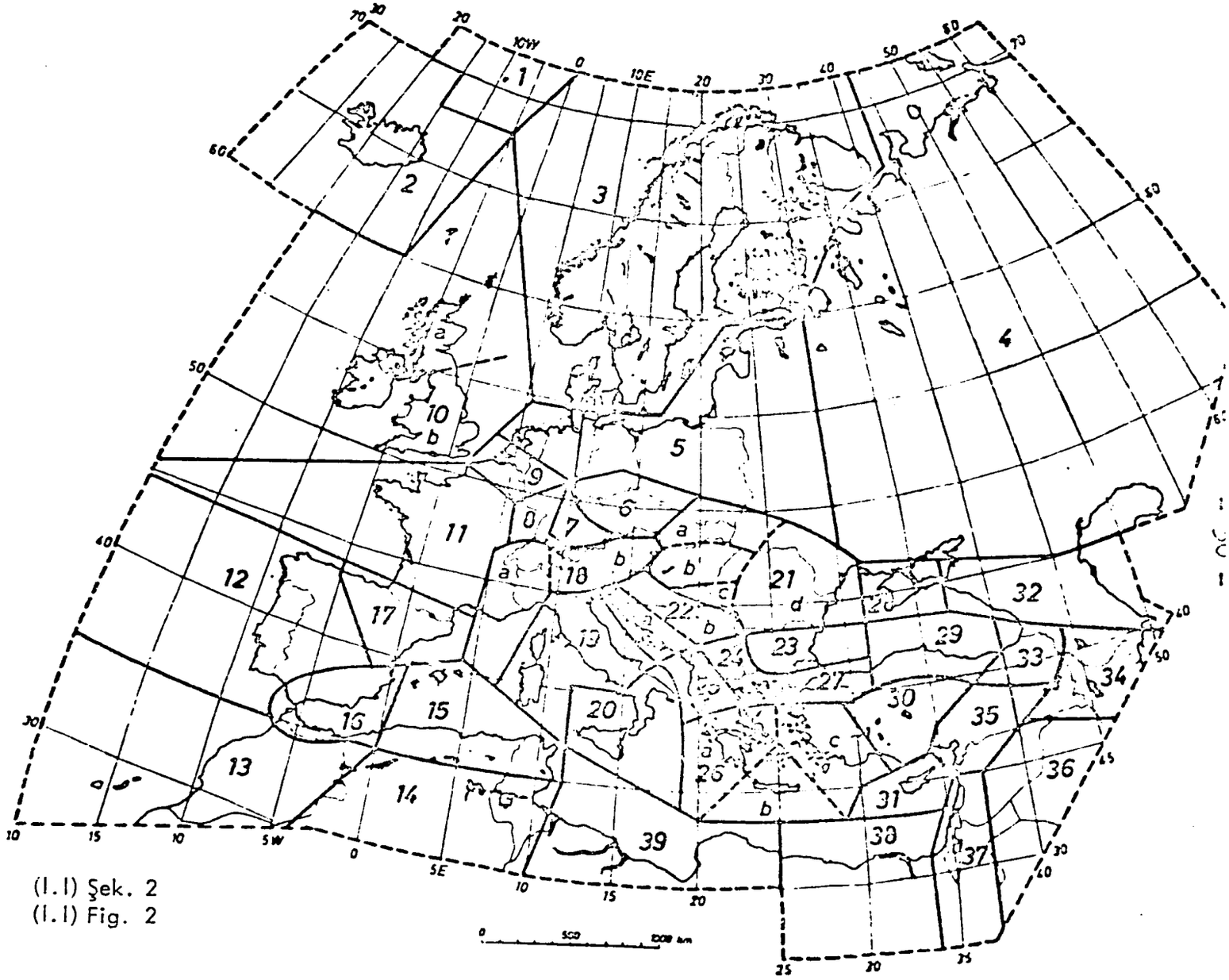
Seismic Regions corresponding to Seismic Intensities

ŞİDDET (Intensity)	DEPREM BÖLGESİ (Seismic Region)
$I \geqslant I$	1. derece (degree)
$I = VIII$	2. derece (degree)
$I = VII$	3. derece (degree)
$I = VI$	4. derece (degree)
$I \leqslant V$	Tehlikesiz (No risk)

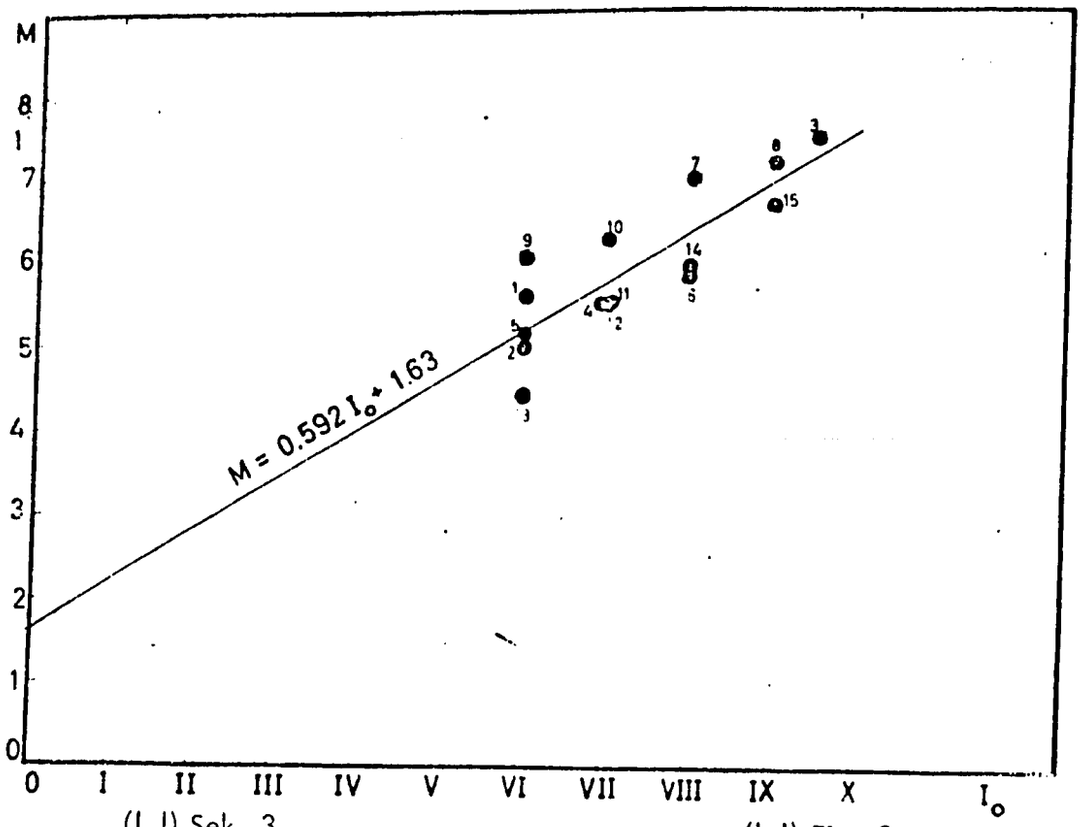


(I.1) Şek. 1
(I.1) Fig. 1

Government of Turkey - Ministry of Reconstruction and Resettlement
Earthquake Risk Zones

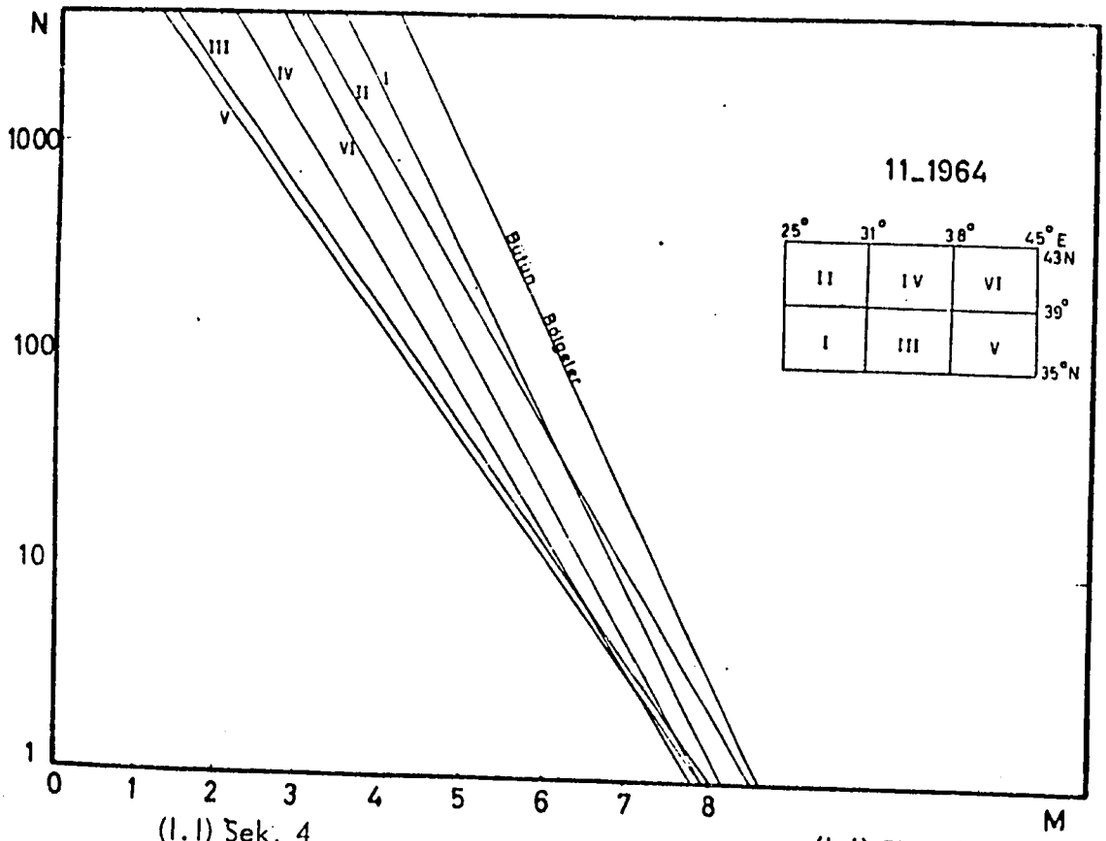


(I.1) Şek. 2
(I.1) Fig. 2



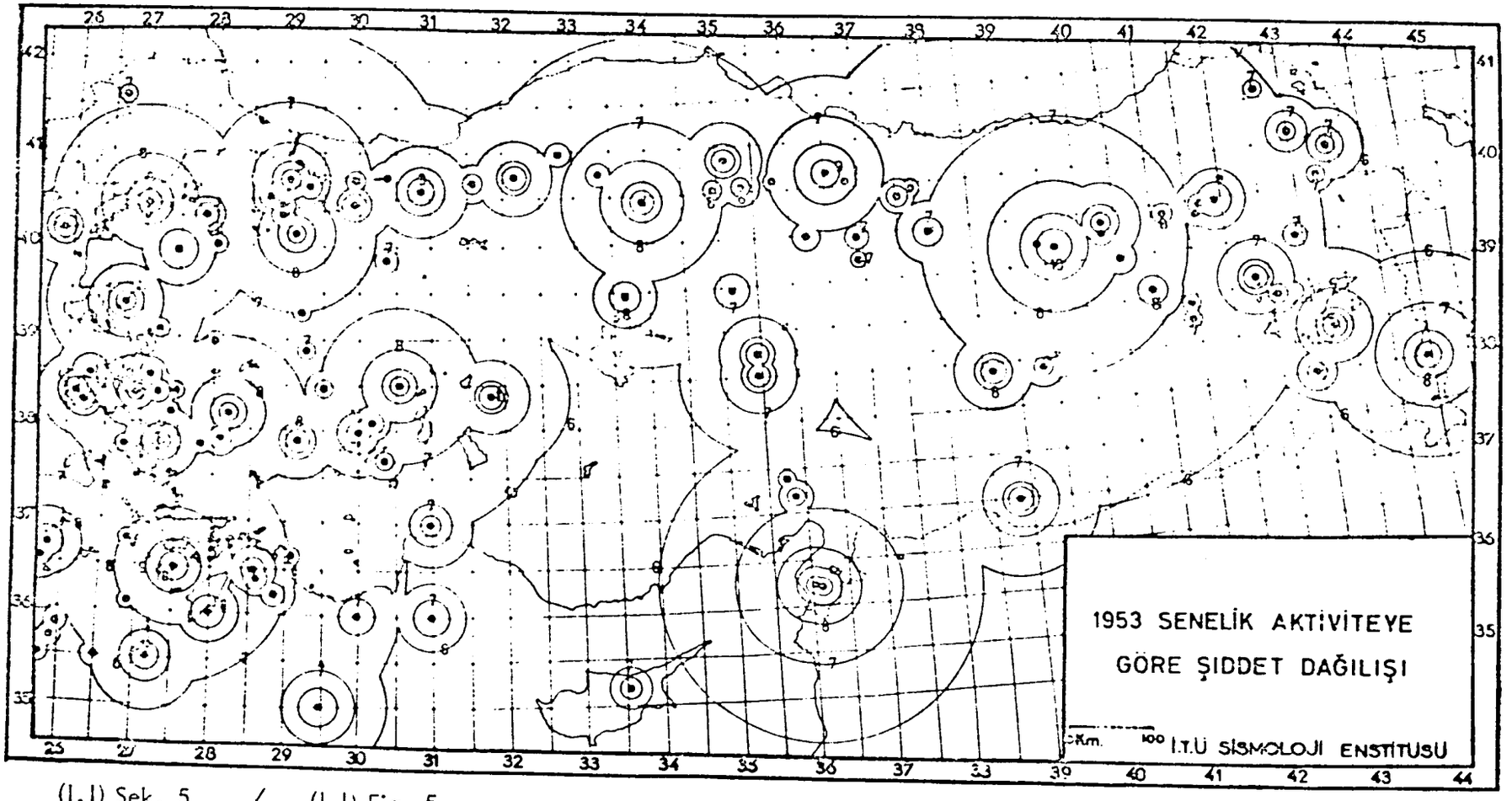
(I.I) Şek. 3

(I.I) Fig. 3



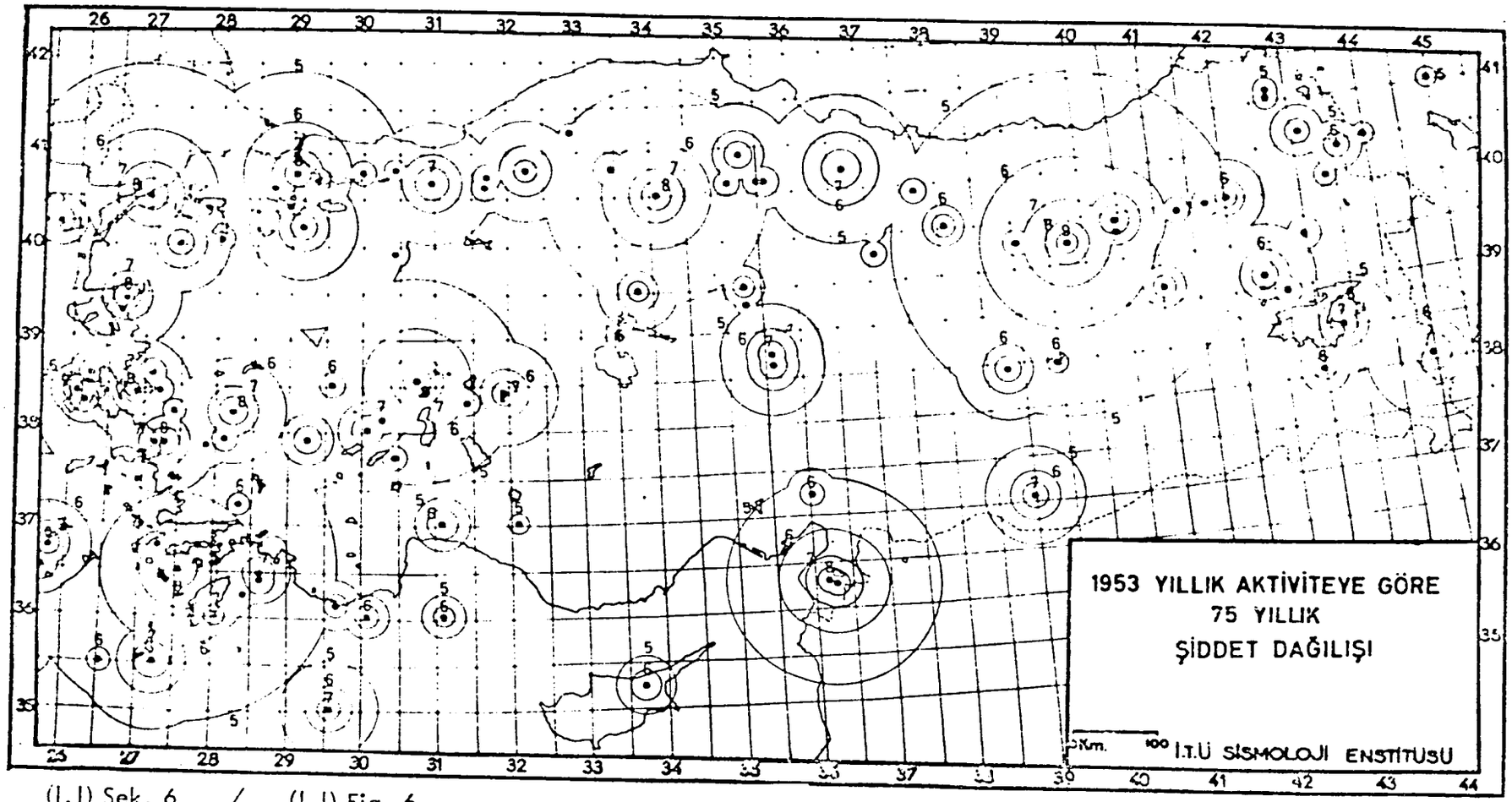
(I.I) Şek. 4

(I.I) Fig. 4



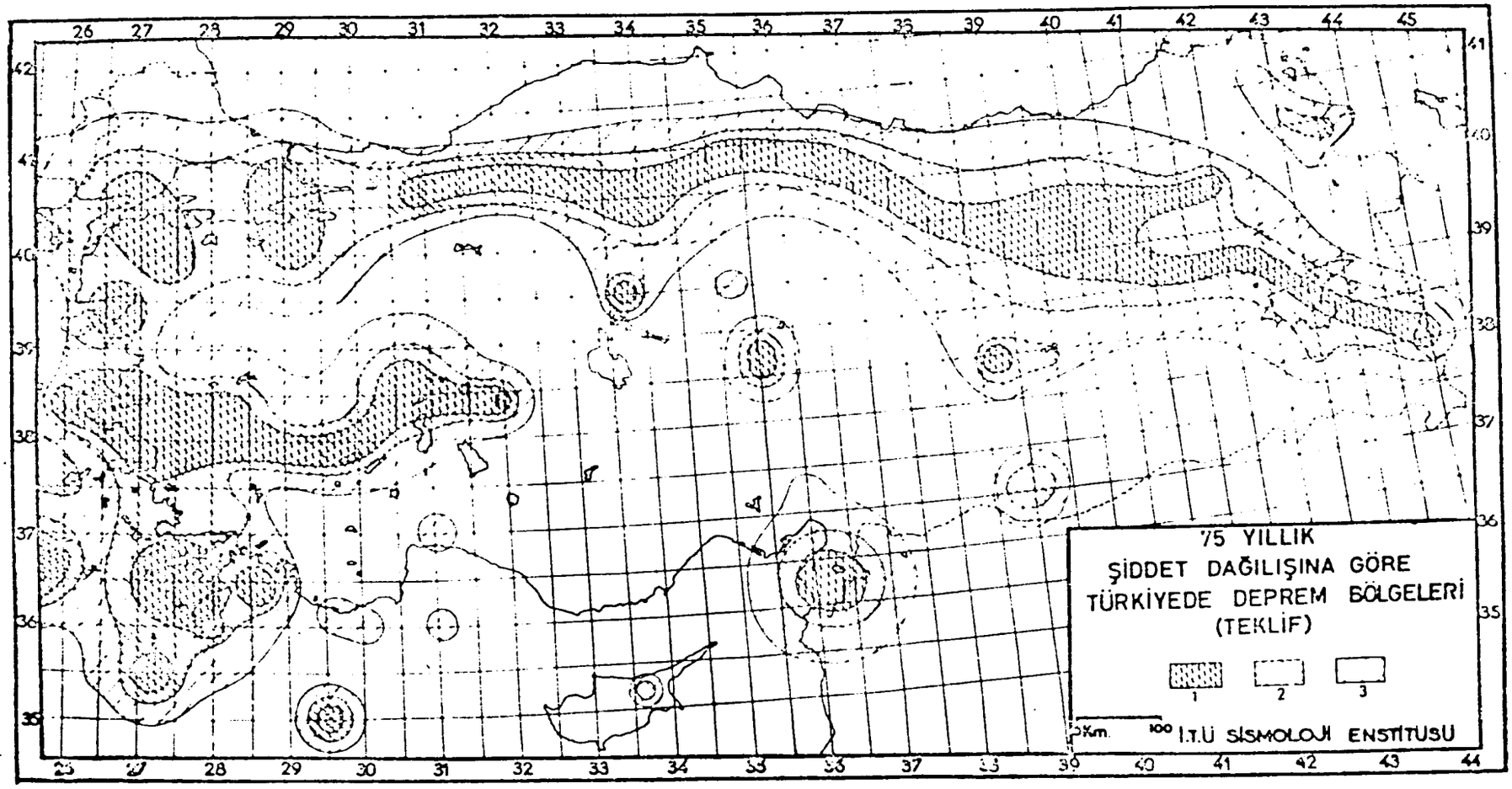
(I.I) Şek. 5 / (I.I) Fig. 5

Intensity Distribution for the past 1953 Years



(I.I) Şek. 6 / (I.I) Fig. 6

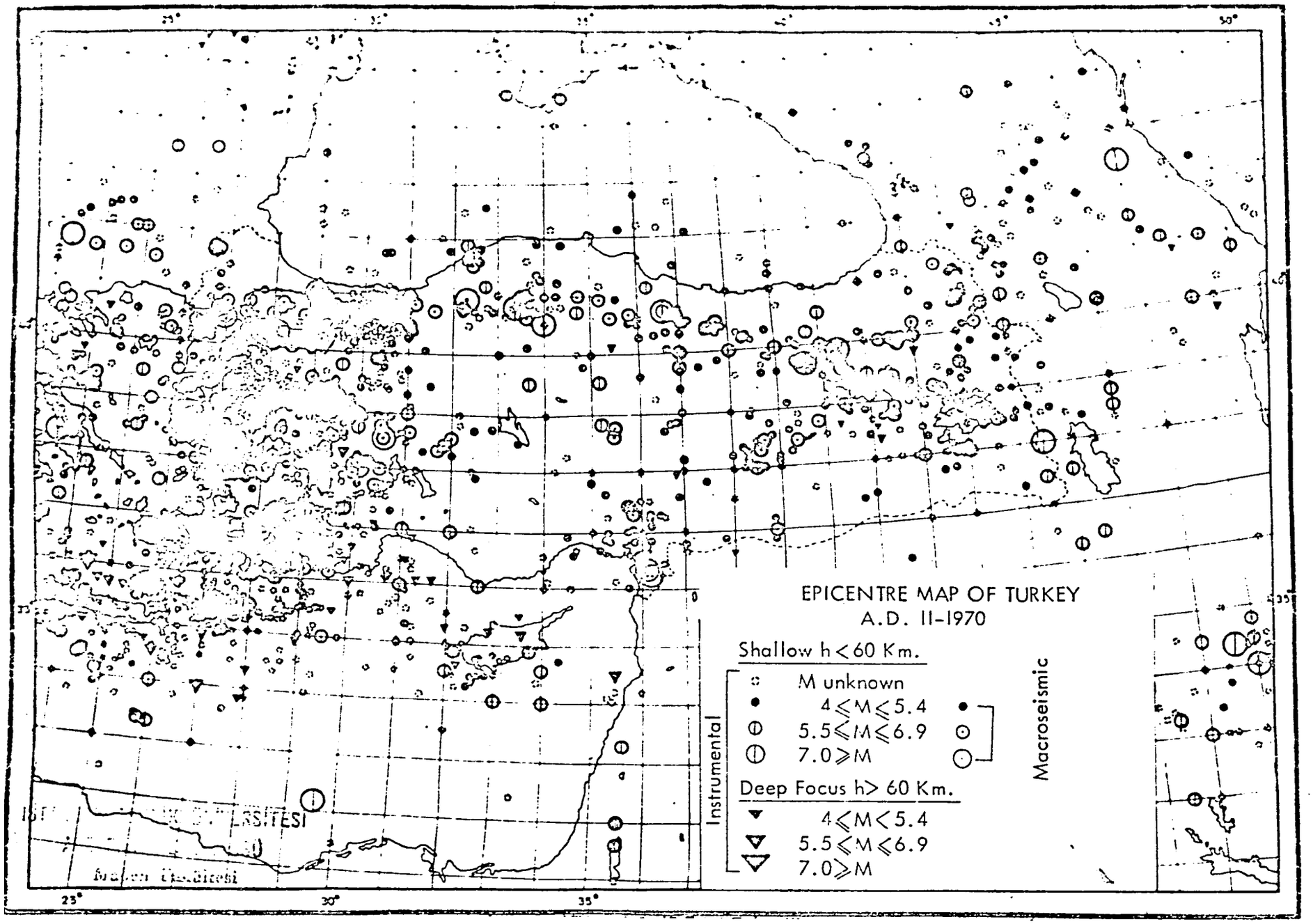
Intensity Distribution for 75 Years based on 1953 years' activity



(I.1) Şek. 7 / (I.1) Fig. 7

Earthquake Risk Zones based on
75 years' Intensity Distribution
(Proposed)

1 2 3


EPICENTRE MAP OF TURKEY
A.D. II-1970
Shallow h < 60 Km.
M unknown
4 ≤ M ≤ 5.4
5.5 ≤ M ≤ 6.9
7.0 ≥ M
Deep Focus h > 60 Km.
4 ≤ M < 5.4
5.5 ≤ M ≤ 6.9
7.0 ≥ M
Instrumental
Macroseismic
25°
30°
35°

(I.1) Fig. 8

1.2 RURAL DWELLING TYPES IN THE SEISMIC REGIONS OF TURKEY

Introduction

In general, rural dwellings in Turkey are formed spontaneously, as a result of the combination of regional constructional materials wit the traditional structural methods.

Rural dwellings are also seen to exist in the surroundings of the cities.

On the other hand, as the structures in the seismic regions are not specially designed to resist earthquake forces and no additional care is taken in their construction, earthquake damages increase to larger amounts.

1.2.1. Factors Effecting the Formation of Rural Dwellings

A. Physical surrounding - Climate - Water resources - Vegetation.

(i) The possibilities of obtaining constructional materials:

In the structures most of the time the primary constructional materials existing in the nature (e.g. stone, timber) in the neighbourhood of construction site are used. So the physical surrounding and the climate, determining the kind of the regional materials becomes the most important parameter effecting the type of the structural frame of rural dwellings.

As a matter of fact, in a rocky region without trees, timber frame systems do not develop and in regions rich in forests timber frames are frequently used. Adobe masonry systems are generally seen in regions where timber and stone suitable for construction cannot be found, but where water is available.

(ii) From the point of view of the shaping of rural dwellings:

The measurements taken against climatic conditions (sun rain, snow, etc.) often influence the structural system as well as the shaping of architectural elements (windows, roofing, cantilevers, etc.).

B. The distance to cities and to the centres of constructional material production and transportation facilities:

The distance from the village to cities and the transportation facilities influence the type and the quality of the constructional material as well as the design and the constructional methods of the structures.

C. Socio-economic conditions:

The socio-economic potential of the regional people effects directly the possibility of using qualified workers and good quality materials.

D. Conformity with the traditional structural discipline:

One of the factors effecting the structural shaping of the rural dwellings is the "Traditional Turkish Structural Discipline". Structures built in accordance with this discipline have been observed to resist earthquakes for years. On the contrary new buildings constructed with structural methods away from the traditional ones suffered much more damage during recent earthquakes (Fig. 1).

1.2.2. Classification of Rural Dwellings:

In view of their structural systems, rural dwellings in Turkey can be divided into two main groups.

A. Block structures

B. Frame structures

A. Block Structures:

Structures in this group may be studied in two sections:

(i) Wooden Block Structures:

The walls in wooden block structures are formed from timbers of 20-25 cm. of diameter, which are placed one on top of another and connected (nailed) at the corners.

This kind of structure has a wide application in the forest houses of Northern Anatolia (Bolu-"ize) and in the summer camping houses of the same region (Fig. 2).

(ii) Masonry Structures: Can be divided into four sub-groups.

1. Stone Masonry Structures.

This type of structures, in which the walls are made of stones, are generally constructed in the mountainous and rocky regions. Many structures of this type are seen in Eastern, South8Western, South and South-Eastern Anatolia (Fig.s 3 and 4).

The walls are in general 40-60 cm. thick (sometimes 75 cm.) and the stones are held together with mortar. Only in the South-Western regions no mortar is used (dry wall). To increase the stability of the walls horizontal laths (wooden, metal or reinforced concrete) are placed with nearly one meter distance.

Stone masonry structures can further be classified according to the kind and shape of the stones used. 48 percent of the rural dwellings in Turkey have their wall made of stone.

2. Adobe Masonry Structures.

In general, adobe masonry structures are constructed in regions where timber, stone and other constructional materials canno be obtained. It is unfortunately one of the most common structural systems used in rural regions in Turkey (28%) and exist mainly in the surroundings of Marmara and in Western, Central and Eastern Anatolia.

This system also can further be classified as bloc adobe, poured in place adobe and poured in place adobe strengthened with branches of trees.

3. Brick Masonry Structures.

In the rural regions near cities, bricks are used in the construction of walls (Fig.s 7 and 8). This structural system is mainly practiced in the surroundings of Marmara, in Northern and North-Eastern Anatolia. Successful results are obtained when the system is applied in accordance with the traditional technology (Fig.9).

4. Other Block Systems.

This group is composed of the structures in which the walls are made from other materials than stone, adobe and brick. Very few examples are seen with concrete blocks and Ytong (only in Marmara-Cebze region).

5. Mixed Systems.

Sometimes the above mentioned structural systems are used together. Some mixed systems are then obtained:

Stone and Brick
Adobe and Brick
Stone and Adobe

The practice of these mixed systems are emphasized by architectural considerations in the design of window and door openings, and by statical considerations in the construction of corners.

3. Framed Structures:

Framed structures developed in rural regions can be divided into two groups according to the type of the material used to construct the frame.

(i) Timber framed structures,
(ii) Reinforced concrete or metal framed structures.

(i) Timber framed structure is the most common type of framed structures seen in Turkey. In different regions, different kinds of filling and covering materials are used. A classification can be made based on these differences:

1. Timber framed structures, with filled walles (Hımış).

(a) Filled with mud and branches of trees:

Branches of trees are knitted between the vertical elements of the frame, then plastered with mud, from both sides. This quite primitive type of structures are very common in the surroundings of streams and rivers (Fig. 11).

(b) Filled with adobe:

The spaces between the vertical elements of the frame are filled with adobe. This system has a wide application especially in the surroundings of forest villages in Western Anatolia. In Gediz 70 percent of the structures were of this type (Fig.s 11 and 12).

As the timber elements used in this system are not worked up, the earthquake damages are greater.

(c) Filled with stone:

In the regions where stone is available, this type is as common as the preceding one. Mud is again used as the binding material (Fig. 13).

In the Black Sea region where the vertical elements of the frame are closer, square stones are used as covering material.

(d) Filled with bricks:

This system in which the spaces between the vertical elements of the frame are filled with bricks, is especially practiced in Marmara region, Northern Anatolia, Black Sea region and partly in the Central Anatolia (near Ankara). As it is possible to construct multi storey houses (max. 3 storeys) with timber frames, the use of this system in two storeys cantilevered (çıkmalı) houses has created a special style of construction (Fig.14).

(e) Mixed systems:

For several reasons, sometimes in some regions, the above mentioned systems are used together, to make up the mixed system.

2. Timber framed structures with empty walls.

(a) Walls covered with wood panels:

In this system commonly seen in forest villages, the walls are covered from inside and outside with wood panels (called "Bedavra"), having cross sections of 2,5 3 15 20 cm and length of 1,5 2 m. Many examples are met in Northern and Southern Anatolia (Fig.15).

(b) Walls covered with wood and plaster,

"Bağdadi" system:

This type of constructional system is widely used in the surroundings of Marmara and in the rural regions near to cities in the Aegean, Mediterranean and Black Sea regions.

In this system, strips of wood with small cross sections are nailed on the timber frame from interior and exterior and then plastered, forming finally a light and flexible structure.

This system is commonly practiced and developed in the traditional Turkish structural discipline (Fig.s 16 and 17).

(ii) Reinforced Concrete System:

Very few examples are seen in rural regions. Several applications exist according to different types of filling materials. (Fig. 18).

1.2.3. Summary

The different Turkish rural dwelling types given above in detail, are classified together in a table, in Figure 19.

In the table given in Figure 20, the distribution of structural types according to different regions is summarised, and regional differences in the density of use are given.

Regions where a certain type is preferred as the primary, secondary, tertiary structural systems, or rarely used are also shown.

In Figure 21, rural dwelling types in seismic regions of Turkey are shown on a map.

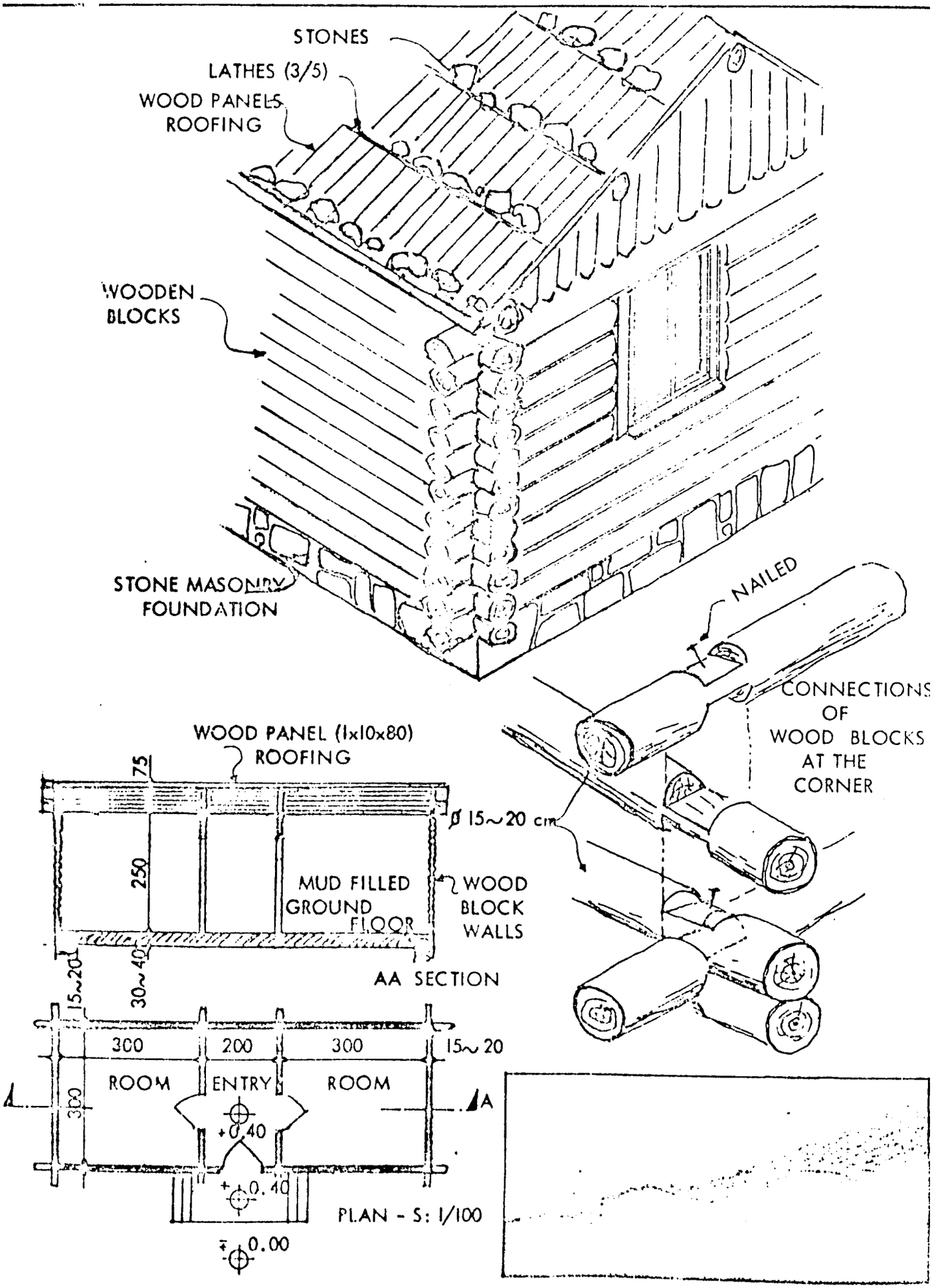
Photographs of structures to illustrate these types are provided in the legend.

Finally, considering also the statistical data obtained from the 1970 census of dwellings, the types of rural dwelling in Turkey may be summarised as follows:

48%	Stone and brick
13.4%	Timber framed
27.6%	Adobe masonry
9.7%	Mixed systems
1.3%	Others

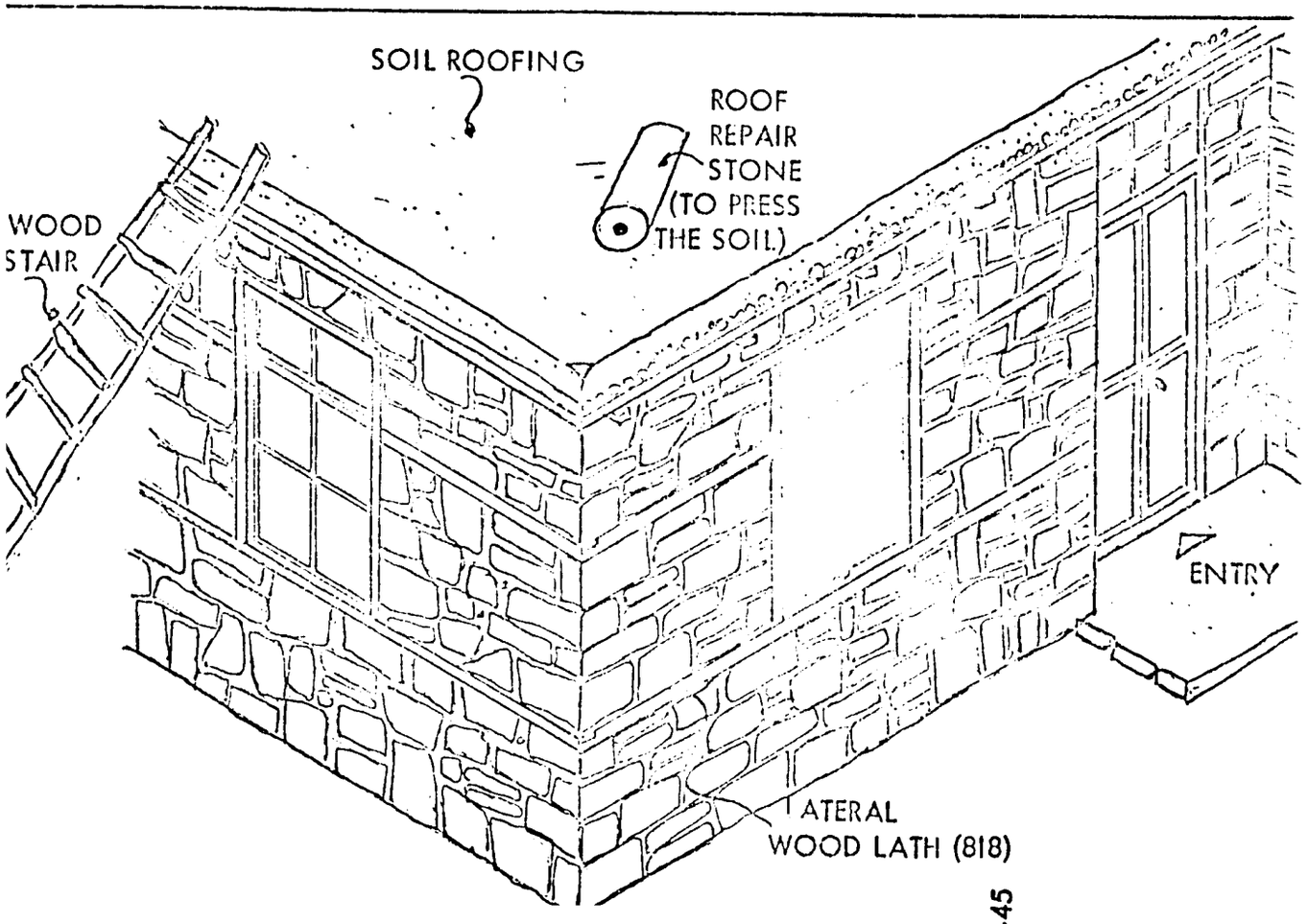
(I.2) Şekil I (Burdur-Yarılar köyü) Türk yapı disiplininde 2 katlı kerpiç yığma bir yapı. Mütemadi hatıllar yatay kuvvetlere karşı koymuştur.

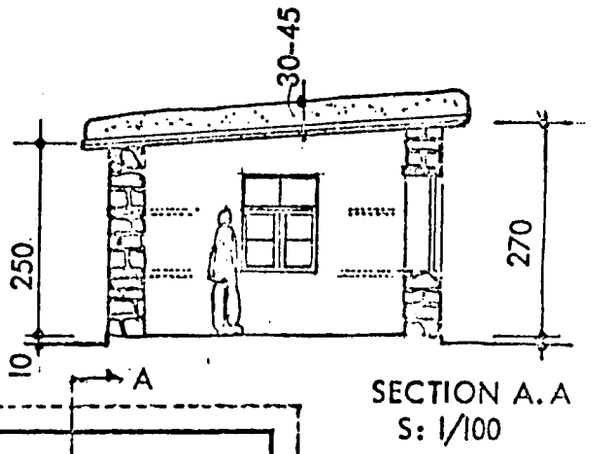
(I.2) Figure I (Burdur-Yarılar village) An adobe masonry two storeyed structure according to Turkish traditional architecture. Continious timber tie-beams provide strength for lateral forces.

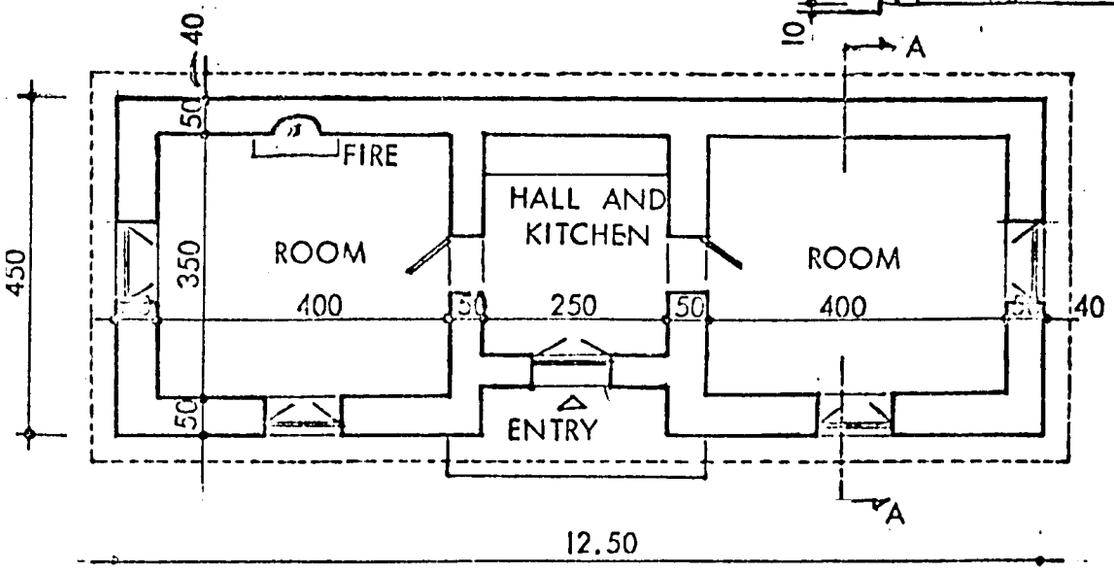

STONES
LATHES (3/5)
WOOD PANELS ROOFING
WOODEN BLOCKS
STONE MASONRY FOUNDATION
NAILED
CONNECTIONS OF WOOD BLOCKS AT THE CORNER
WOOD PANEL (1x10x80) ROOFING
75
250
Ø 15~20 cm
MUD FILLED GROUND FLOOR
WOOD BLOCK WALLS
15~20
30~40
AA SECTION
300
200
300
15~20
ROOM
ENTRY
ROOM
A
300
+0.40
+0.40
PLAN - S: 1/100
±0.00

STONE-MASONRY SYSTEM

(I.2) Figure 3

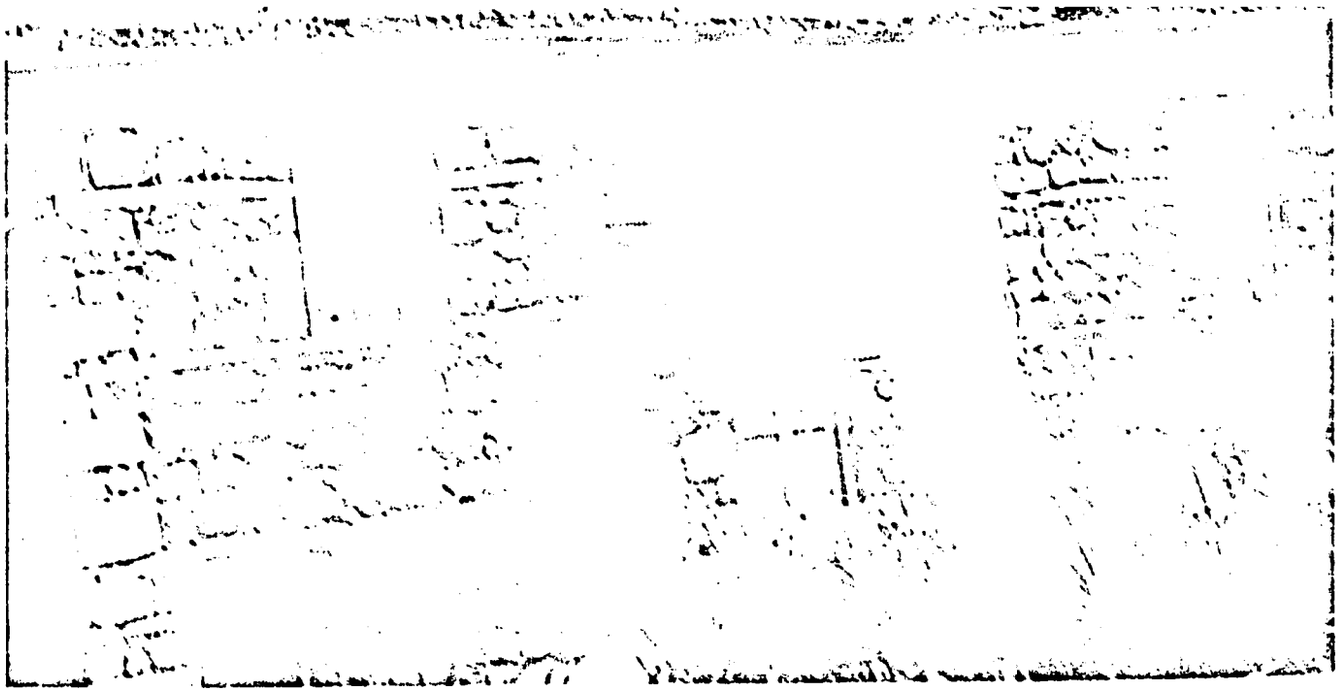






(A.2.1.b/2) STONE MASONRY TYPICAL DWELLING - PLAN S: 1/100

NOTE: NEXT PAGES IT WILL BE GIVEN DIFFERENT WALL CONSTRUCTIONS TYPES, ABOUT STONE MASONRY WALL

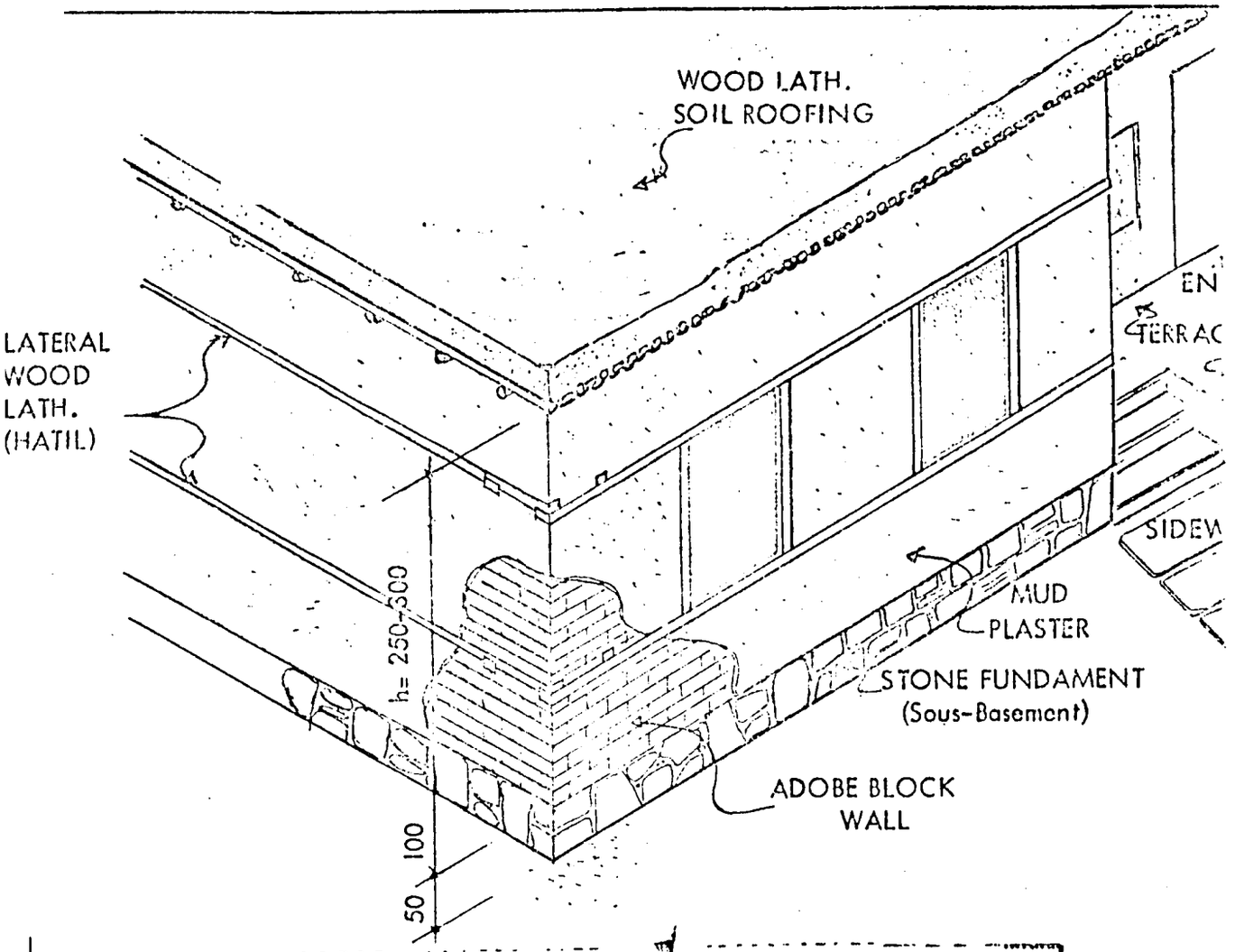


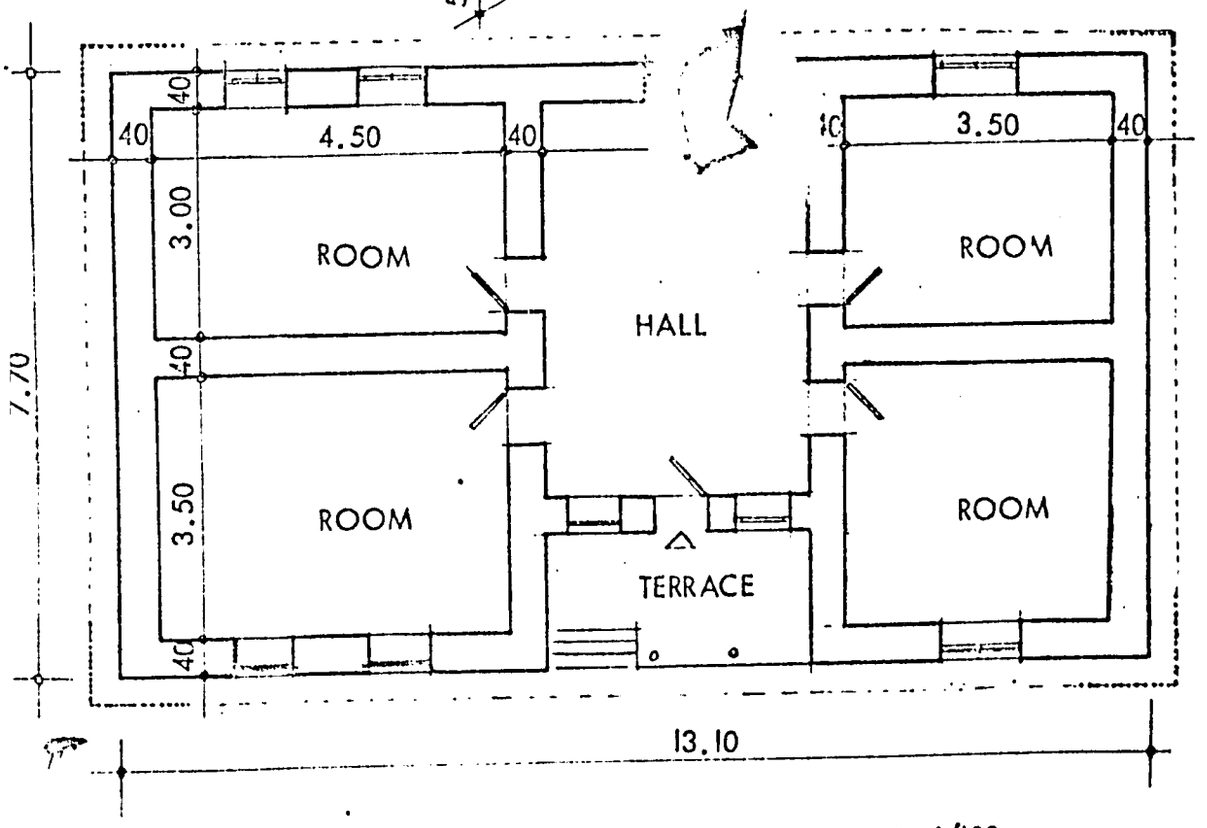
(I.2) Şekil 4. (Bingöl çevresi) Tipik bir taş yığma yapı.

(I.2) Figure 4. (Bingöl environment) A typical stone masonry structure.

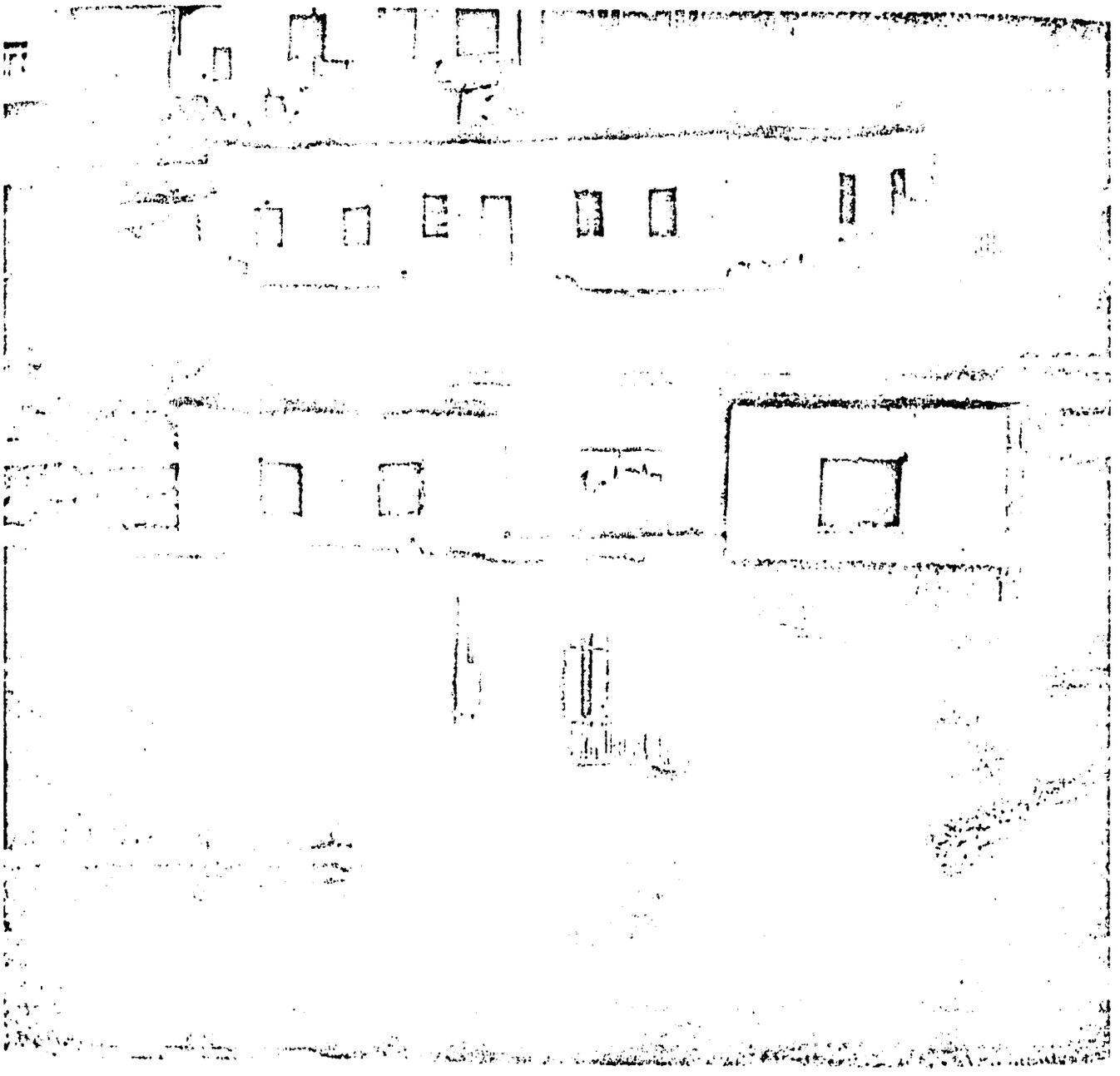
ADOBE - MASONRY SYSTEM

(I.2) Figure 5





TYPICAL ADOBE MASONRY DWELING PLAN. S. 1/100
(From Central Anatolia, Kırşehir-Kaman)

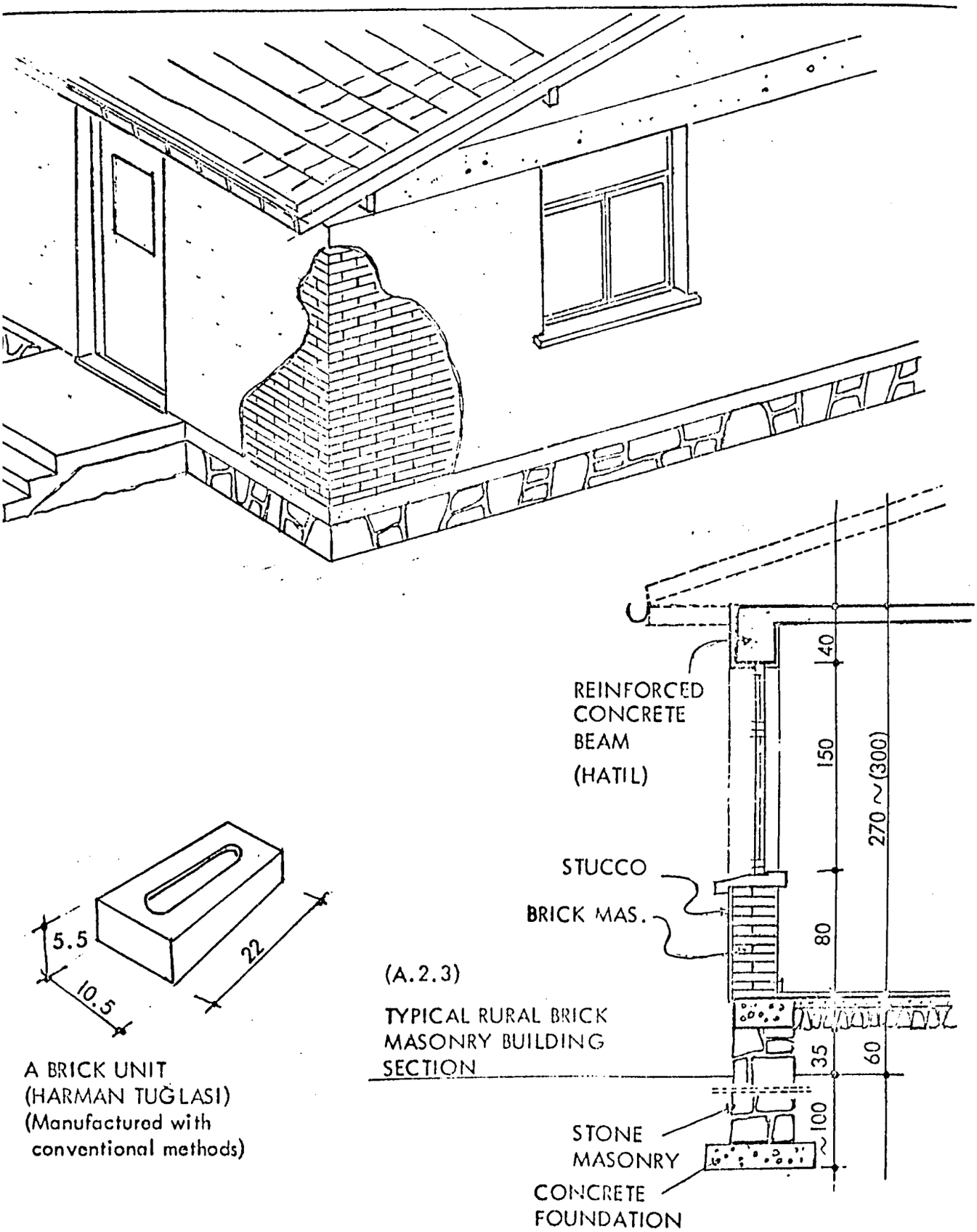


(I.2) Şekil 6 (Kırşehir bölgesi) Tipik kerpiç yığma yapılar.

(I.2) Figure 6 (Kırşehir region) Typical adobe masonry houses.

BRICK - MASONRY SYSTEM

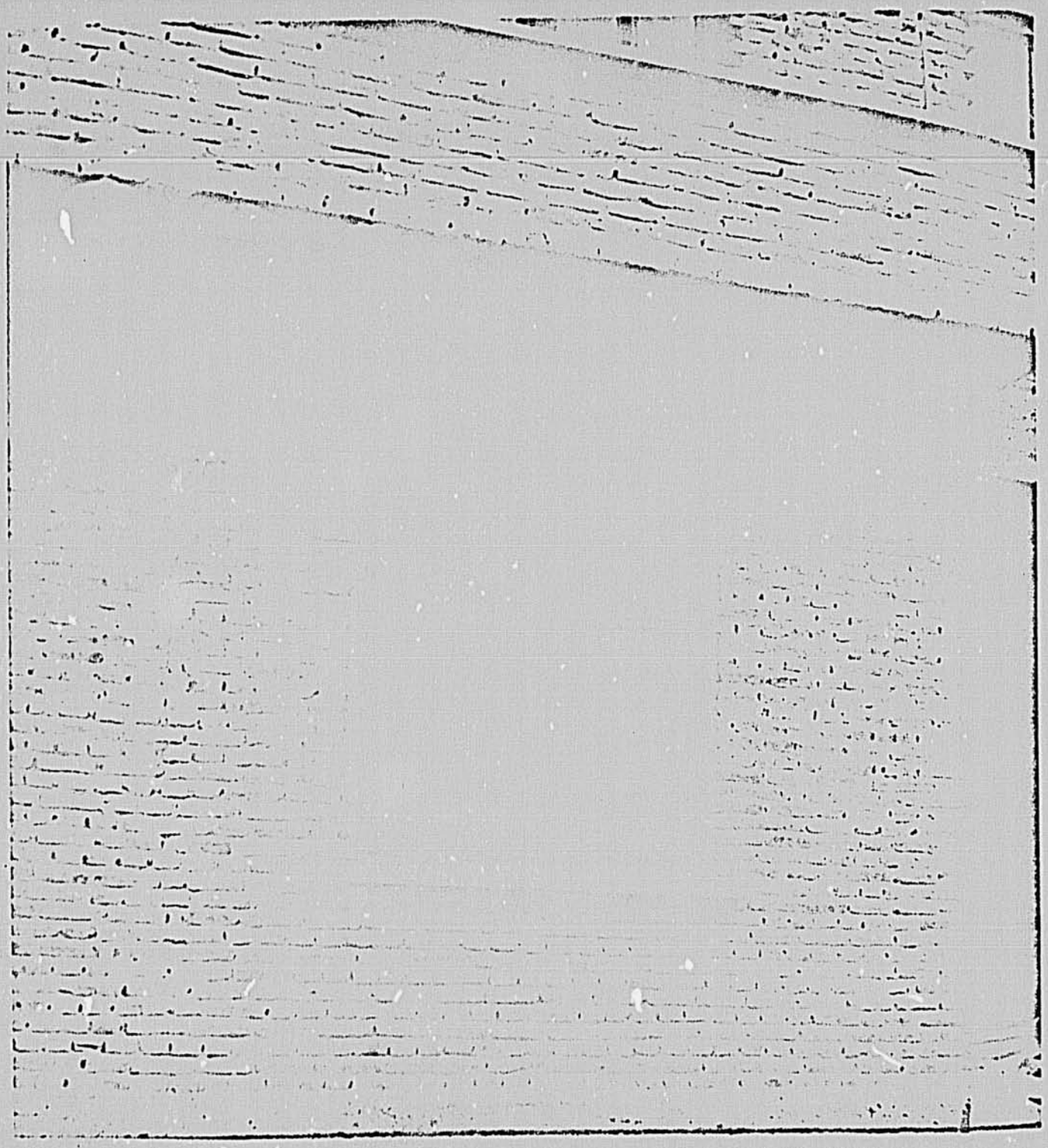
(I.2) Figure 7.



A BRICK UNIT
(HARMAN TUĞLASI)
(Manufactured with
conventional methods)

(A.2.3)

TYPICAL RURAL BRICK
MASONRY BUILDING
SECTION

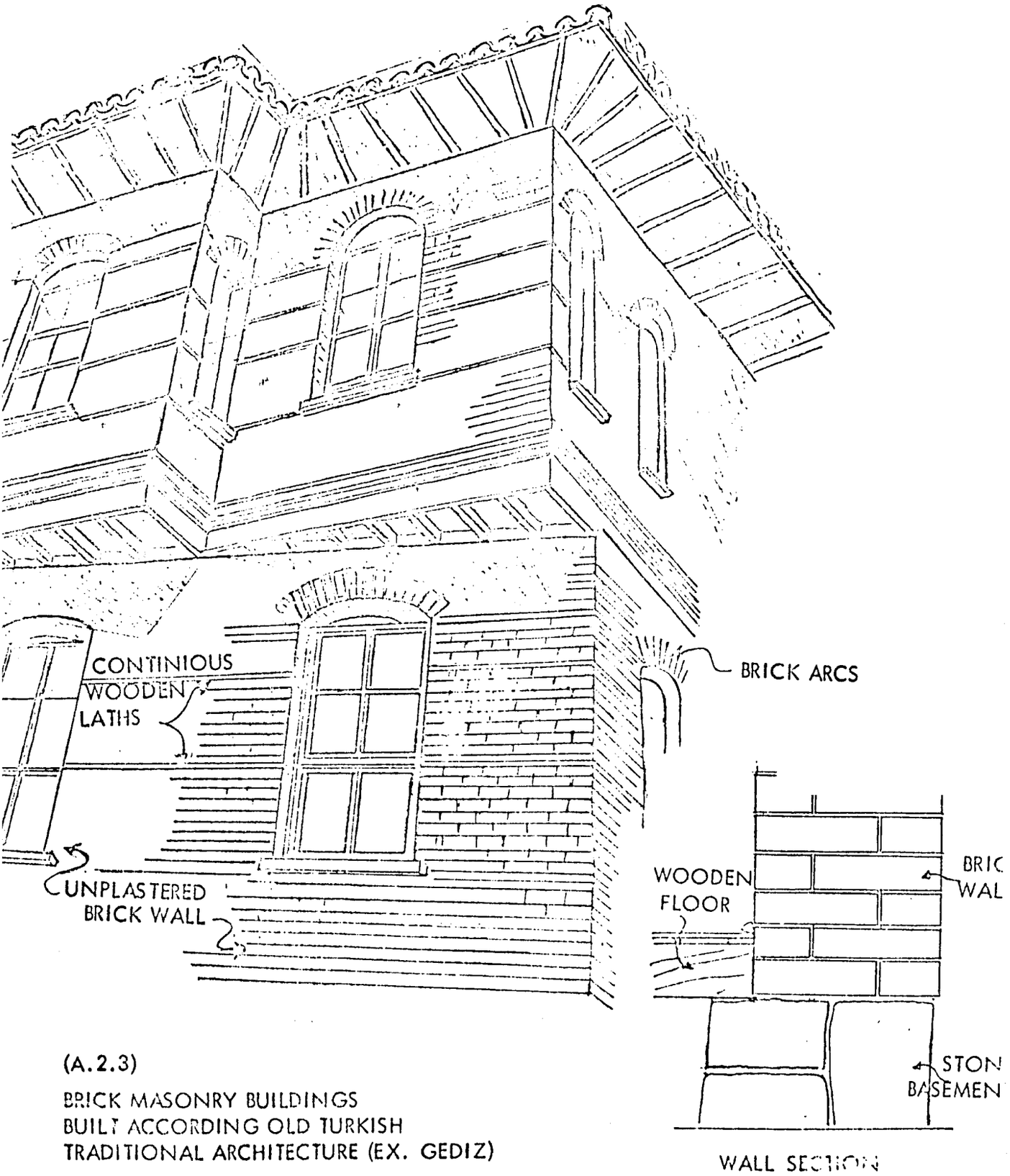


(1.2) Şekil 8. (Burdur bölgesi) Tuğla yığma bir yapı.

(1.2) Figure 8. (Burdur region) A brick masonry structure.

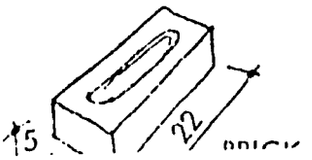
BRICK-MASONRY SYSTEM
(in old turkish traditional architecture - Urban)

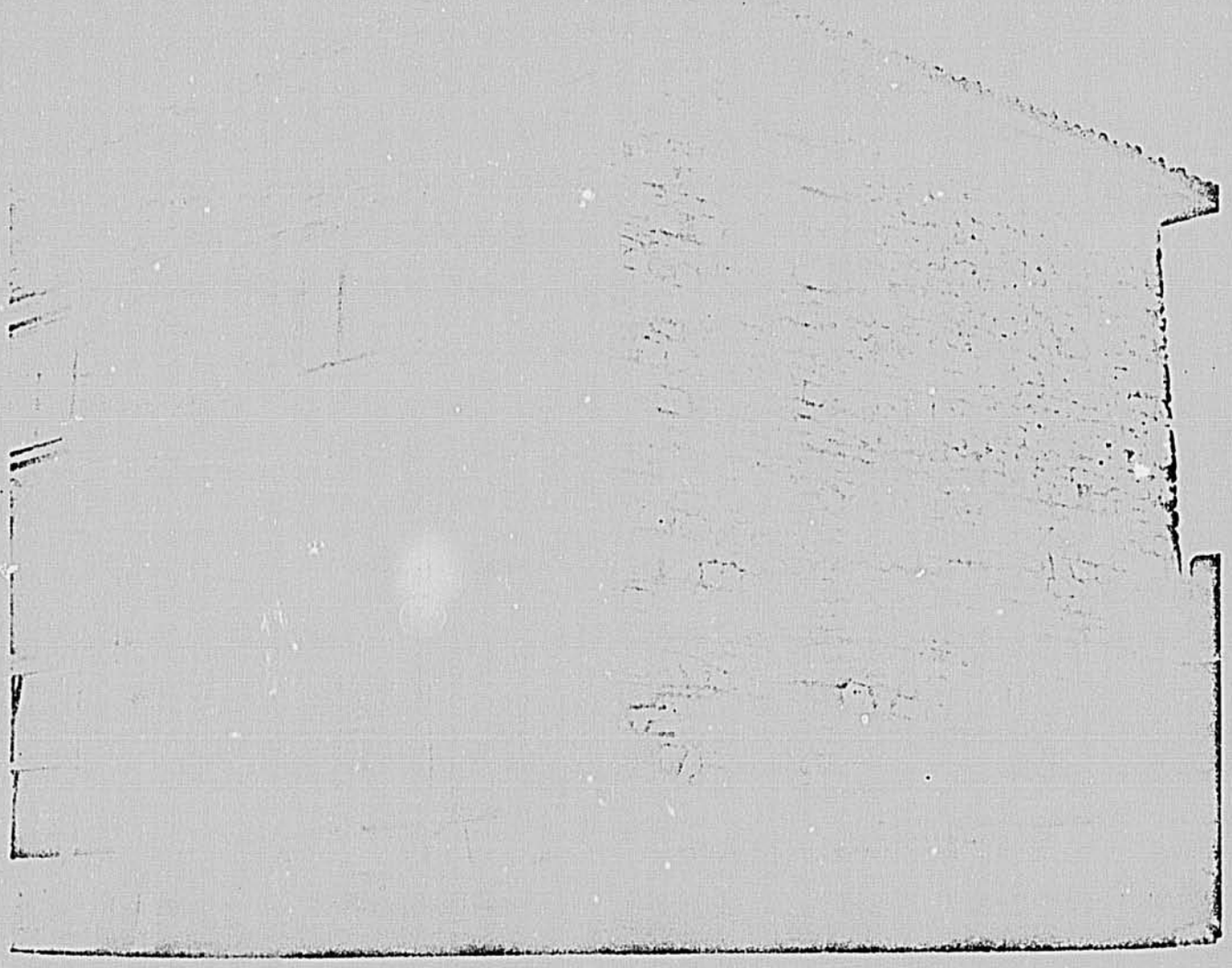
(I.2) Figure 9



(A.2.3)

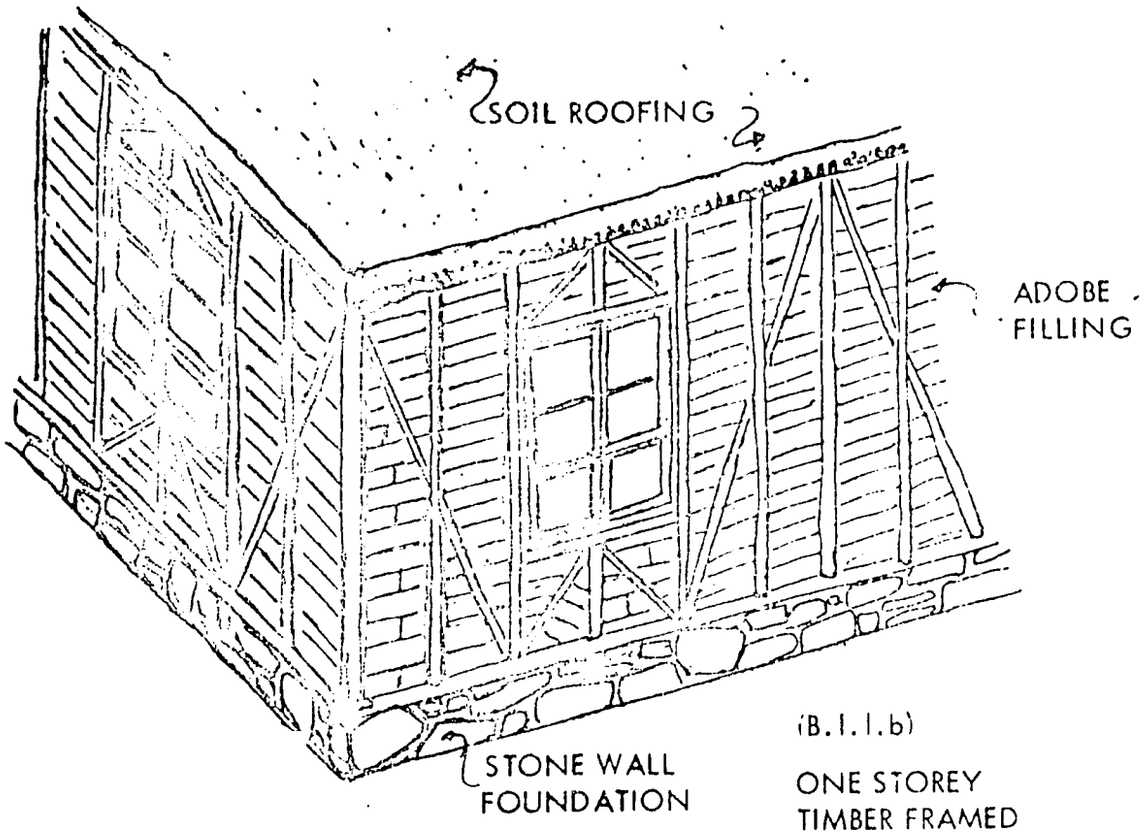
BRICK MASONRY BUILDINGS
BUILT ACCORDING OLD TURKISH
TRADITIONAL ARCHITECTURE (EX. GEDIZ)





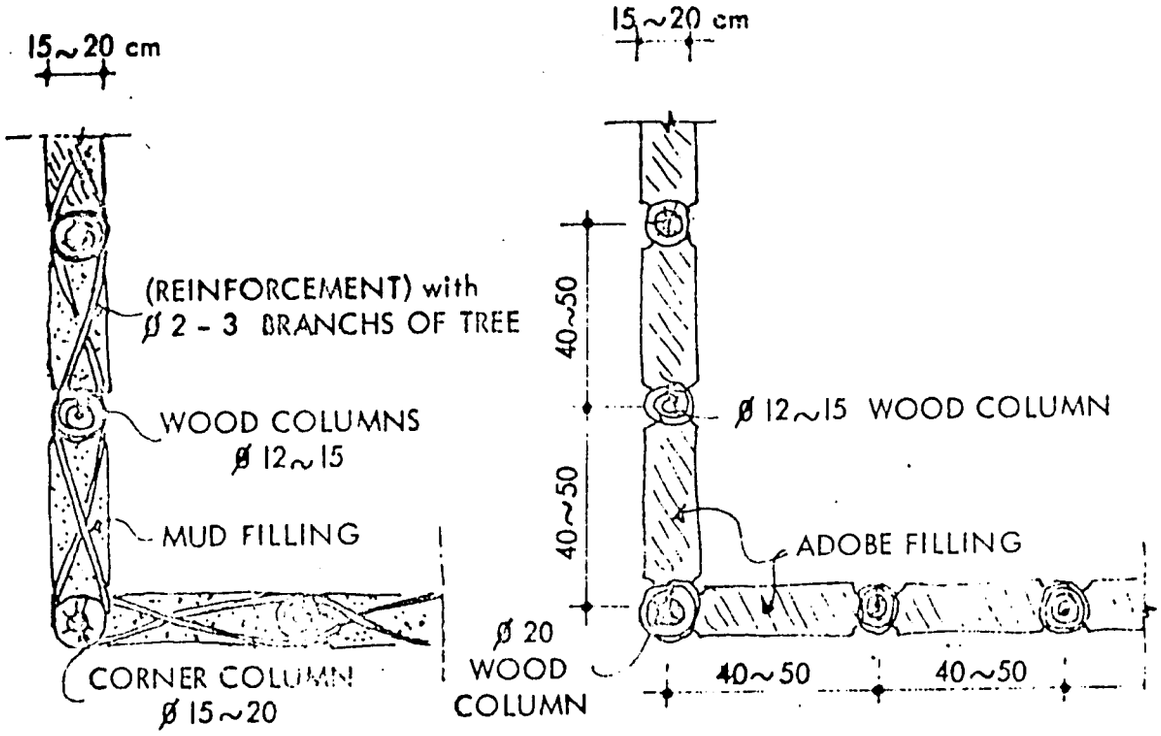
(1.2) Şekil 10 (Balıkesir-İvrindi) Karışık yapı malzemeleriyle bir uygulama (Taş + tuğla)

(1.2) Figure 10 (Balıkesir-Ivrindi) A structure with mixed systems and materials (Stone + brick)



(B.1.1.b)

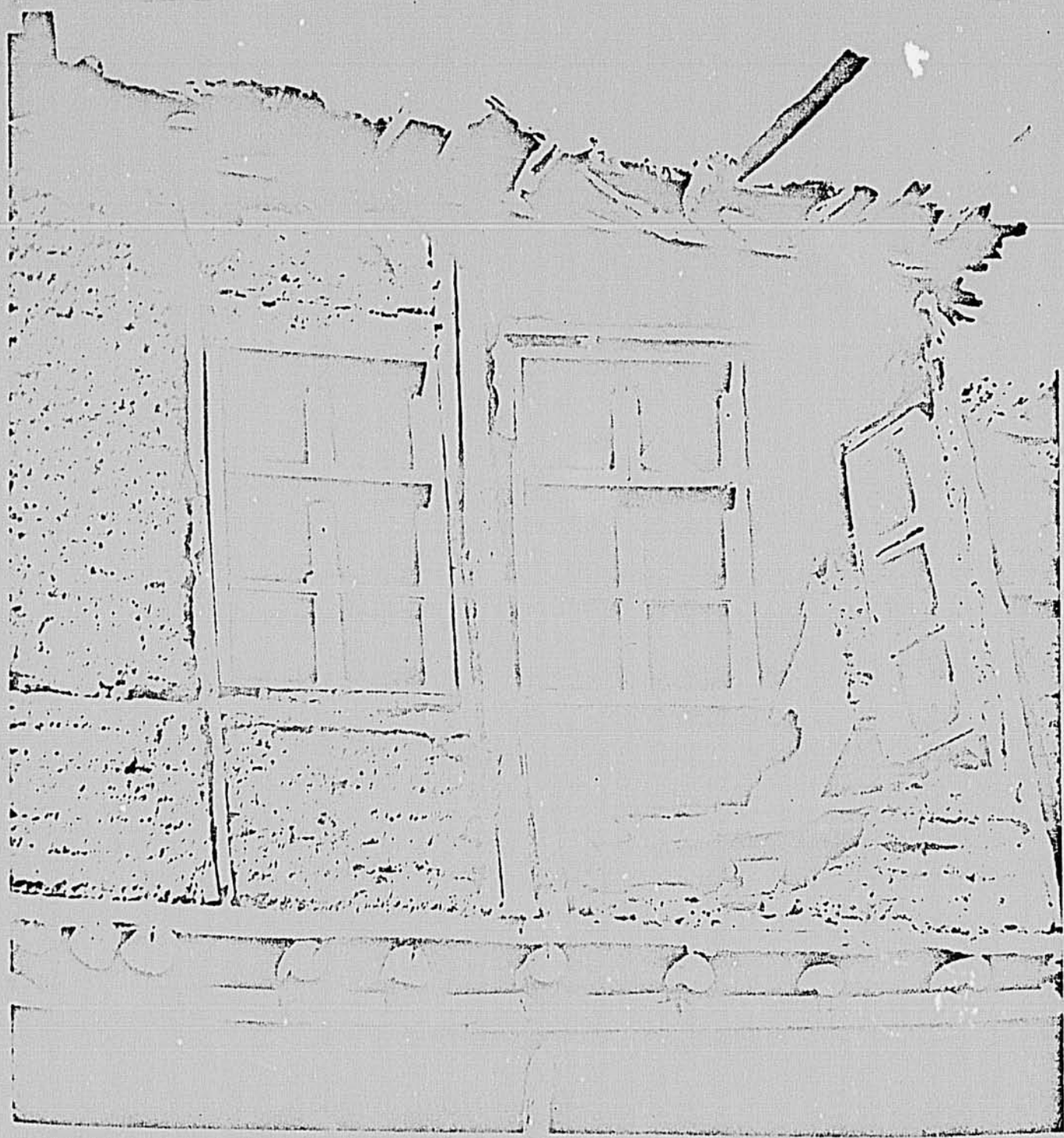
ONE STOREY TIMBER FRAMED AND ADOBE FILLED STRUCTURES



TIMBER FRAMED WALL TYPES

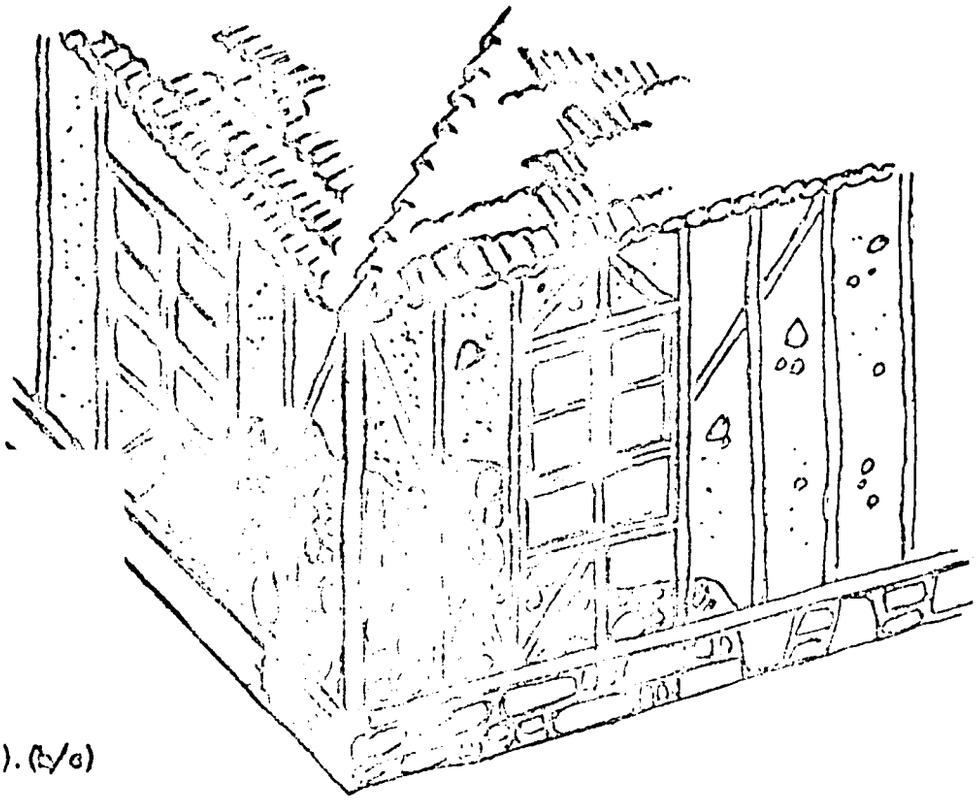
FILLED WITH (MUD + BRANCHS) FILLED WITH (ADOBE BLOCKS)

KP 1972



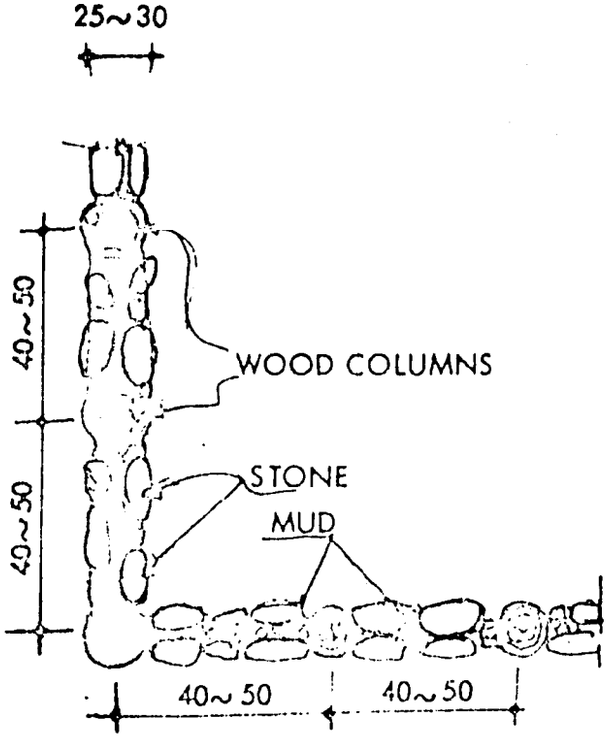
(I.2) Şekil 12. (Gediz bölgesi) İki katlı kerpiç dolgulu ahşap karkas yapı

(I.2) Figure 12. (Gediz region) Two storeyed adobe filled timber framed structure.



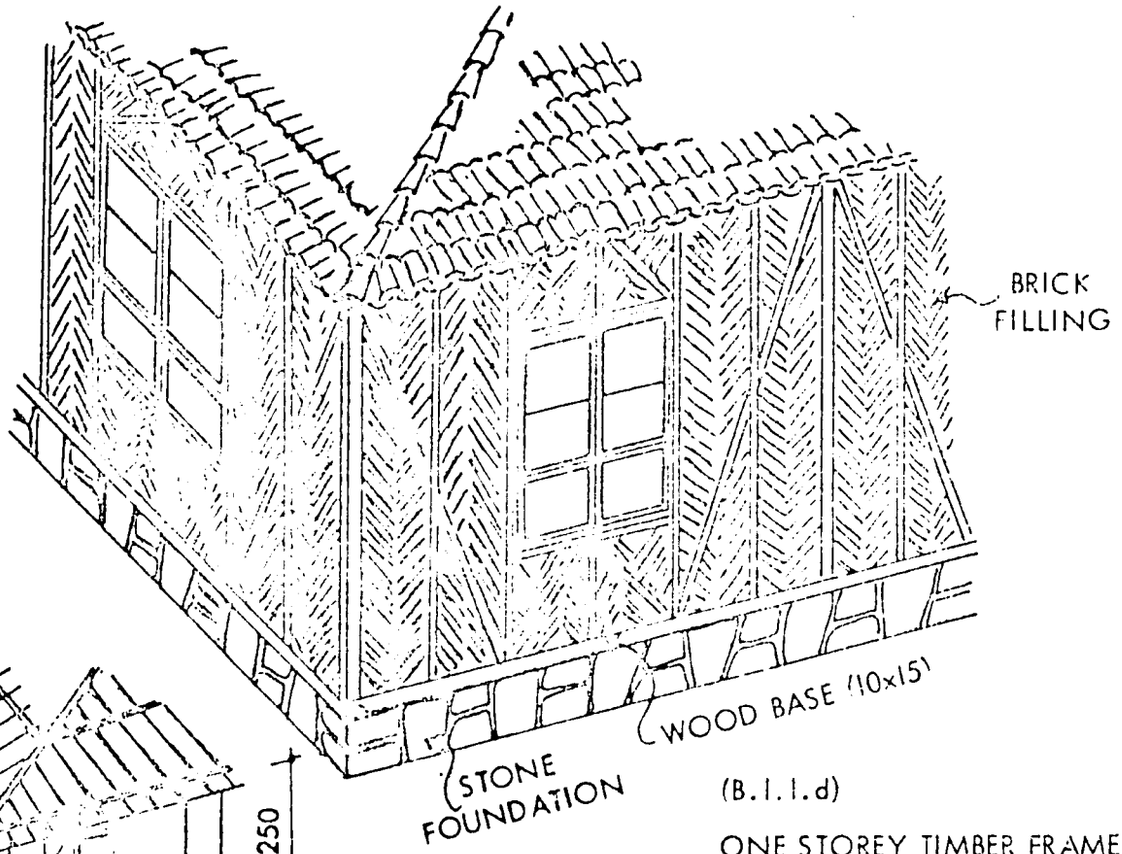
(B.1.1.c).(b/c)

TIMBER FRAMED AND STONE + MUD
FILLED CONSTRUCTIONS
(GEDİZ - WEST ANATOLIA)



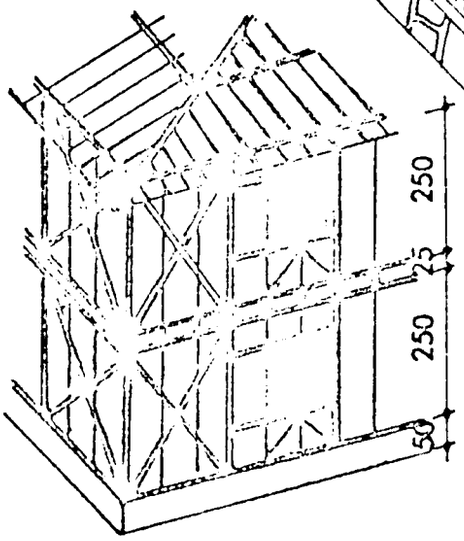
WALL PLAN

Kp 1972

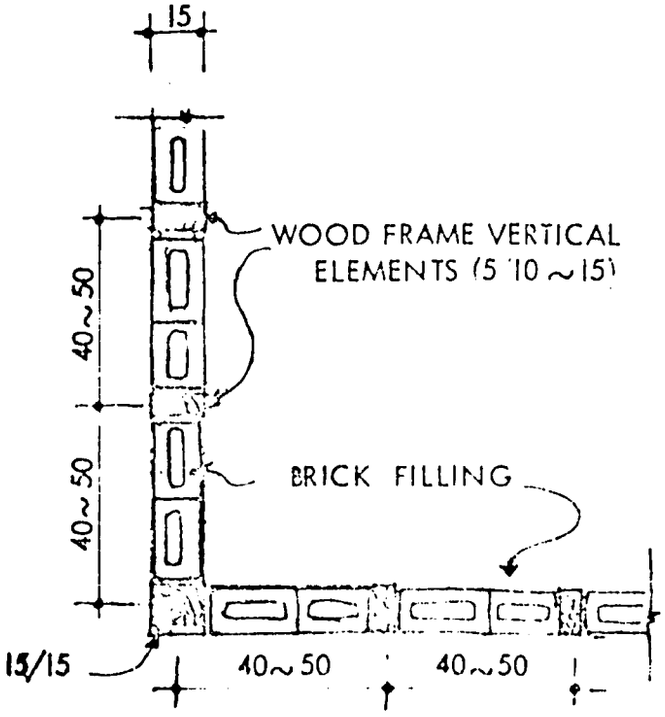


(B.1.1.d)

ONE STOREY TIMBER FRAMED AND BRICK FILLED STRUCTURES

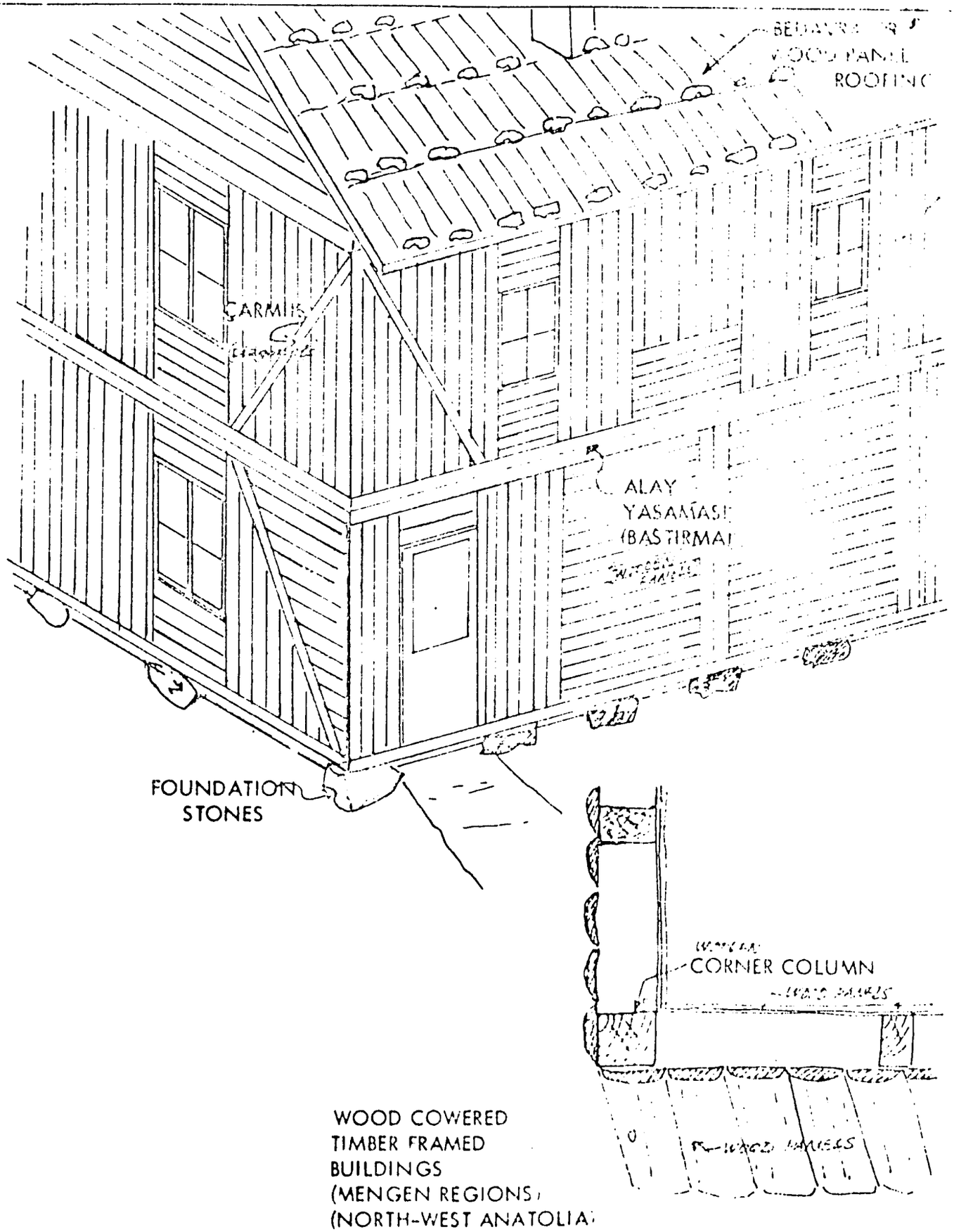


TWO STORIED TIMBER FRAMED AND BRICK FILLED STRUCTURES



TIMBER FRAME SYSTEM
(Nailed wooden panels both sides)

(I.2) Şekil 15
(I.2) Figure 15



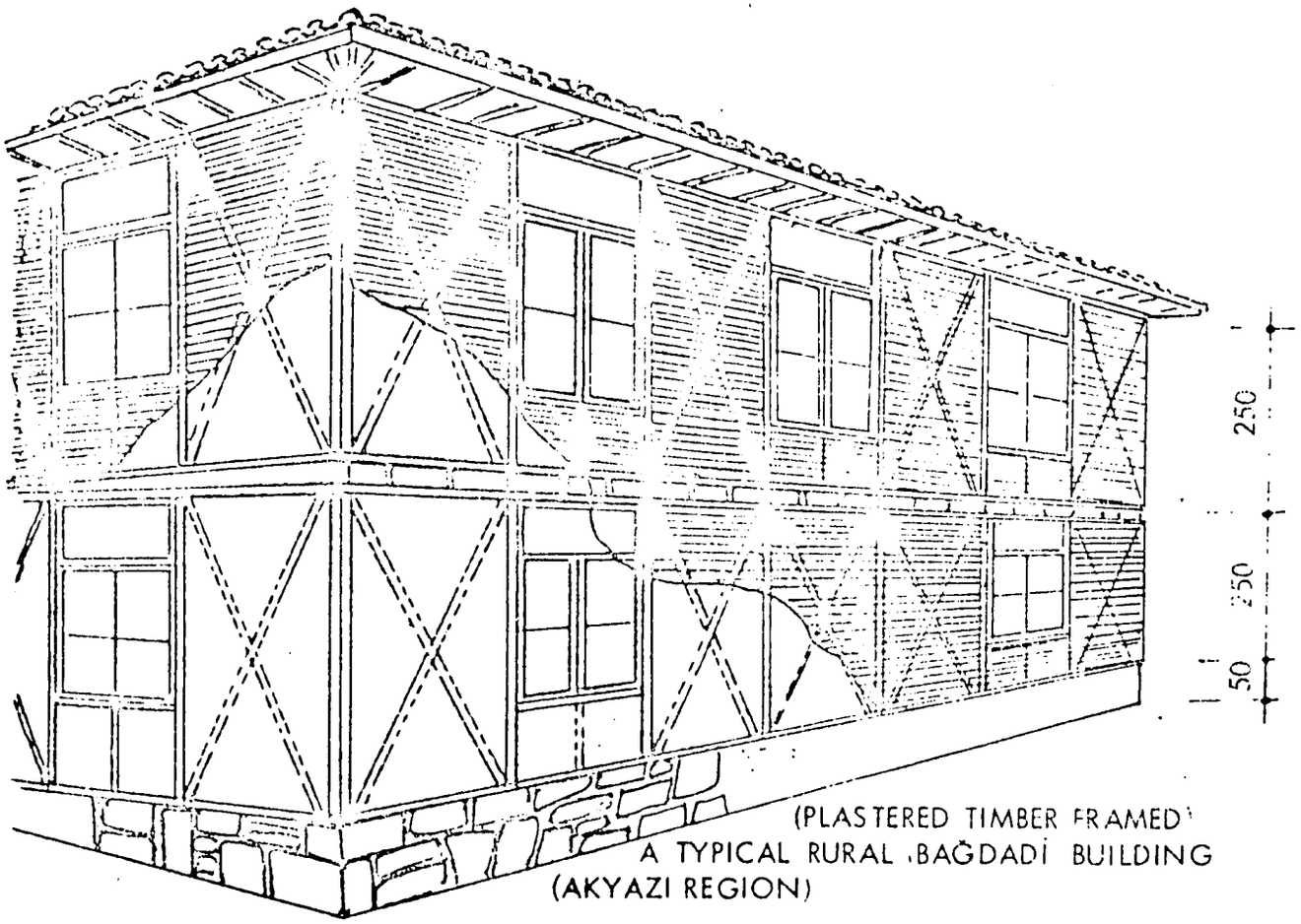
WOOD COWERED
TIMBER FRAMED
BUILDINGS
(MENGEN REGIONS)
(NORTH-WEST ANATOLIA)

KF 1972

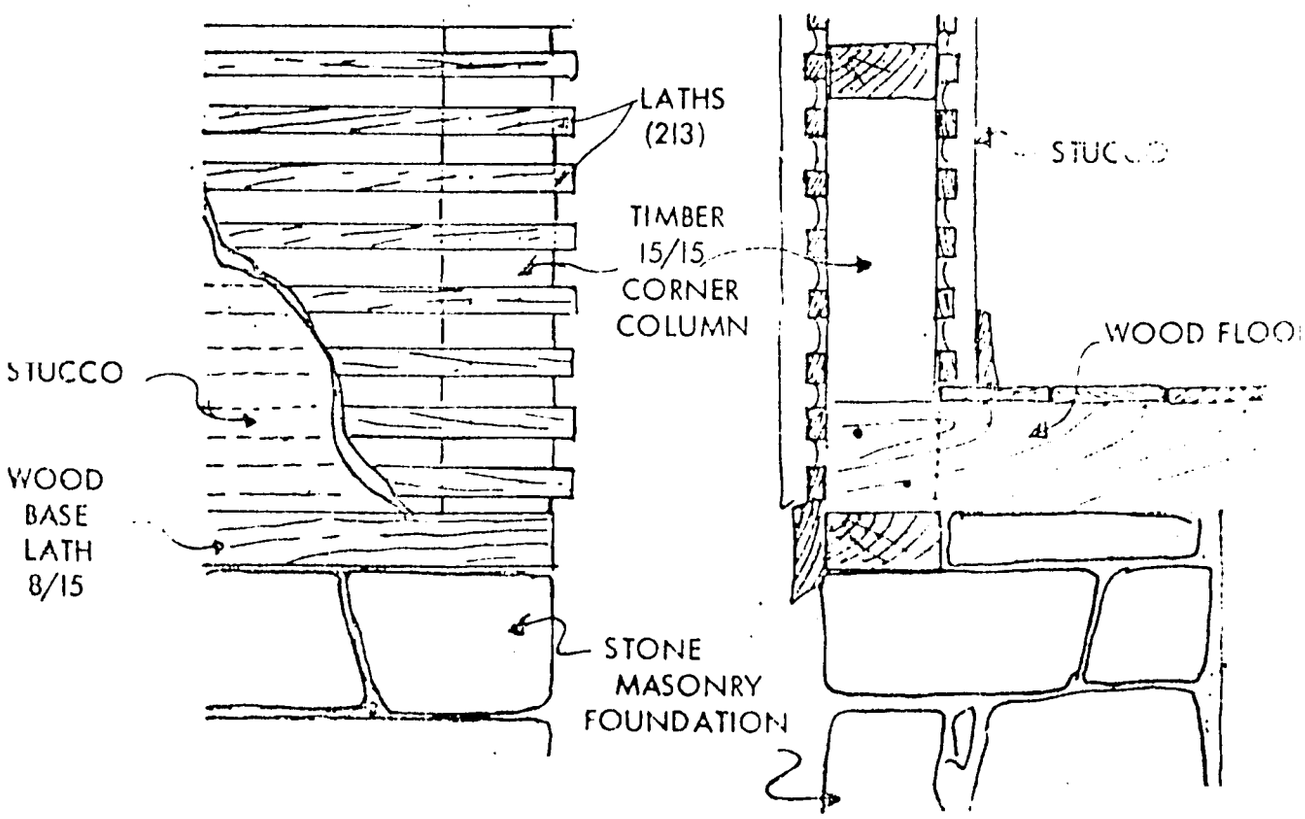
TIMBER FRAME SYSTEM (BAĞDADİ)

(Lath nailed and plastered - Rural)

(1.2) Şekil 16
(1.2) Figure 16

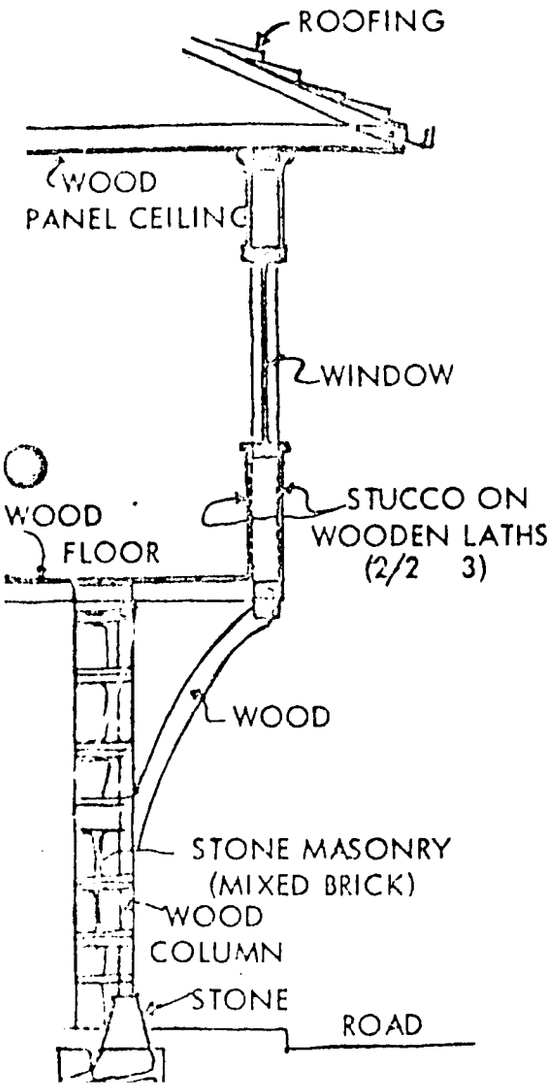


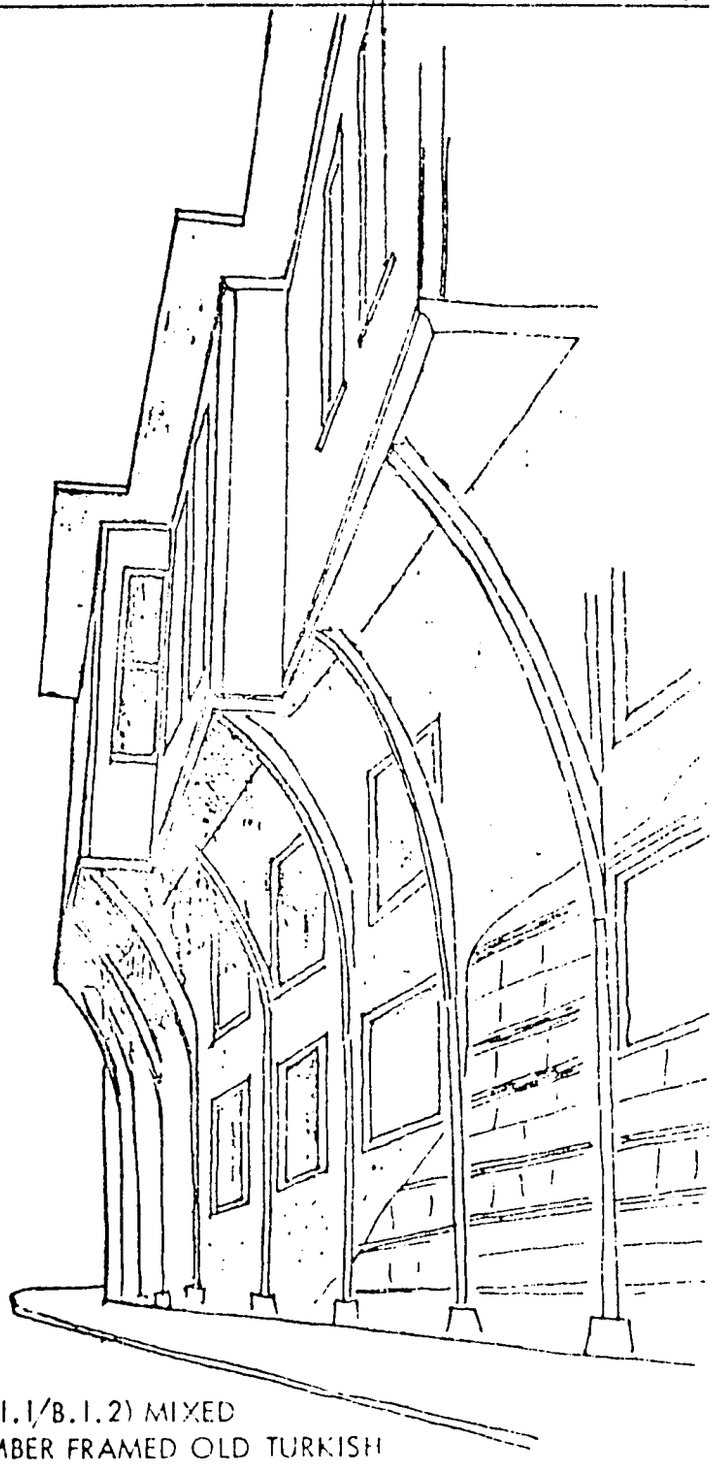
(PLASTERED TIMBER FRAMED)
A TYPICAL RURAL BAĞDADİ BUILDING
(AKYAZI REGION)



TIMBER FRAME SYSTEM (BAGDADI)
(in old turkish trad-arch - urban)

(1.2) Şekil 17
(1.2) Figure 17



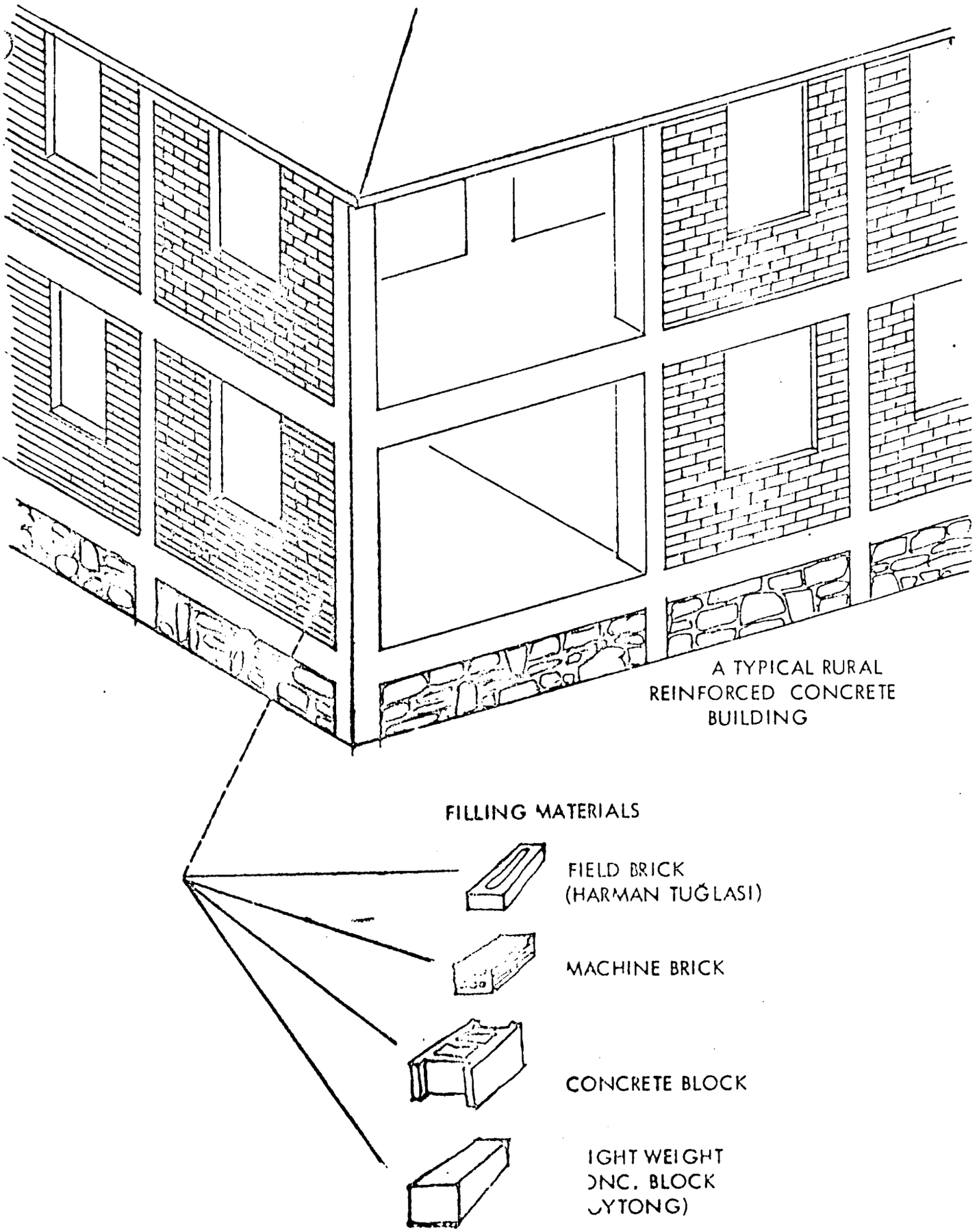


(B.1.1/B.1.2) MIXED
TIMBER FRAMED OLD TURKISH
(COVERED WOODEN LATHS AND
PLASTERED BOTH SIDES. BUILDINGS TRADITIONAL
ARCHITECTURE (MARMARA REGION

REIN FORCED CONCRETE SYSTEM

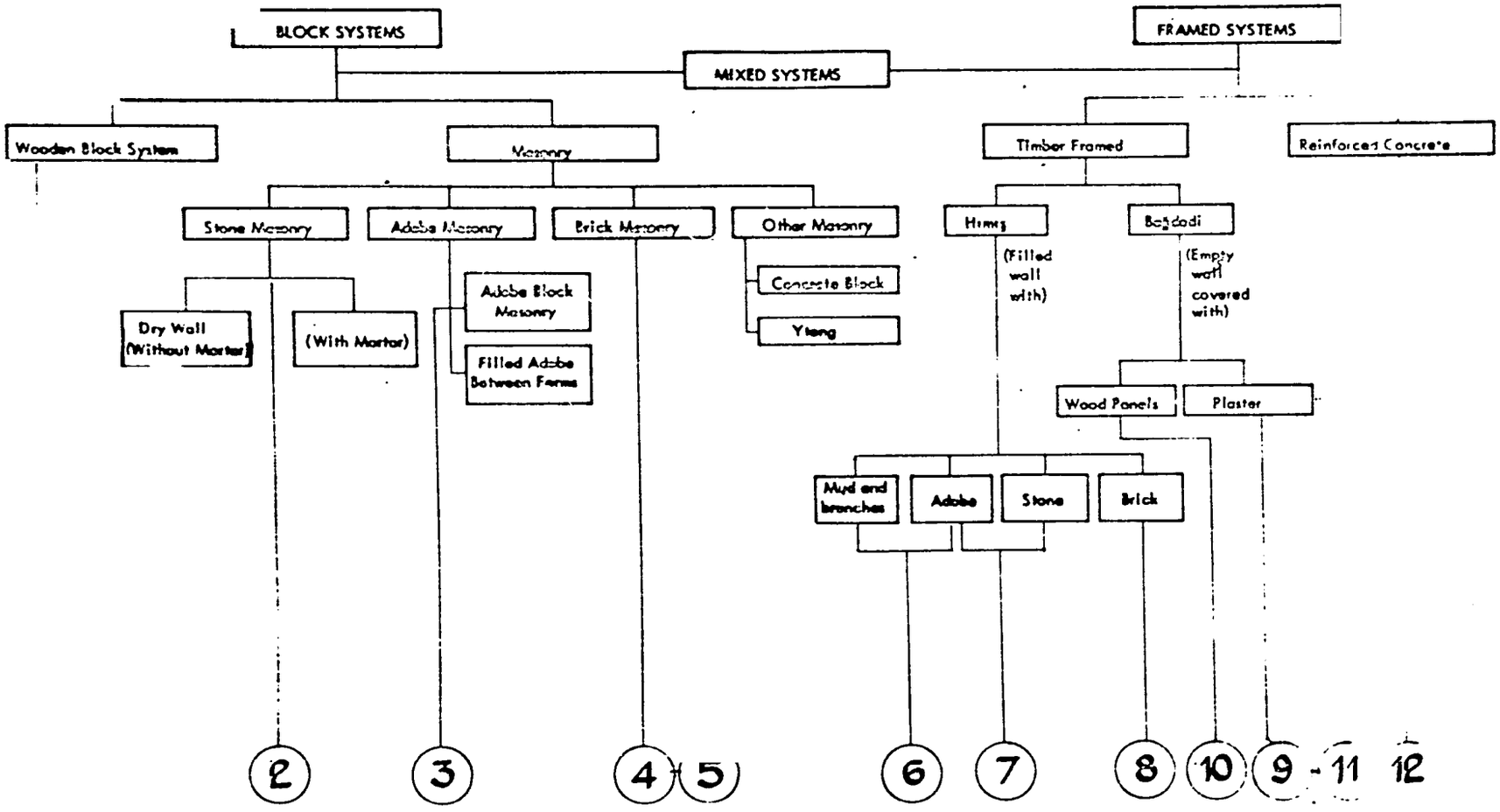
(I.2) Şekil 18
(I.2) Figure 18

12



(I.2) Figure 19

CLASSIFICATION OF RURAL CONSTRUCTION SYSTEMS IN TURKEY



TÜRKİYE SİSMİK BÖLGELERİNDE KIRSAL YAPI TÜRLERİNİN DAĞILIŞI

Rural Construction System in Seismic Regions of Turkey

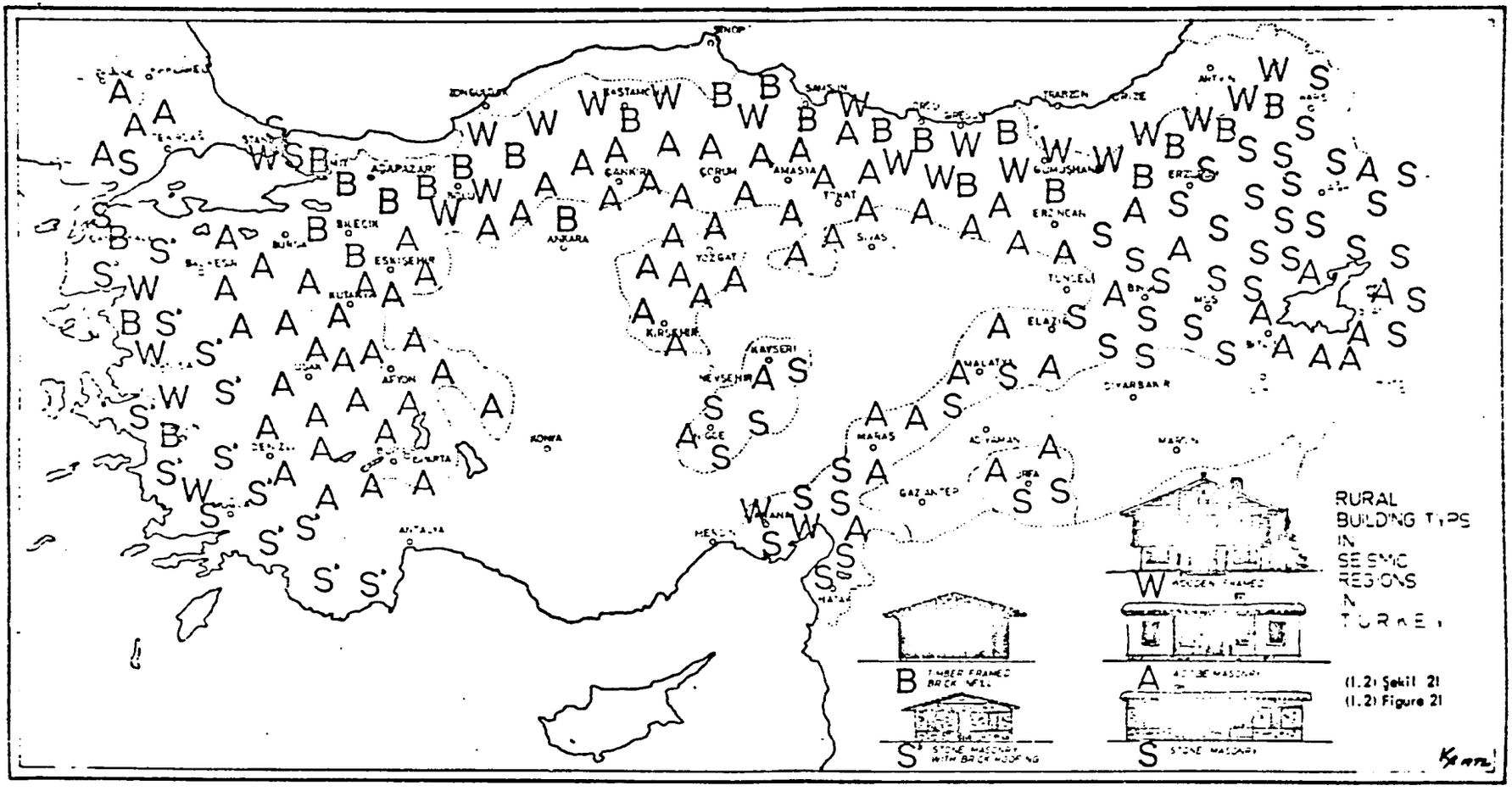
(I.2) Şekil 20
(I.2) Figure 20

SİSMİK BÖLGELER Seismic Regions	Ahşap Yığma Wooden Block S.	YIĞMA / Masonry Systems				AHŞAP KARKAS / Timber Framed Systems							B.A KARKAS Rein-forced Concrete
						HIMIŞ					DAĞDADİ		
		Taş Stone	Kerpiç Adobe	Tuğla Brick	Diğer Other	Çamur Mud	Kerpiç Adobe	Taş Stone	Tuğla Brick	Diğer Other	Ahşap Wooden	Sıvalı Plastered	
EGE BÖLGESİ Ege Region													
MARMARA VE ÇEVRESİ Marmara Region													
GÜNEY ANADOLU Southern Anatolia													
ORTA ANADOLU Central Anatolia													
DOĞU ANADOLU Eastern Anatolia													
KUZEY ANADOLU Northern Anatolia													

İşaretler _ Legents:

Türlerin Uygulanması/ Use of systems:

- 1. derece / Mostly
- 2. derece / Secondly
- 3. derece
- Nadiren / Rarely


RURAL
BUILDING TYPES
IN
SEISMIC
REGIONS
IN
TURKEY
W
WOODEN FRAMED
B
TIMBER FRAMED
BRICK WALL
A
ADOBE MASONRY
S
STONE MASONRY
STONE MASONRY
WITH BRICK ROOFING
(1.2) Şekil 21
(1.2) Figure 21

1.3 RESPONSE OF VARIOUS TYPES OF HOUSES TO EARTHQUAKES

1.3.1. Damage History

The damage history of the earthquakes occurred in Turkey during the past twenty years is summarised in Table 1. Some previous major earthquakes are included in Table 2. It is evident from these tables that average frequency is about eight months in Turkey for an earthquake with a magnitude of M: 6.2 and with an intensity of I_o: VIII(MM).

Approximately more than 5000 lives were lost and 10,000 persons were injured, and about 140,000 houses were destroyed due to earthquakes occurred in Turkey in the past twenty years. Table 3 contains information about the damage distribution to buildings with respect to their type of construction, in the March 28, 1970 Gediz earthquake.

Field observations after the earthquakes indicate that there are some particular and definite patterns in the response of various types of buildings to earthquakes. Before these patterns are studied, it would be advisable to make a reference to the classification of different types of construction currently observed in Turkey.

1.3.2. Types of Construction

It is seen from Fig. 1 that the housing construction is basically categorized into two groups as non-framed and framed structures.

A) Non-framed structures are built in any one of the following ways:

A1) Non-framed structures with wooden walls

A2) Stone masonry structures with no frames:

(a) Out of field stones or cobbles
(b) Coarse hand worked masonry
(c) Fine hand worked masonry
(d) Masonry with timber bond beams
(e) Masonry with reinforced concrete bond beams

A3) Stone masonry without mortar

A4) Adobe construction

A5) Solid or hollow brick masonry

(a) Brick masonry with lime mortar
(b) Brick masonry with cement mortar

A6) Concrete block or light weight tile masonry

A7) Masonry out of mixed material

(a) Stone and adobe mixed
(b) Brick and adobe mixed
(c) Stone and brick mixed.

B) Framed structures may be classified as follows:

B1) Timber framed structures:

(a) Walls filled with mud and straw
(b) Walls filled with adobe
(c) Walls filled with bricks
(d) Walls filled with stones
(e) Walls filled with mixture of adobe, brick or stone
(f) Walls filled with wooden planks without filler material
(g) Walls filled with wooden laths without filler material
(h) Walls with partial or no filler material

B2) Reinforced concrete structures:

(a) With solid brick partitions
(b) With hollow brick partitions
(c) With concrete block partitions
(d) With light weight concrete partitions

B3) Semi-framed structures:

In this category of structures, all bearing and partition walls are usually either brick or stone masonry, except there are some

irregularly arranged reinforced concrete beams and columns supporting large openings, corners or balconies.

1.3.3. Damage Patterns

The immediate conclusion that can be drawn from field observations is that non-framed buildings suffer more damage than framed buildings. It may also be categorically stated that timber framed structures are the least damaged type of all. There are many examples of undamaged timber structures in the immediate vicinity of the surface fault line with large ground deformations. The collapse of a timber frame structure is an absolutely rare case, except those more than fifty years old and built out of raw timbers.

Damage percentage on the other hand, in masonry structures is the highest. The resistance of masonry structures to lateral loads is extremely inadequate, especially of those with poor workmanship and weak mortar. As the quality of workmanship and the strength of mortar is increased the casualty rate drops down drastically. Mosques for instance, are built with special care in villages and this is the reason why they survive the earthquakes usually with slight or no damage, even in the cases when the rate of destruction in the rest of the village is in the order of ninety percent.

Adobe construction collapses readily and suffers relatively the heaviest damage in almost all earthquakes. Only in the very rare instances, especially when the ceiling is covered with timber or with light weight metal, the survival may be a possibility. Normally, the total collapse and consequently heavy toll of lives are inevitable. There are practically no specific standards of adobe construction in Turkey and very little

attention is paid to stabilization and to proper construction of bond beams, lintels, lateral ties of walls at ceiling and various other levels. The poor quality of adobe construction and its total inadequacy against lateral loads have been amply demonstrated during the May 1971 Bingöl earthquake. Almost all adobe houses collapsed in many of the surrounding villages, while well-built masonry structures of school and Forest Administration buildings in these villages suffered absolutely no damage.

Adobe construction costs relatively lower than any other types, since the basic material is available cheaply everywhere. Instead of prohibiting the adobe construction, it is therefore desirable to improve the quality of adobe material and also to implement new techniques of construction, such that the adobe houses acquire sufficient strength against earthquakes.

It is very difficult to draw any specific conclusion for the behaviour of brick masonry structures. The damage pattern is very unpredictable. Some brick masonry construction resist damaging earthquakes satisfactorily, if they are built with due care and obedience to the building code requirements about the wall thickness, opening ratios, quality of mortar, etc. Some others however, evidentally possessing deficiencies one way or the other, undergo severe damages. In the past few earthquakes, it was very difficult to explain the reasons why some brick masonry structures did not suffer any damage while some others in the immediate vicinity collapsed totally.

The important fact associated with the earthquake response of brick structures is that the death toll is relatively very high when the building suffers a complete failure. In fact, when an earthquake hits a highly populated and well developed city area, the majority of lives are lost due to collapse of brick masonry houses or apartments as it was exactly the case during the May 1971 Burdur earthquake. It is highly desirable to perform research about the response of brick masonry structures in order to determine the conditions and parameters affecting the failure. Undoubtedly, weak mortar, large openings and excessively heavy concrete slabs may be mentioned as the parameters contributing significantly to the unsatisfactory performance.

In general, reinforced concrete frame structures perform very satisfactorily and suffer the least damage among all other types. But, if the reinforced concrete building is not designed and constructed in accordance with the requirements of ductility and strength, it is possible that severe structural damage may occur up to the extent of total collapse as already experienced in the July 1967 Adapazarı and March 1970 Gediz earthquakes. Lack of stirrups in the vicinity of column ends, adverse effects of torsion due to unsymmetrical arrangement of rigidities and also the quasi-resonance phenomenon produced as a result of soil-structure period interaction may be cited as some of the main causes of damages suffered by reinforced concrete structures in Turkey. It is particularly interesting to note that the predominant

period of underlying soil at Adapazarı and Bursa alluvial plain is very close to the natural periods of the buildings collapsed at these places during the past two earthquakes.

Damages to various types of construction in Turkey during the recent Gediz, Burdur and Bingöl earthquakes are illustrated in Fig.s 1 to 10.

(1.3) TABLO 1 - TÜRKİYEDE SON 20 YILDA VUKU BULAN DEPREMLER

(1.3) Table 1 - Earthquakes in Turkey during the last 20 years

NO.	CATAL. NO.	TARİH Date	Macroseismic Epicentre	YER Place	M/I_o (MM)	Zone	ÖLÜ Deaths	EVLERDE HASAR Damaged Houses
1	1299	13.8.1951	40,6N/33,6E	Çerkes, Çankırı	7.0/IX	1	50	16,727
2	1308	31.1.1952	40,0N/41,6E	Hasankale, Erzurum	5.6/VII	1	94	1,570
3	1329	22.10.1952	37,0N/35,5E	Misis, Adana	5.0/VIII	2	10	511
4	1347	18.3.1953	40,0N27,4E	Yenice-Gönen	8.0/X	1	265	5,000
5	1374	2.5.1953	38,6N/26,5E	Karaburun, İzmir	5.7/VII	1	?	100
6	1381	18.6.1953	41,4N/26,3E	Edirne	5.7/VI	2	?	323
7	1391	7.9.1953	40,5N/33,1E	Kurşunlu, Çankırı	7.0/VIII	1	?	10,000
8	1459	16.7.1955	37,5N/27,0E	Söke, Aydın	7.1/VIII	1	?	1,500
9	1475	20.2.1956	40,0N/30,2E	Eskişehir	6.5/VIII	3	10	2,320
10	1553	25.4.1957	36,6N/29,2E	Marmaris	7.8/VIII	1	18	3,000
11	1559	26.5.1961	40,4N/31,1E	Abant, Bolu	7.1/IX	1	66	500
12	1736	25.4.1959	36,0N/28,7E	Köyceğiz	6.3/VII	1	58	60
13	1959	23.5.1961	36,5N/28,6E	Marmaris	6.7/VII	1	?	200
14	2043	4.9.1962	39,9N/43,9E	Iğdır	5.8/VIII	2	?	2,000
15	2051	14.9.1962	39,6N/28,3E	Dursunbey, Balıkesir	4.2/VII	3	?	200
16	2075	11.3.1963	37,8N/29,1E	Denizli	5.5/VII	1	?	300
17	2101	18.9.1963	40,3N/29,0E	Yalova, İstanbul	6.2/VII	1	2	39
18	2113	22.11.1963	37,3N/29,8E	Tefenni, Burdur	4.4/VII	3	?	150
19	2151	14.6.1964	38,0N/38,4E	Malatya	6.5/VIII	3	?	3,000
20	2181	6.10.1964	40,1N/27,9E	Manyas	7.0/IX	1	23	10,037
21	-	7.3.1966	39,1N/41,5E	Varto	5.6/VIII	1	15	7,600
22	-	19.8.1966	39,1N/41,3E	Varto	6.1/IX	1	2517	20,000
23	-	22.7.1967	40,6N/31,0E	Adapazarı	7.7/X	1	286	7,100
24	-	26.7.1967	39,6N/40,4E	Pülümür	6.3/VI	1	97	1,000
25	-	3.9.1968	41,6N/32,4E	Bartın, Samsun	5.7/VIII	4	54	3,850
26	-	23.3.1969	39,2N/28,4E	Demirci	6.1/VI	2	0	980
27	-	28.3.1969	38,3N/28,6E	Alaşehir	6.1/VII	1	53	4,661
28	- -	28.3.1970	39,0N/29,4E	Gediz	7.1/IX	2	1086	19,398
29	-	2.7.1970	38,8N/36,9E	Gürün, Sıvas	4.8/VII	4	1	250
30	-	12.5.1971	37,4N/30,3E	Burdur	6.4/VIII	1	57	4,930
31	-	22.5.1971	38,7N/40,3E	Bingöl	6.8/VIII	2	878	11,795
							5000	138,000

Average M 6.2 I_o VIII

(1.3) TABLO 2

CAN VE MAL KAYIPLARI

(1.3) Table 2

Death Toll and Structural Damage

TARİH Date	YER Place	M	ÖLÜ Death	EVLERDE HASAR Damage to Houses	
				ORTA Fair	AĞIR Heavy
19.4.1939	Kırşehir	7.6	155	-	4,300
27.12.1939	Erzincan	8.0	40,000	-	135,000
20.12.1942	Erbaa-Niksar	7.3	3,000	-	32,000
26.11.1943	Havza-Ladik	7.6	4,000	-	40,000
1.2.1944	Bolu-Gerede	7.4	4,000	-	50,000
31.5.1946	Varto-Üstükran	7.2	839	-	3,000
17.9.1949	Karlıova	6.4	300	-	1,500
13.8.1951	Kurşunlu-Ilgaz	7.0	50	-	8,000
18.3.1953	Yenice-Önen	8.0	265	-	5,000
19.8.1966	Varto	6.1	2,517	-	20,000
28.3.1970	Gediz	7.1	1,068	-	14,414
12.5.1971	Burdur	6.4	57	4,878	52
22.5.1971	Bingöl	6.8	755	6,572	5,223

(1.3) TABLO 3

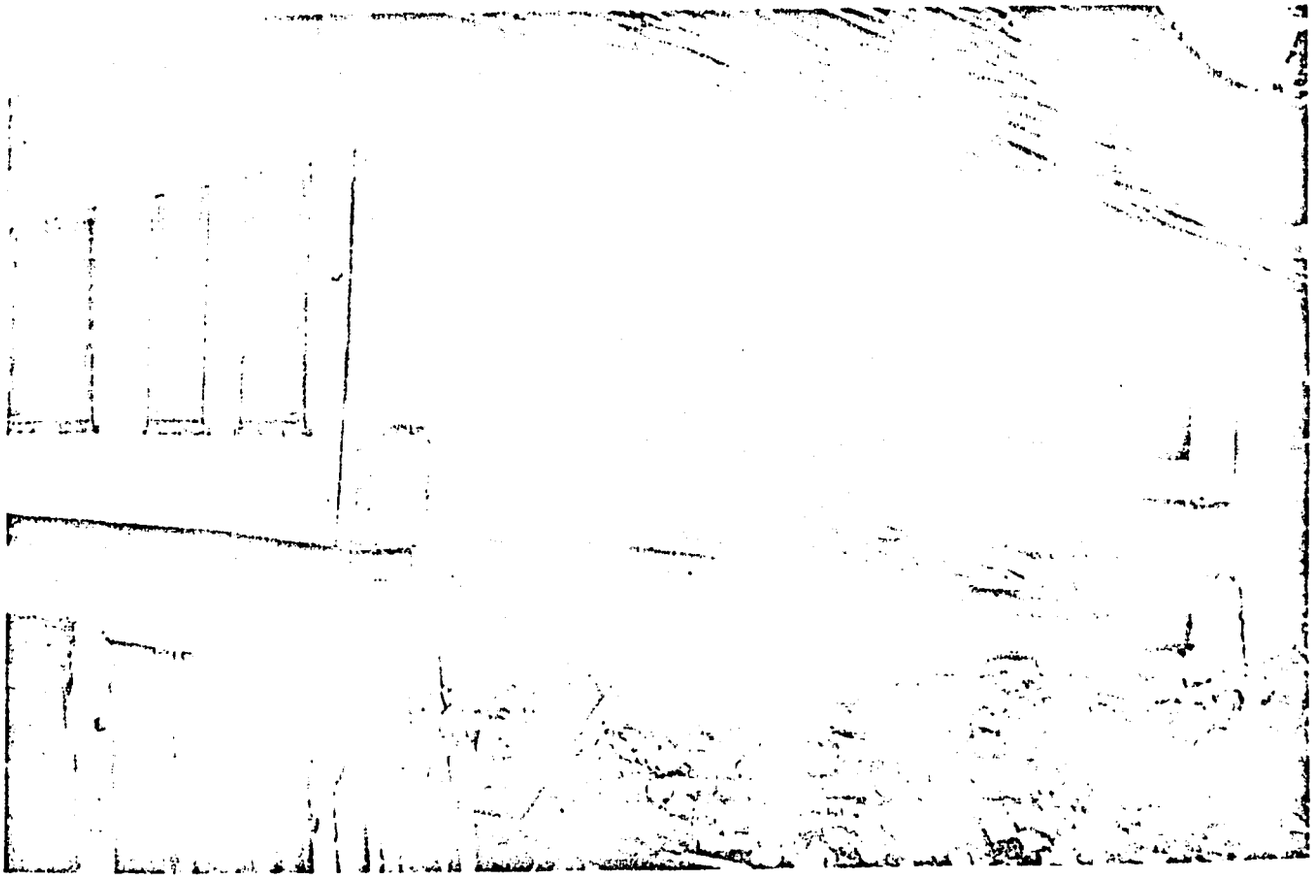
GEDİZ (28.3.1970) DEPREMİNDE
YAPI TİPLERİNE GÖRE HASAR DAĞILIMI (1

(1.3) Table 3

Gediz Earthquake (28.3.1970)
Distribution of Damage by Type of Construct n (1)

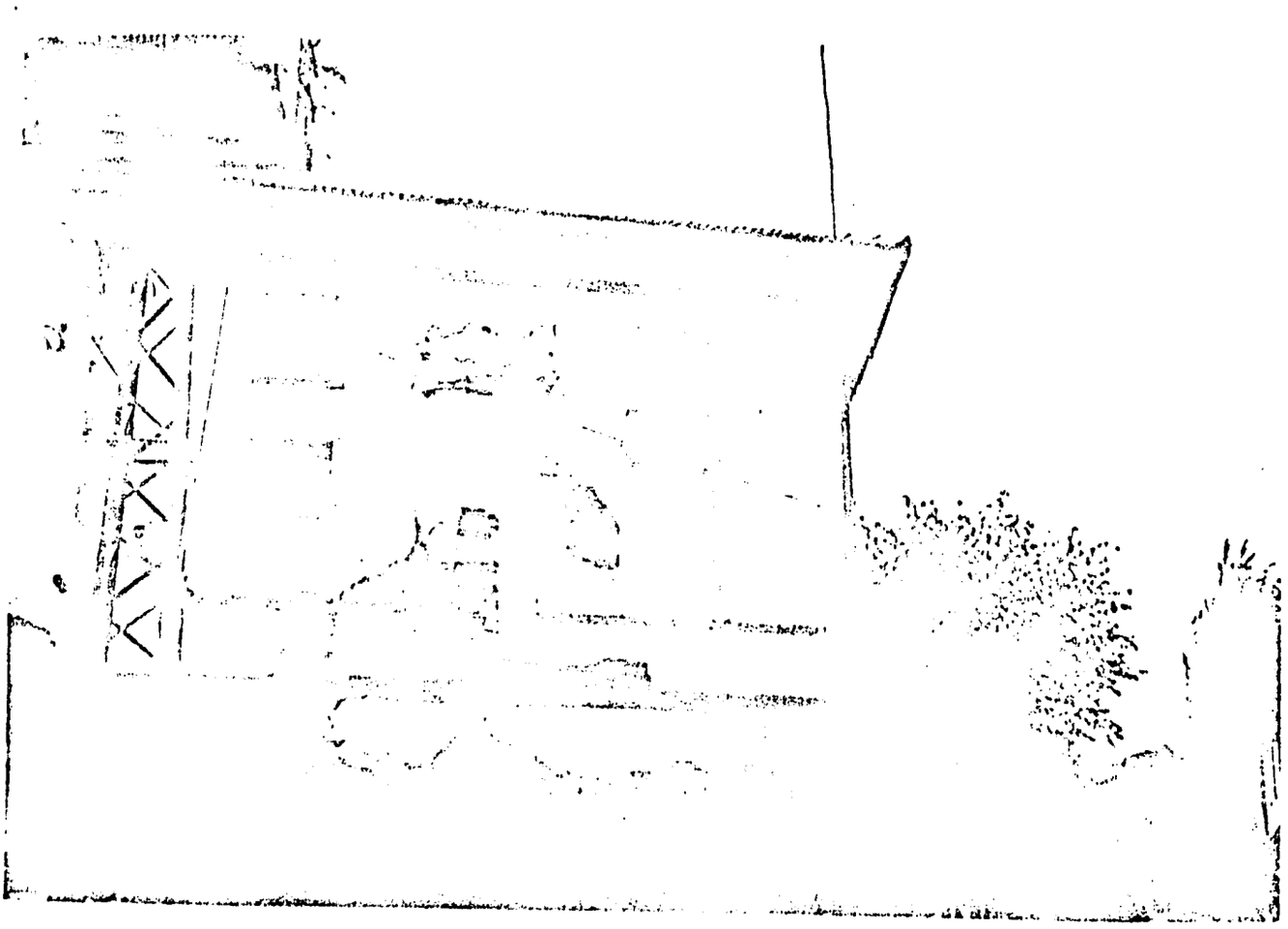
YAPI TİPİ Type of Construction	ÇOK HASAR Major Damage	ORTA HASAR Medium Damage	AZ HASAR Small Damage
1. YIĞMA Masonry	79 (%27)	108 (%37)	105 (%37)
2. BAĞDADİ Timber frame with laths	19 (%12)	107 (%63)	42 (%25)
3. HIMIŞ Timber frame	537 (%45)	582 (%50)	52 (%5)
4. BETONARME Reinforced concrete	10 (%24)	18 (%43)	14 (%33)

(1) Tabban, A. "Microzoning of Gediz Town, Basing on Macroseismic Data", Earthquake Research Institute, Ministry of Reconstruction and Resettlement, 1971.



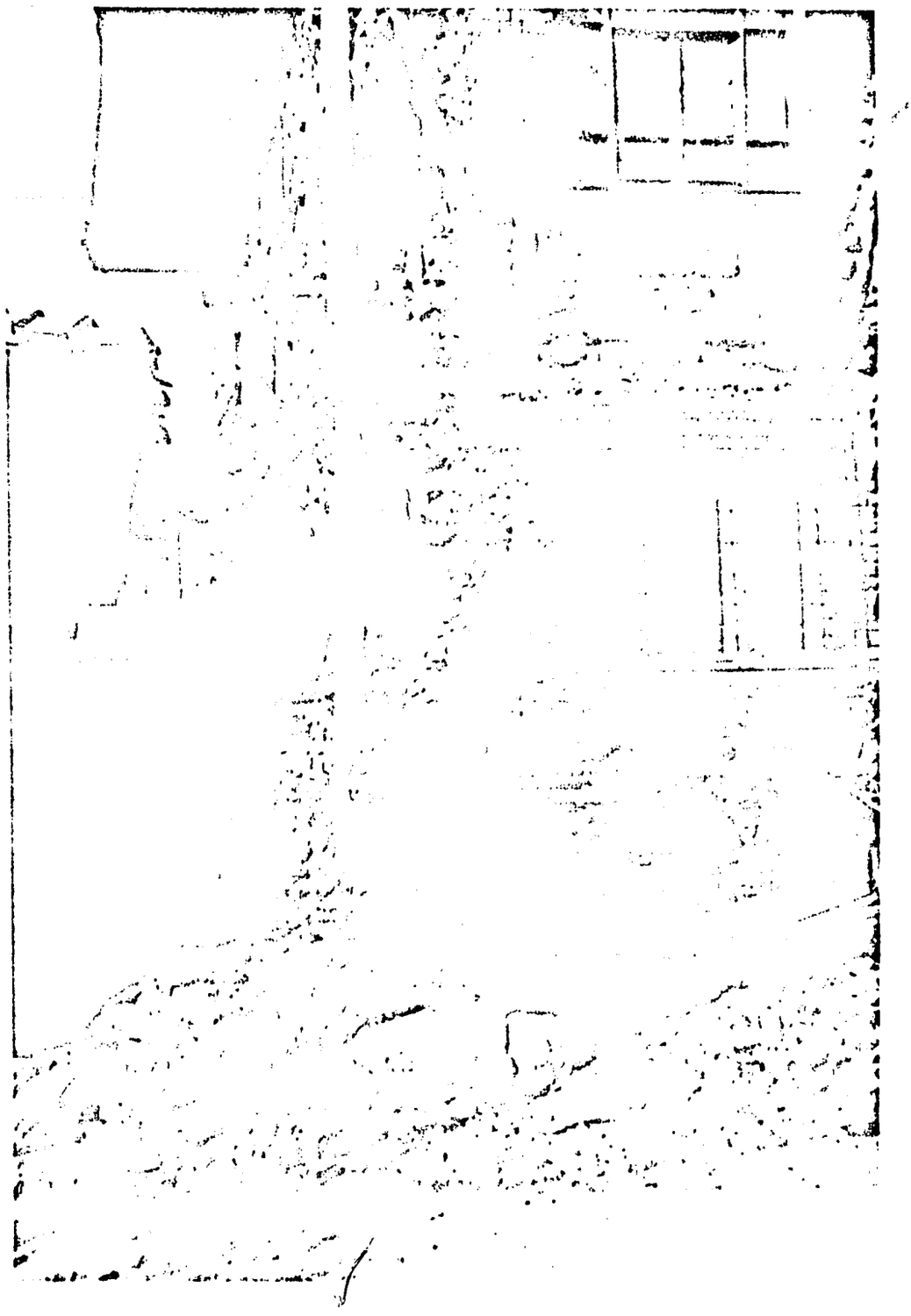
(1.3) Şekil 1 (Cediz 1970) Kısmen Hımış, kısmen Bağdadî yapı
Kısmî yıkım Deformasyon

(1.3) Figure 1 (Cediz 1970) Timber Frame Structure with laths and in fill wal
Partial collapse and large deformation



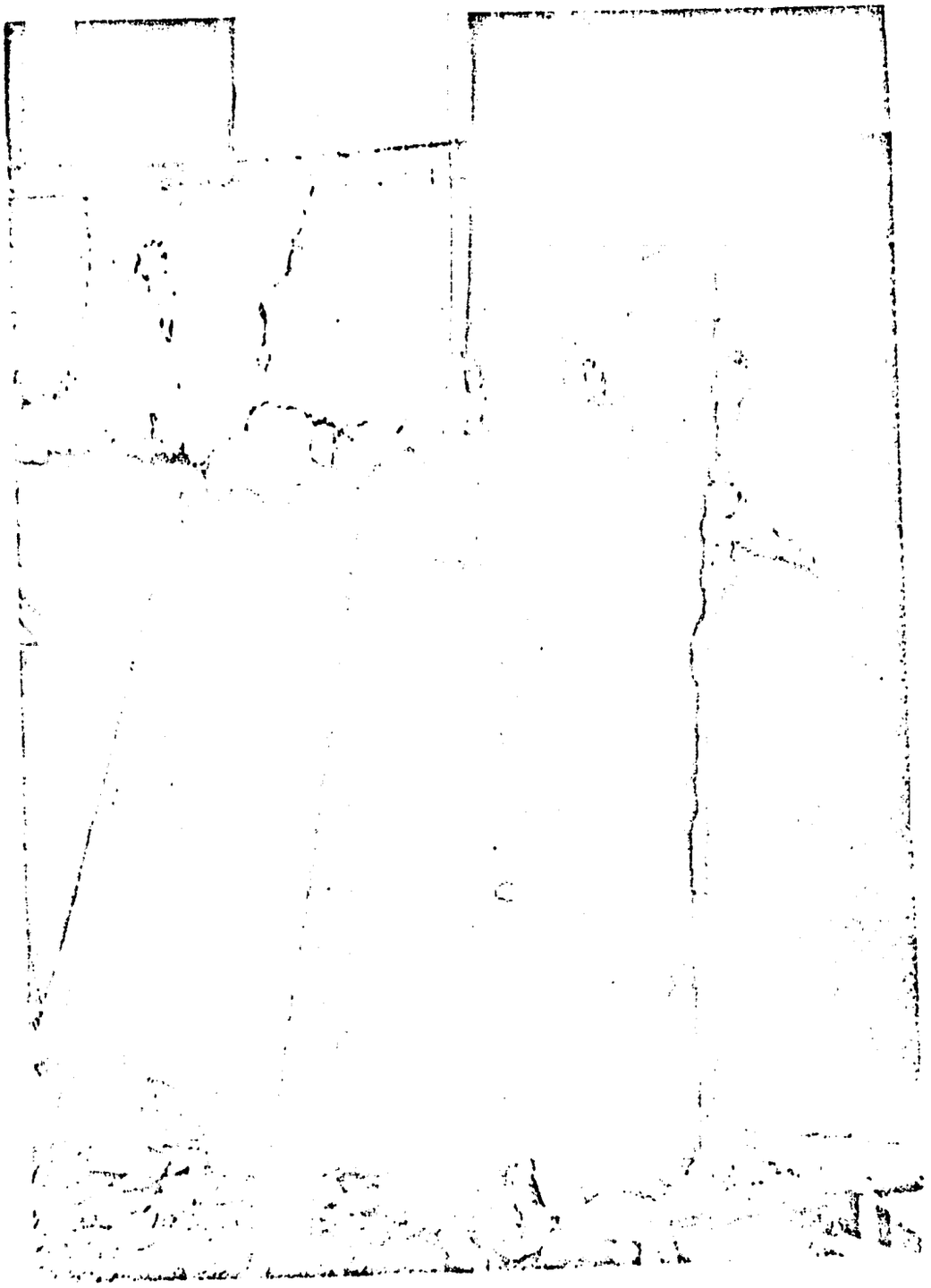
(1.3) Şekil 2 (Gediz 1970) Hımış yapı. Karışık geometrisine rağmen hasarsız.

(1.3) Figure 2 (Gediz 1970) Timber Frame Structure. Minor damage in spite of complex geometry.



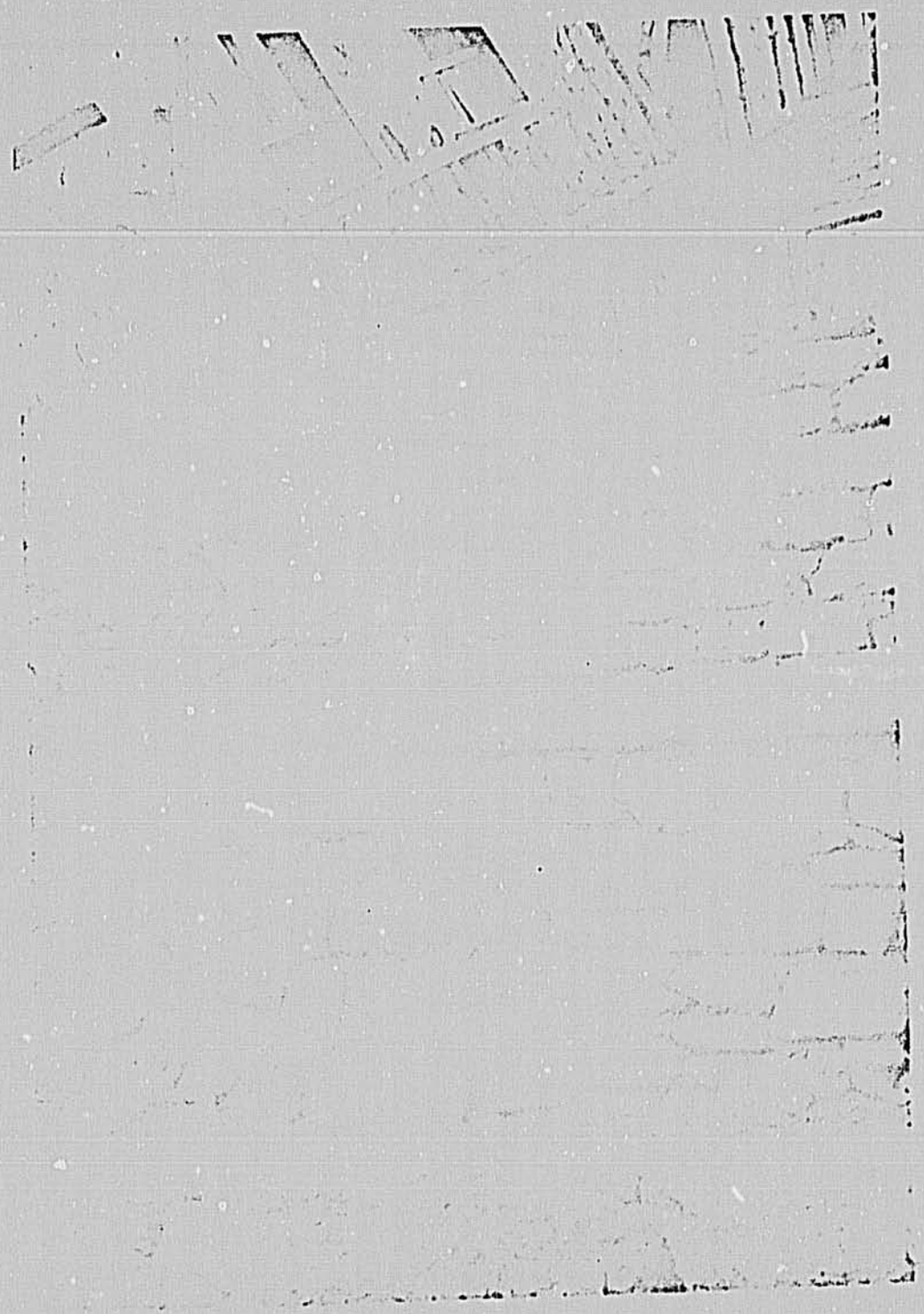
(1.3) Şekil 3 (Cediz 1970) Dıştan taşla kaplı, hımış yapı.
Köşe güçmesi detayı

(1.3) Figure 3 (Cediz 1970) Timber Frame with stone cover.
Damage at corner.



(1.3) Şekil 4 (Gediz 1970) Tipik eski bir hımış
Büyük plastik deformasyon.

(1.3) Figure 4 (Gediz 1970) Typical old Timber Frame.
Large plastic deformation

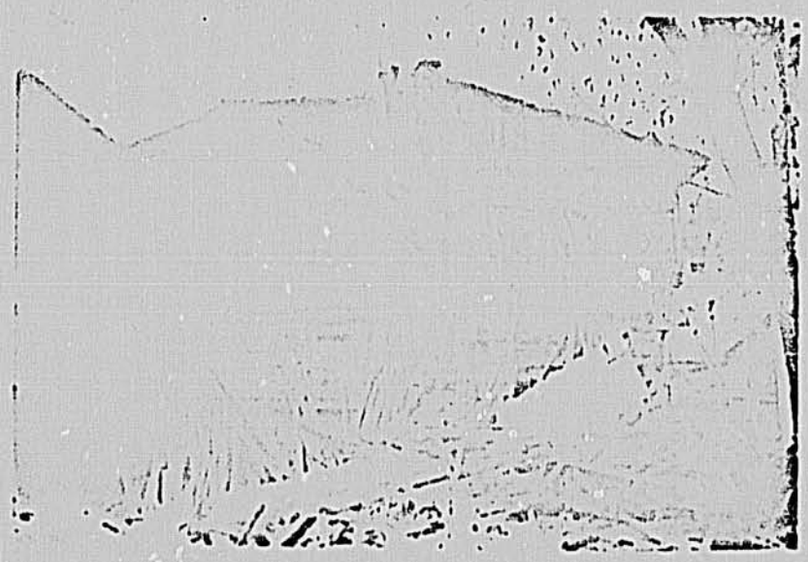


(1.3) Şekil 5 (Gediz 1970) Ön planda harçsız taş kerpiç karışımı bir duvarın göçmesi. Arka planda hımış bir konutun alt katının göçmesi.

(1.3) Figure 5 (Gediz 1970) Adobe and Stone masonry with no mortar in foreground. Basement failure of a timber house in background.

Burdur'da sahibi tarafından hasarlı hımış İken bağdadî olarak onarılan yapı (Yazıköy 1971).

Owner repaired damaged timber house using laths (Yazıköy 1971).

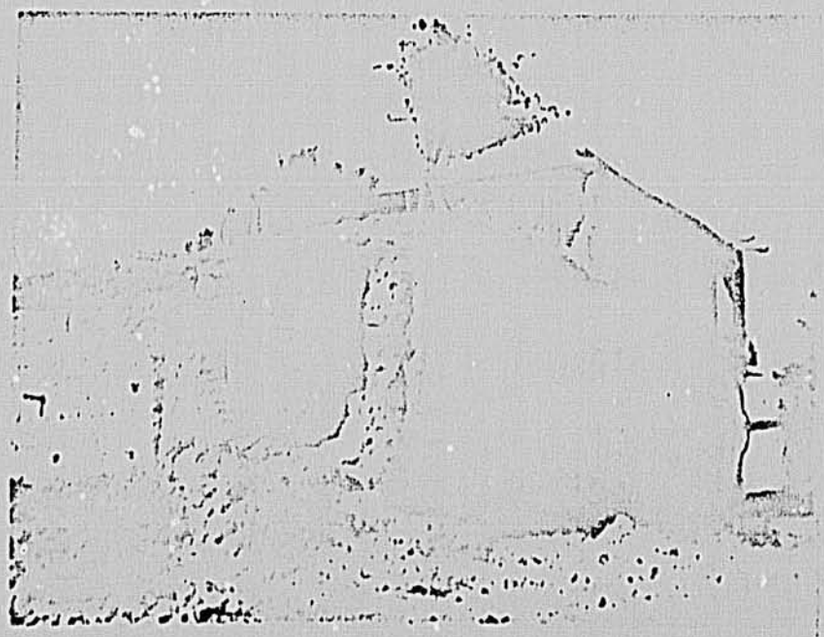


(1.3) Şekil 6 (Gediz 1970) Yıkılmış ve deformasyona uğramış "hımış" yapılar.

(1.3) Figure 6 (Gediz 1970) Damaged or collapsed old timber structures.

(1.2) Şekil 7 (Gediz 1970) Dış yüzü tuğla örtülü kısmen düzgün "hımış" yapıda çivili bağlantı zaffiyeti.

(1.3) Figure 7 (Gediz 1970) Poor connections in a timber structure in-filled and covered by brick walls.

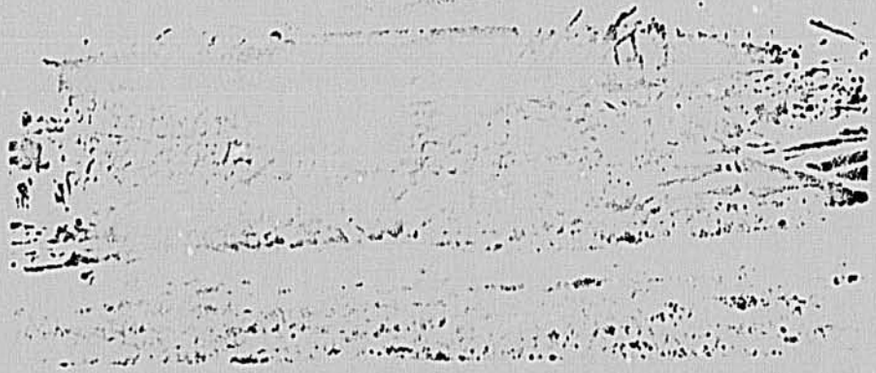


(1.3) Şekil 8 (Burdur 1971) Tipik kerpiç yığma yapı yıkığı.

(1.3) Figure 8 (Burdur 1971) A typical adobe house.

(1.3) Şekil 9 (Bingöl 1971) Tipik harçsız yuvarlak taş yığma duvarlı yapılarda yıkıklar.

(1.3) Figure 9 (Bingöl 1971) Masonry houses out of field stones with mud mortar.



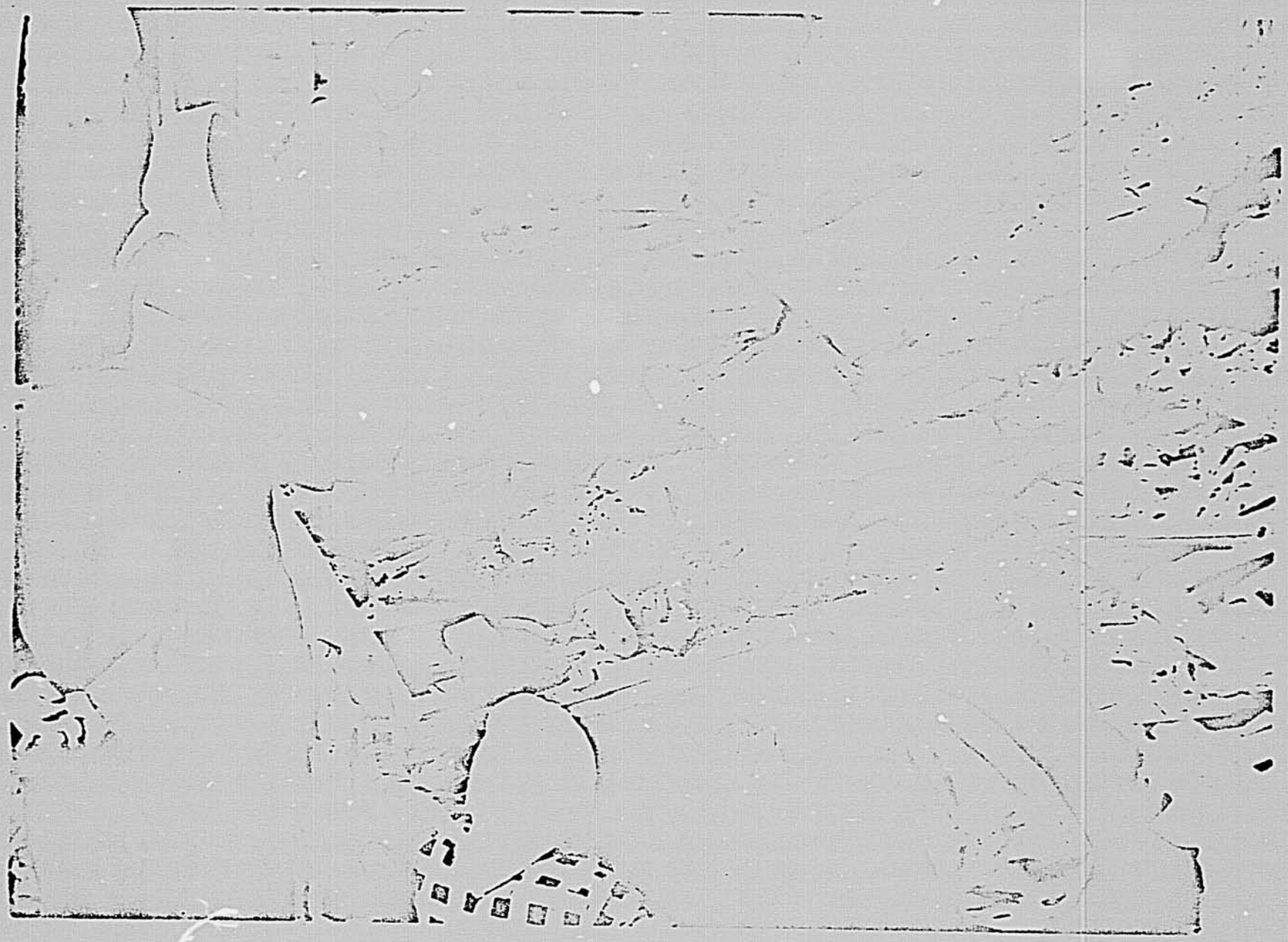
(1.3) Şekil 10 (Bingöl 1971) Tipik harçsız yuvarlak taş yığma duvarlı yapılarda yıkıklar.

(1.3) Figure 10 (Bingöl 1971) Masonry houses out of field stones with mud mortar.

(1.3) Şek. 11 - Bingöl Depremi. Bingöl çevresi. Bir katlı, taş yıkma sistem bir yapıda orta hasar.
(1.3) Fig. 11 - Bingöl Earthquake. Stone masonry, medium damage.

(1.3) Şek. 12 - Burdur Depremi. Burdur-Yazılar Köyü. İki katlı kerpiç yıkma vapıda ağır hasar
(1.3) Fig. 12 - Burdur Earthquake. Yazılar Village. Two-storey adobe building. Heavy damage.

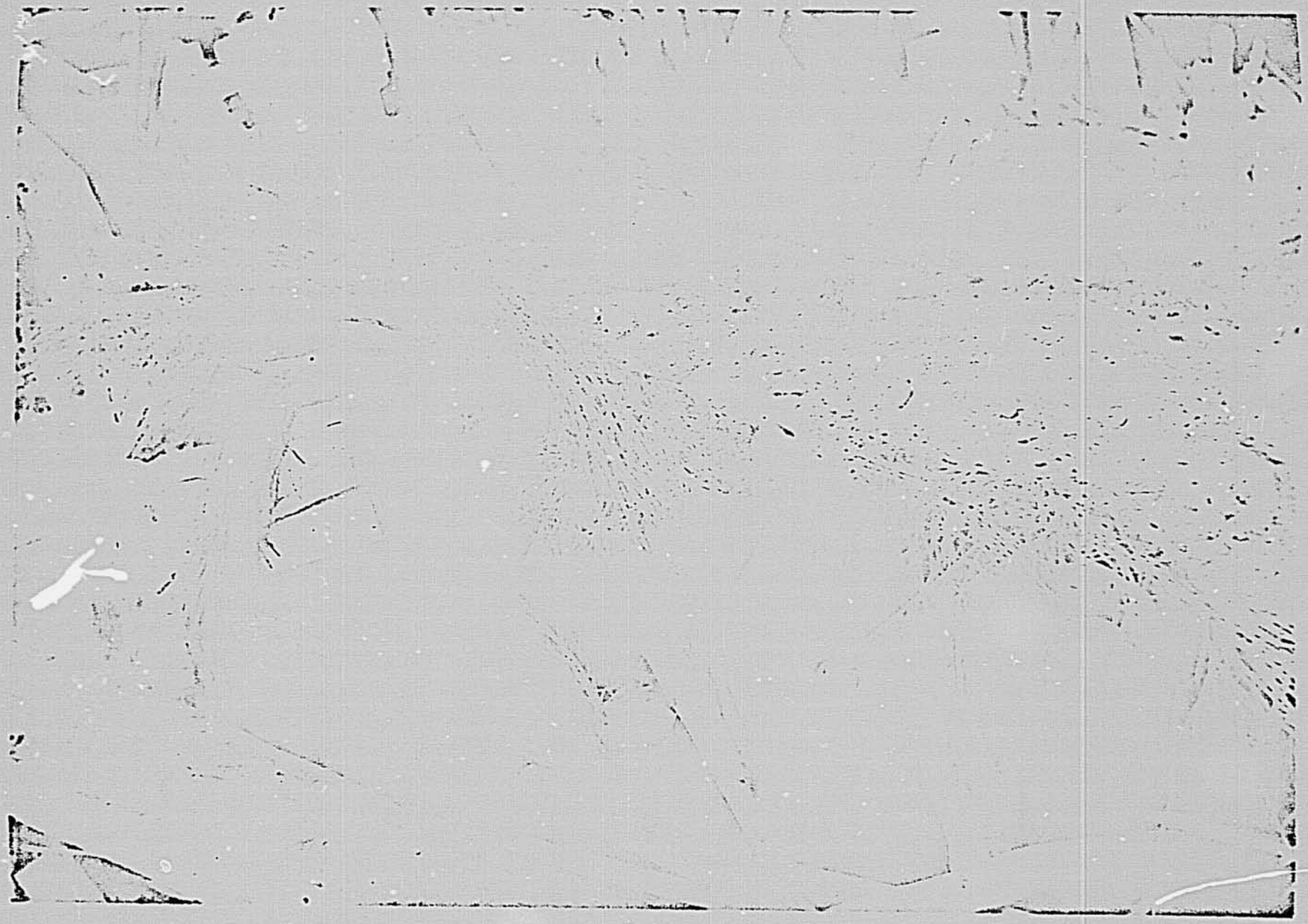
(1.3) Şek. 13 - Burdur Depremi. Burdur-Yazılar Köyü. İki katlı kerpiç yığma yapıda ağır hasar.
(1.3) Fig. 13 - Burdur Earthquake. Burdur-Yazılar Village. Two-storey adobe building. Heavy damage.



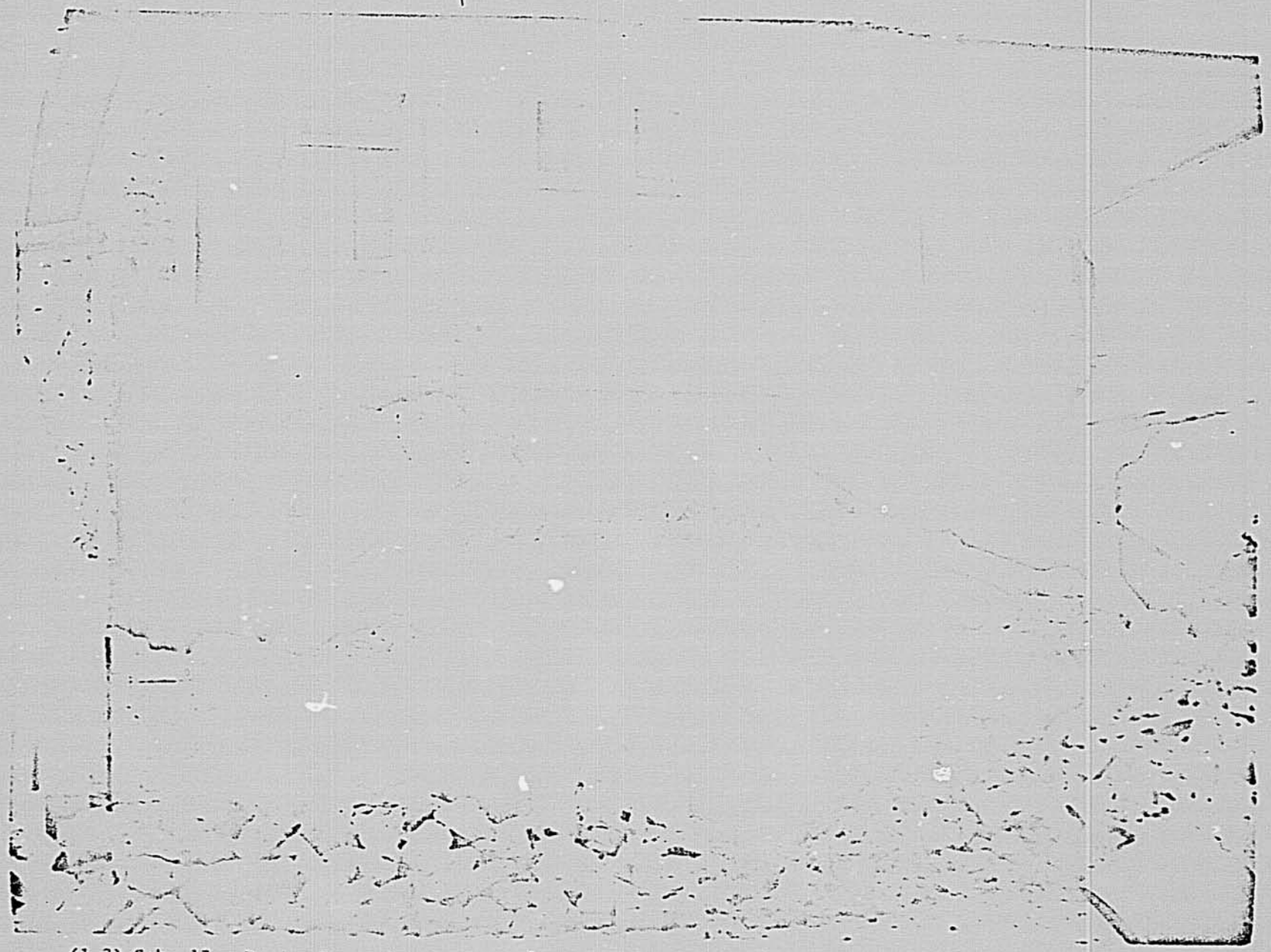
(1.3) Şek. 14 - Burdur Depremi. Burdur çevresinde. İki katlı kerpiç yığma bir yapıda ağır hasar.
(1.3) Fig. 14 - Burdur Earthquake. Two-storey adobe building, heavy damage.

(1.3) Sek. 15 - Burdur Depremi. Burdur-Yazılar Köyü. (3 No.daki evin yanında) iki katlı ahsap çerçeveli (hımıs) kerpiç dolgulu yapıda ağır hasar.

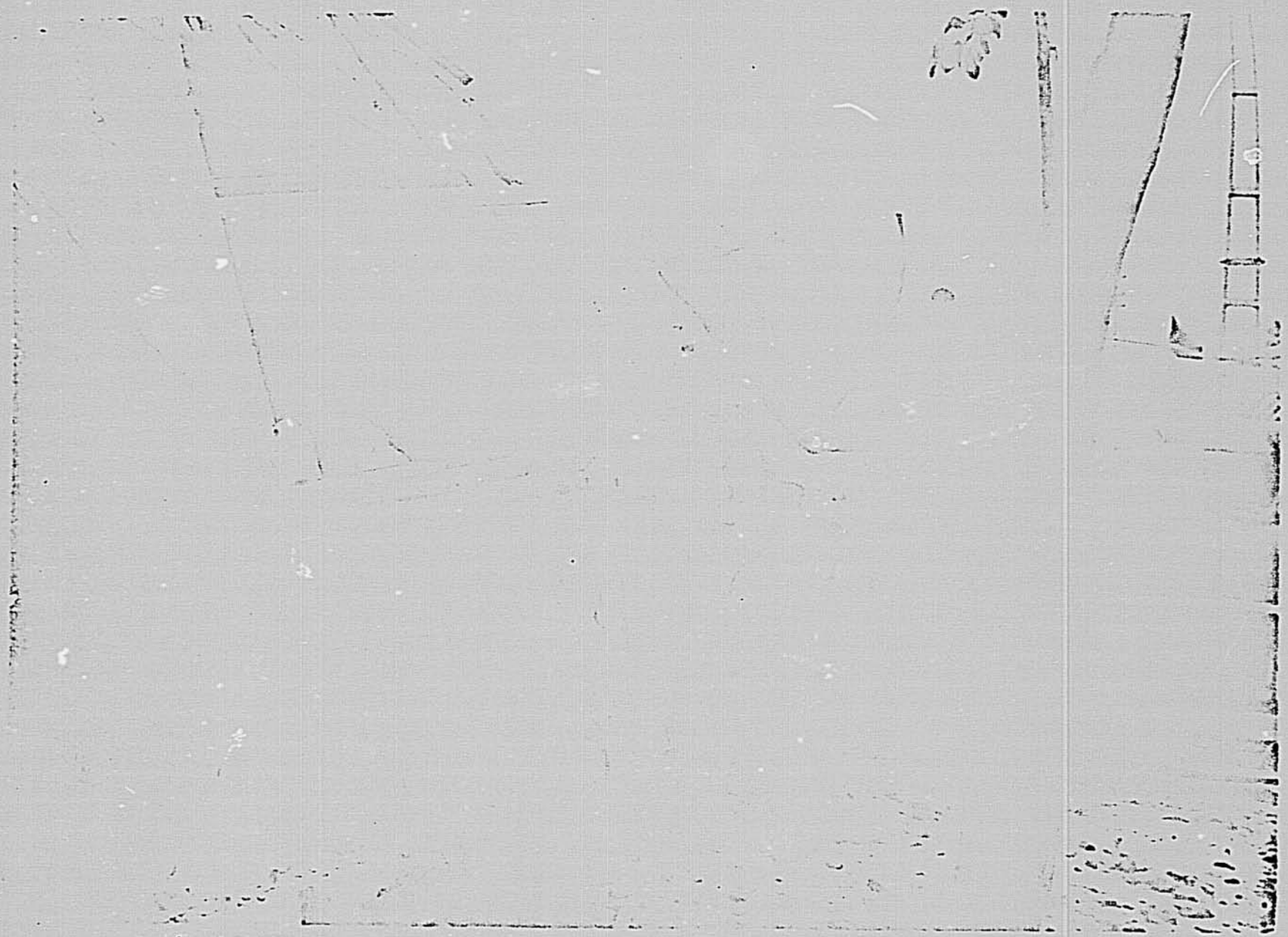
(1.3) Fig. 15 - Burdur Earthquake. Yazılar Village. (Next to house in Fig.3) Timber Frame two-storey adobe filled building, heavy damage.



(T.) Şek. 16 - Burdur Depremi. Burdur-Günalan Köyü. Kerpiç yığma yapı çatısında ağır hasar.
(İ.) Fig. 16 - Burdur Earthquake. Günalan Village. Heavy damage at roof of an adobe building.



(1.3) Sek. 17 - Burdur Depremi. Burdur. İki katlı tuğla yığma bir yapıda ağır hasar.
(1.3) Fig. 17 - Burdur Earthquake. Brick masonry two-storey house, heavy damage.



(1.3) Şek. 18 - Burdur Depremi. Burdur. Bir katlı tuğla yığma yapıda ağır hasar.
(1.3) Fig. 18 - Burdur Earthquake, Brick masonry one-storey house, heavy damage.

(1.3) Sek. 19 - Burdur Depremi. Burdur. Betonarme bir yapıda ağır hasar.
(1.3) Fig. 19 - Burdur Earthquake. Heavy damage at a reinforced concrete structure.

2. THE GEOGRAPHY AND THE GEOLOGICAL STRUCTURE OF TURKEY

2.1. PHYSICAL GEOGRAPHY

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2.1.2. Dimensions
2.1.3. Boundaries
2.1.4. Topography
2.1.5. Appendices

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2.3. RELATION BETWEEN EARTHQUAKES AND GEOLOGICAL STRUCTURE OF TURKEY

2.3.1. Metamorphic-Crystalline Massifs
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2.1. PHYSICAL GEOGRAPHY

2.1.1. Geographical Location of Turkey

The most striking characteristic of the geographical location of Turkey is its central placement. In fact, Turkey is located centrally between the old world continents, in the Northern hemisphere and between the North Pole and the Equator.

The second important characteristic in its geographic location is the fact that it is surrounded by water although it is between continents. The Mediterranean Sea which is part of the Atlantic Ocean with its own extensions surrounds Turkey from three sides.

Another characteristic is that it is located on major routes.

The fact that Turkey is on important routes has led to its political importance in history, and today this importance has grown much more.

2.1.2. Dimensions of Turkey

The area on which Turkey is located consists of the peninsula of the Western most part of Asia and extends in the North-West corner to Europe, forming a rectangle. The length of this rectangle is about 1600 km. and its width is about 600 km.

Official sources give the area of Turkey as 780,576 sq. kilometres(1). This area includes the areas of lakes and other stationary water areas which total to 9,465 sq. kilometres.

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(1) 23,623 sq. kilometres are in Europe and 756,953 sq. kilometres are in Asia.

2.1.3. Boundaries of Turkey

Turkey has continental boundaries of 2750 km. and coastal boundaries of 8250 km.

One of the characteristics of these boundaries is that, most of these have been established only recently. It is usually assumed that the oldness of the boundaries of a country is an indication of its political stability. Modern Turkey was formed after the collapse of the Ottoman Empire with national boundaries and for this reason political stability is established in the country.

The fact that Turkey is surrounded by seas facilitates foreign contacts. Across the coastal boundaries Turkey is not only a neighbour of geographically near countries but also of the whole world.

2.1.4. Topography of Turkey

A. Turkey is a country of high altitude:

A distinguished characteristic of Turkey is its high altitude. Average altitude of Turkey is about 1130 metres. This average altitude is more than 3.5 times that of Europe (330 m.) and even higher than that of Asia (1050 m.). (Fig.s 1 - 3)

The distribution of areas with respect to their altitudes can be shown by the following ratios:

Areas between	0 m.	and	500 m.	17.5%
Areas between	500 m.	and	1000 m.	27%
Areas between	1000 m.	and	1500 m.	30%
Areas between	1500 m.	and	2000 m.	15.5%
Areas higher than	2000 m.			10%

Contrary to the Eastern European countries, areas of altitudes from the sea level to 250 m. occupy only 10% of the total land. On the other hand areas of altitudes higher than 1000 m. constitute more than half (55.5%) of the areas. Areas of altitudes higher than 2000 m. occupy not less than 10% of the total area of the country.

B. Surface Characteristics are varied in Turkey:

Turkey has various surface characteristics. One can observe parallel mountain ranges, mountains standing alone or covered with deposits from old lakes, plateaus which are separated by valleys, and alluvial plains along the valleys which become wider towards the downstream. However, this variety seems to fit a certain classification.

(i) Major mountain ranges of the country run along the North and South of the rectangle in the East-West direction and form wide arches (Northern Anatolian Mountains in the North and Taurus mountains in the South).

(ii) These coastal mountain ranges are separated by high plateaus in the middle.

(iii) These ranges get closer in the East and for this reason Eastern Anatolia is higher and more mountainous.

(iv) In the West, although the mountains seem to run closer again, one cannot observe either the density or the altitude of the mountains in the East. They form a threshold in mid-Western Anatolia and beyond this threshold the altitude decreases until it reaches sea level at the Aegean Sea and the Sea of Marmara. Here there are no mountains parallel to the coast but mountains which run perpendicular to the coast separated in between by low regions.

(v) Aside from the flat lands of Central Anatolia, the following flat lands are seen in Turkey:

a. South-Eastern Anatolia flat lands, situated in the South-Eastern extension of the Taurus Mountains.

b. The dish shaped Thrace in the North-West.

c. Alluvial plains along valleys and downstream of rivers (like the plain of Adana) (Fig.s 2, 4, 5).

2.1.5. Appendices

1. Turkey - Physical (Map)

2. Drainage, Basins and Lakes (Map)

3. Hypsographic Curve of Turkey

4. Geological Map of Turkey (Map)

5. Structure

2.2. CLIMATIC CONDITIONS

2.2.1. Location of Turkey within Climatic Regions

Turkey is located in the central climate zone and in a region of transition.

A. Central Climate:

Central climate prevails in countries in the North of Turkey. Every season there is some precipitation. Maximum precipitation is observed in winter on the Atlantic coast but this moves towards the summer as we go Eastward in Europe. Also the difference in temperature between seasons gets larger in the same way. There are two types of central climate, with the following different properties: (i) small seasonal temperature differences, uniform precipitation - oceanic; and (ii) large seasonal temperature differences, precipitation concentrated in summer months - continental.

B. Steppe Climate:

Turkey is affected by the subtropical climate in the South.

The characteristic features of the climate in this region is the small amount of precipitation. The amount of precipitation may decrease to such an extent that, it affects the plant life of the region. Steppes and deserts are the characteristics of drier regions. These arid countries starting from the Atlantic coast of Africa occupy the Northern half of this continent and extend towards Central Asia (Gobi desert, etc.) over Arabia and Iran.

C. Mediterranean Climate:

In the regions around the Mediterranean Sea a third kind of climate is seen. This is called the Mediterranean climate and like the climate described in (B), summers are hot and dry. On the other hand, one can observe some resemblances between the winters of the Mediterranean region and the type described in part (A). This season is rainy as in (A), also winters are mild due to the latitude of the region.

Turkey is under the influence of these three major types of climate. However, there are numerous variations within the country due to high altitude, existence of coastal mountain ranges, proximity to the shore, etc.

2.2.2. Major Climatic Conditions of Turkey

A. Mediterranean Climate:

It is characterized by hot and almost completely dry summers, and mild and rainy winters. This climate is observed on the Mediterranean shores of Turkey as well as in Western Anatolia (winters are more distinct in Western part).

Along the Mediterranean shores, on a narrow band in the South of mountain ranges which isolate the Northern parts, this climate prevails with its full characteristics. On these shores winters are short and the average temperature of the coldest month (January) varies between 8°C and 12°C. It is very seldom colder than 0°C (the lowest recorded temperature -4°C - -7°C). Although there is much snowfall on the nearby mountains, snow is very seldom seen and when it snows it does not stay on the ground for long.

Summers start very early and last quite long and the average temperature of the warmest month (July) varies between 27°C and 29°C. During summer, the temperature often reaches 40°C and higher in shadow (at Adana 45.6°C). Average total annual rainfall shows variations along the shore, but generally exceeds 60 cm. per sq. metre. It is measured 1.00 m. by some meteorological stations. Two thirds of the annual rainfall takes place in winter. The rainy season is between October and May. There is no rain fall in summer except occasional showers.

In the mountaneous regions near the Mediterranean shore, the climate is slightly different because of the topographic conditions of the region. Summers are fresher in the high plateaus and people move from the coast to plateaus during summer vacations. Winters are cold and the high mountains are covered by snow, whereas lower plateaus are only subject to rainfall. Total annual rain-fall increases from shore to high peaks of Taurus chaine, but on the other side of the peaks, it decreases again

On the Aegean shore and on the nearby zones the Mediterranean climate properties are seen. In this region too, summers are hot and dry. The average temperature of the warmest month varies between 25°C and 28°C (maximum at İzmir 42.7°C). Because of the geographical conditions (latitude) and the effect of North winds to which the region is more exposed, the winters are colder (average temperature in January between 7°C and 9°C, temperatures below zero are reached more often, minimum measured temperature measured in İzmir being -8.4°). Snow fal

occurs more frequently. The rain-fall of the region varies between 50 cm. and 100 cm. In the higher parts, it even exceeds 100 cm. (at Muğla 120 cm.). Winter rain exceeds 50% of the total rain and summer rain is barely 2-4% of the total rain.

Climate in the Marmara region is not much different except for cooler summers (22.5°-25°C average for the hottest month) and more prominent winters (4°-5°C average for the coldest month). As in the Mediterranean region , the least precipitation is in the summer and the most is in the winter. However, in the North-West parts of this region (e.g. Edirne) and towards the Black Sea coast, a greater percentage of precipitation falls to summer months (7% in Canakkale, 13% in Istanbul, 17% in İzmit, 18% in Edirne). Therefore summer cannot be called an arid season in this section. Marmara region is not only a zone of transition from the Mediterranean climate to the Black Sea climate but from time to time it is influenced by the continental climate of Anatolia and the Balkan peninsulas. Cold waves coming from the Balkans are more frequent and some years have cold winters (minimum recorded temperatures: -16°C in Istanbul, -25.5°C in Bursa, -22°C in Edirne). Annual average rainfall in the Marmara region changes between 50-100 cm. This annual figure shows considerable variations from year to year and especially in the distribution of rainfall between seasons, which is considerably variable. For example, some years summers are arid as the Mediterranean and the Aegean regions and some years as rainy as the Black Sea region and the Balkans.

Passing to the Black Sea region from the Marmara region arid summers disappear. The Black Sea coast has a climate where there is rain in every season. Because of proximity to the sea, summers are not very hot and winters are not very cold. Especially Eastern Black Sea coast has warmer winters because of the shielding effect of the Caucasses from the North winds. Precipitation varies from one place to the other but especially the Northern slopes of the coastal mountains receive the most rain in the country.

Because of proximity to the sea, seasons start late in the Black Sea region. For example, the coldest and the hottest months are February and August rather than January and July. Beginning of spring is almost as cold as winter and summer characteristics exten well into autumn. Along the coast, summer is not very hot but due to high humidity it is effective (average temperature for the hottest month 22°-23°C, maximum recorded temperature 36°-40°C). In summer, in contrast to the clear blue Mediterranean skies, often it is cloudy and foggy in the Black Sea region. The influence of cold waves decrease from West to East in winter (average temperature for the coldest month: 6°-7°C, minimum recorded temperature: -6° - -8°C).

B. Steppe Climate:

The most characteristic features of climate in inland parts of Turkey, are the large temperature differences between seasons, the so-called continental character and the small amount of precipitation due to mountains that separate the region from the coastal regions.

The mountainous Eastern Anatolia has somewhat more precipitation than Central and South-Eastern Anatolia. In the above stated three regions summers are dry as in the Mediterranean climate except, the North-Eastern part of Eastern Anatolia where the climate is of continental type of central climate, where the maximum precipitation occurs in summer and the minimum amount of rainfall is during winter months. In central Anatolia and in most parts of Eastern Anatolia, maximum precipitation falls in the spring, whereas in South-Eastern Anatolia this happens during winter months. In the inner regions, summers are usually hot (very hot summers are in South-Eastern Anatolia and somewhat cool summers occur in the high plateaus of the East) and winters are very cold (and of long duration in Eastern Anatolia). In relation to the inadequacy of rainfall, the typical plant pattern of these inner regions are green grass in spring (after the long and cold winters) which dry off easily early in hot summer, thus forming large areas of steppes, and this is why these regions are said to have steppe climate.

Steppe climate has somewhat carrying characteristics in different parts of the inner region of the country.

C. Central Anatolia:

Winters are cold and the coldness increases towards the Eastern part of the region (the average temperatures of the coldest months are 0°C in Afyon, -0.2^{o}C in Konya; -1.6^{o} in Kayseri and -4° in Sivas, and the recorded lowest temperatures are -28° in Konya and -34.5^{o} in Sivas), spring comes early but lasts short; in summers the days are hot and the nights are cool (average temperature of the hottest month is about 20°-23°C, and the highest temperatures recorded

are between 36°-38°C); the days in early autumn are as hot as the summer days but the nights get colder and colder, and frost may start as early as autumn. Precipitation in Central Anatolia increases from the inner plains and valleys to the mountains surrounding the region and varies from 25 to 50 cm. The largest amount of rainfall occurs sometimes in April or in May but the very following days are dry, hot summer days. In summer there may be showers of indefinite duration. In autumn precipitation may start again and in winter, especially in December and January the second maximum precipitation usually - snow - falls and the precipitation decreases until late winter or early spring. In late spring (April and May) the precipitation increases again so as to achieve its maximum during the year.

In North Central Anatolia, though the maximum precipitation occurs in late spring and early summer, there is a part (e.g. Kastamonu) where minimum precipitation occurs in winter rather than in summer, as is the case in the Black Sea region (in Kastamonu the amount of rainfall is 26.5% in summer and 18.5% in winter). The climate of this part of the region may be classified as (A2) because of its continental character.

D. East Anatolia:

Steppe climate varies in different parts of this region due to the conditions of altitude and topography. Winters are much colder and precipitation is higher. The cold winters get even colder in the North-Eastern parts (the average temperature of the coldest month in the South-West is about -1.5^{o} and -2°, whereas in the North-East it is about -9° and -13°; the recorded lowest temperatures are -25° in Malatya, -28.7^{o} in Van, -39.6^{o} in Kars and -43.2^{o} in Karaköse - the latter is the lowest temperature ever recorded in Turkish meteorological stations).

Summer days are usually hot but the nights are considerably cool and in the North-Eastern plateaus (Erzurum-Kars) this season is somewhat cooler than in the South-Western parts (the temperature of the warmest month is about 26° - 27° in the South-West and it is less than $20^{o}C$ in the North-East, the highest day temperatures in these regions are $42^{o}C$ and $35^{o}C$, respectively). The amount of precipitation is usually more than the Central Anatolia because of the more mountainous character of the region. However, although the sides of the mountains which are exposed to winds that bring rain have a precipitation of more than 50 cm., the opposite sides have precipitation less than 30 cm.

E. South-Eastern Anatolia:

This region also has a climate of the continental type. But since the region is in the South and is lower than the Eastern Anatolia the winters are less cold (it is colder in the Eastern parts and the average of the coldest month is between 2° and $5^{o}C$, the lowest recorded temperatures are -12.5^{o} and -24° in Urfa and Diyarbakır). On the other hand, summers are very hot (temperatures are higher in the Southern part, the average of the warmest month is higher than $30^{o}C$ and the highest temperature ever recorded is 46.5^{o} in Urfa). Precipitation never exceeds 50 cm. in the plains of central regions and decreases towards the Syrian desert (29 cm. in Ceylânpınar), but on mountain sides open to winds, it increases up to 69 cm. in Mardin and even exceeds 100 cm. on the Hakkari mountains. Distribution of rainfall is similar to that of the Mediterranean coast: summers are dry, maximum amount of rainfall occurs during winter months and spring has more precipitation than autumn.

2.2.3. Appendices:

7. Mean Annual Temperature (Reduced)
8. January Isotherms
9. March Isotherms
10. May Isotherms
11. July Isotherms
12. September Isotherms
13. November Isotherms
14. Temperature in Different Regions
15. July - Mean Maximum Temperature
16. January - Mean Minimum Temperature
17. Average Temperature Range
18. Average Number of Frost Days
19. Actual Temperatures (^{o}C) - January
20. Actual Temperatures (^{o}C) - March
21. Actual Temperatures (^{o}C) - May
22. Actual Temperatures (^{o}C) - July
23. Actual Temperatures (^{o}C) - September
24. Actual Temperatures (^{o}C) - November
25. Mean Annual Precipitation

26-31. Monthly Precipitations

32. Variations in Monthly Precipitations
33. Annual Indices of Aridity (according to De Martonne's Formula)
34. Moisture Indices (Annual) (according to Thornth Waite's Formula)

35-38. Monthly Moisture Indices (May-July-September-October)

39. The Annual March of Potential Evapotranspiration (Thornth Waite)

40. Average Number of Days with Snow-cover

41. Tracks of Cyclones

42. Mean Annual Wind Directions (Wind Velocity)

43. Mean Wind Directions (January)

44. Mean Wind Directions (April)

45. Mean Wind Directions (July)

46. Mean Wind Directions

47. Mean Annual Number of Rainy Days

48. Mean Annual Cloudiness

49. Seasonal Distribution of Precipitation (in percent of the Annual Total)

50. Mean Annual Relative Humidity

51. Vegetation

52. Percentage of Forest and Bushland Areas by Cities (Vilayets)

53. Vegetation Profiles

All the above information are included in the Geographical Atlas of Turkey provided with the Report.

2.3. RELATION BETWEEN EARTHQUAKES AND GEOLOGICAL STRUCTURE OF TURKEY

Since Turkey is situated in the Alpine orogenic zone, frequently earthquakes of various magnitude occur causing lots of damage.

Earthquakes are closely related to regional geological structure, from the point of view of cause and effect relationship, so much that earthquake phenomenon is a natural consequence of the historical geological structure of the region. Therefore, it is necessary to study the geological structure of Turkey.

The geology of Turkey has been studied during the last 40 years. The results of the first synthesis has been mapped and published by M.T.A. (The Institute of Mineral Research and Exploration of Turkey) in a scale of 1/500.000 in 1964.

Some experienced investigators have examined the general geological structure of Turkey by preparing maps of various scales, before and after the publication of M.T.A. All these investigations, however, do not contain much detailed information. The above mentioned institute, on the other hand, has started geological mapping in the scale of 1/25.000, during the last few years.

Meanwhile all universities are encouraging detailed investigation for the doctorate and post-doctorate theses on this subject. According to the available geological information, it is possible to consider the relation between the earthquake and geological structure of Anatolia. (Fig 1)

T. Ketin [4] describes the main structural units in the tectonic zones of Turkey, as follows:

1. Metamorphic-Crystalline massifs
2. Folded Paleosoic ranges
3. Folded Mesosoic and Tertiary ranges (Alpine ranges)
4. Graben and depression areas
5. The big faults and overthrusts
6. Active faults and main seismic regions

2.3.1. Metamorphic-Crystalline Massifs:

Metamorphic-crystalline massifs are very important units in the tectonic evolution of Turkey, and cover large areas and outcrop often throughout Anatolia.

They are composed of gneiss, micaschist, quartzites and marbles, and behave as a rigid block against the tectonic deformations. These crystalline rocks outcrop in different sizes at Istıranca, Armutlu, Bolu, Uludağ, B. Menderes, Sultandağı, Kızılırmak, Anamur, Ilgaz, Daday, Amasya-Tokat and Bitlis massifs.

2.3.2. Folded Paleosoic Ranges:

Folded Paleosoic ranges were formed in the first geological period and are seen at North-Western Anatolia, around Marmara Sea, at Ereğli-Zonguldak-Amasra regions, near Ankara, Istanbul-Kocaeli massifs, Çamdağı, Alaplı-Yığılca and Karaburun, İzmir.

2.3.3. Folded Mesosoic-Tertiary Ranges:

Folded Mesosoic-Tertiary ranges (or Alpine Ranges) form coastal ranges of the Black Sea (Pontids), Taurus ranges in South and masses at South-Eastern Anatolia. They are the youngest ranges in Turkey.

The outstanding characteristic feature of these structures is that "ophiolitic green series" (made up of basic and ultrabasic rocks like periolotite, gabbro, serpentine) have played a major role in the formation of the ranges.

2.3.4. Graben and Depression Areas:

The graben and depression areas are long and narrow basins of different size surrounded by normal faults. They are filled with neogen and quaternary sediments. They have been seen in many regions of Turkey. The main grabens of Anatolia are as follows:

In Western Anatolia, Gediz depression, B. Menderes and K. Menderes valleys, Saros, Edremit, Çeşme (Gökova), Çemlik and İzmit bays, İznik, Burdur, Eğridir, Beyşehir and Sapanca lakes, Marmara Sea, Düzce, Tosya, Kargı, Bayburt, Erbaa-Su Şehri, Erzincan, Muş, Amik plains and their Northern and Southern extensions.

Depression areas are basins surrounded by mountain areas. Their geological formation is related to their slow vertical movements after the orogenic movements. Some examples for these basins are the Ergene basin, Manyas lake, Bursa-Yenişehir-İnegöl, Adapazarı-Sakarya, Antalya-Tuz gölü, Havza-Merzifon, Taşova, Erbaa, Malatya-Arguvan, Pınarbaşı-Kangal, Denizli-Sarayköy, Acıpayam-Acıgöl, Erzurum-Pasinler, Ağrı-Diyadin, Muş-Bingöl, Adana-Ceyhan, Bulanık-Tutak, Van-Diyarbakır, Bismil and Cizre depressions. Some of these graben and depression areas at Western Anatolia are still active and some others in Eastern Anatolia generally are not active.

2.3.5. The Main Faults and Overthrusts:

Main faults of Anatolia may be divided into two types: The first type of these are dip-slip faults. These are described as "normal faults" of "thrust faults" according to the relative movements of blocks. The faults in Western Anatolia are generally dip-slip faults. C. Erentöz and S. Abdüsselâmoğlu observed dip-slip movements on the field after Manyas (October 6, 1964) and Gediz (March 28, 1970) earthquakes, respectively.

Canıtez, N.[1] examined focal mechanisms in earthquakes which occurred in South-Western Anatolia. According to results of these investigations, faults are generally dip-slip (normal and thrust) faults. However, Canıtez [1] reported a few strike-slip faulting in the North of Western Anatolia.

As a result of all these studies we may conclude that in Western Anatolia, dip-slip movements are more frequent than the strike-slip faultings.

The second type of faultings are strike-slip movements. The largest one of these movements appear in the North Anatolian fault zone. Detailed information about this zone was given by İ. Ketin [5] in 1969. According to him, this fault has started active movements after the strong earthquakes occurred since 1939. In fact, this faulting zone exists since Pliocene (before 10-12 million years). The North Anatolian fault system begins from Yenice-Gönen at Biga peninsula and extends to Abant-Bolu-Gerede-Ilgaz-Tosya-Lâdik-Erbaa-Kelkit-Erzincan-Elmalıderesi-Üstükran-Varto plains and passing from North of Van lake, reaches Iranian border.

Another strike-slip fault is in the Ecemiş basins, however differing from the North Anatolian fault, this slip is located towards left on this fault [4]. No important earthquake has been observed on this fault recently.

Overthrusts were formed in the last paroxism of Alpine orogenic movements. They were observed in many parts of Anatolia, especially in South-Eastern regions, Central Anatolia in the vicinity of Ankara-Yozgat area, the Western parts of the Taurus mountains and between Kavaklar and Şile at the Northern side of Bosphorus.

2.3.6. Active Faults:

Some of the observed faults in Turkey became active after the recent earthquakes and created dangerous fractures.

On the other hand, there are some fractures which have slow activity, in the Neocene areas about which no detailed information exist. For example, one tectonic zone, the Gediz earthquake (March 28, 1970) has gained activity with this earthquake.

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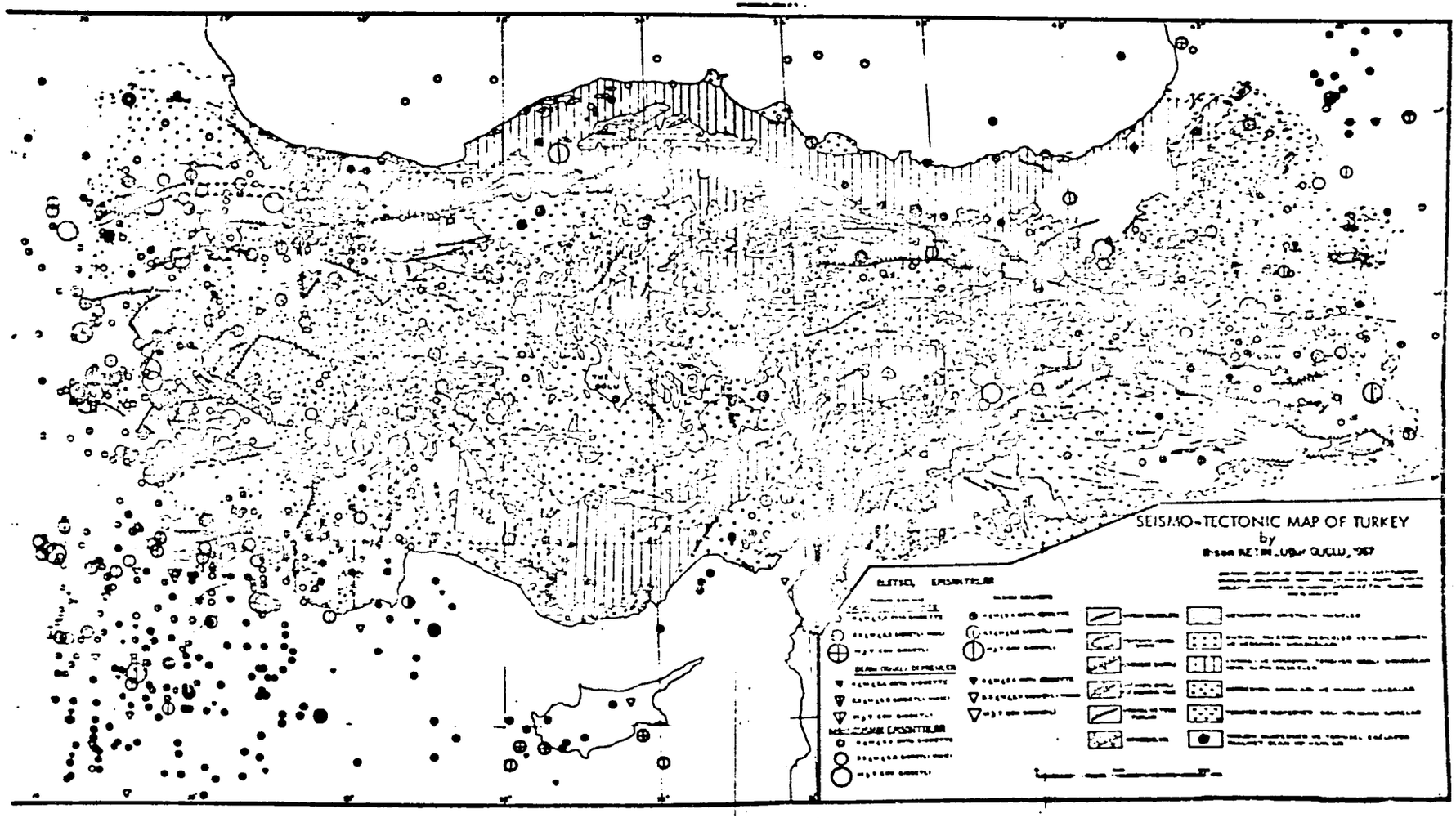

2.3 Map I

3. TURKISH ECONOMY

3.1. NATIONAL INCOME AND ITS DISTRIBUTION TO PRINCIPAL SECTORS

3.2. INVESTMENTS AND THEIR DISTRIBUTION TO PRINCIPAL SECTORS

3.3. PRODUCTION AND ITS DISTRIBUTION TO INDUSTRIAL AND AGRICULTURAL SECTORS

3.4. TRANSPORTATION

3.5. CONSUMPTION AND ITS DISTRIBUTION

3.6. REGIONAL DISTRIBUTION OF INCOME AND INVESTMENT

3.7. PUBLIC FINANCE

3.8. DEPOSITS - LOANS

3.9. FOREIGN TRADE AND BALANCE OF PAYMENTS

3.10. PRICE MOVEMENTS

3.11. GENERAL COMMENTS ON TURKISH ECONOMY AND THE PHILOSOPHY OF DEVELOPMENT PLANS

3.1. NATIONAL INCOME AND ITS DISTRIBUTION TO PRINCIPAL SECTORS

Turkey has a low national income regarding her natural resources and demographic properties. Although the gross national product and the national income increased with current prices more than 10 times during the last twenty years, and reached some 170 billion TL. in 1972, this is still very low with 2,600 TL. national income per capita, with 1961 constant prices.

Economic development of Turkey has been controlled by the State in a better way from 1962 on, the date of beginning of application of the first Five-year Development Plan. This is the reason why 1961-1962 prices are generally taken as the basis of comparison and the year 1962 is taken as the starting point.

In Table 1, increase in national income and gross national product for the last decade is given with current factor cost and with 1961 factor cost. It is noticeable that agriculture is the main sector of Turkish economy with a contribution of about 30% to the total national income in 1969-1970 period, while the contribution of industry is only about 20%, and that of construction is only 7% regarding the economic situation of the period 1969-1970. These figures were 40.7%, 16.4% and 4.0% in 1962, respectively for agriculture, industry and construction. Variation of national income and gross national product per capita is given in Table 2.

During the implementation of the first Development Plan between 1963 and 1966, the average increase in the gross national product has been about 6.5% per annum, on the average slightly below the Plan target of 7% per annum. During the same period the rise in the cost of living

was 4.5% per annum. Although the rise in the gross national product has been rather encouraging during the period of the First Development Plan, the contribution of agriculture and particularly industry sectors were appreciably below the Plan targets, whereas the services have exceeded the Plan expectations.

According to the State Institute of Statistics (Devlet İstatistik Enstitüsü), in 1970 the rate of growth in agriculture, 0.4%, has fallen far short of the Plan target of 4.1%. Similarly the industry sector has achieved a growth rate of less than one thirds of the expected rate (3.6% realised versus 12% expected). Construction and housing sectors have exceeded the expectation figures of 7.2% and 5.9% realising growth rates of 8.1% and 9.1%, respectively.

The Third Development Plan includes projects up to 1975. The increase in the gross national product until this year will be about 650 billion TL. with the 1965 prices. This increase is expected to be realised with contributions of 10%, 38% and 52% from the sectors of agriculture, industry and services, respectively.

The distribution of the National income according to 1965 prices to the sectors for the First Five-year Plan period (1962-1966) is given in Table 3. Table 4 shows the national income estimates for 1969, 1970 and 1971 at 1965 prices and at current prices, respectively. Those estimated values were reached with a ± 5% error until 1971. In 1972, a gross national product of 220 billion TL at current prices is expected.

It can be noted that, the Plan targets are not reached in the main sectors such as agriculture and industry, but reached in the sectors of transportation and of 'housing + construction' considered together.

On the contrary, income from Turkish workers living abroad started to constitute an essential part of the national income.

3.2. INVESTMENTS AND THEIR DISTRIBUTION TO PRINCIPAL SECTORS

The total realised investments at the end of 1971 has been 77.2 billion TL., during the Second Development Plan period. To achieve the Plan target, total investments in 1972 have to be 34.3 billion TL., based on 1965 prices. Even if the targets for the year 1972 are realised 100%, total investments will be 7.9% short of the Five-year Plan target. This is mainly due to the shortage of investments in education, agriculture, health, tourism and mining sectors. It is observed that manufacturing industry, housing, and energy sectors have been emphasized to a greater extent than planned.

On the assumption that the targets for the year 1972 will be fully achieved, the contribution of major sectors to the investment are as follows:

Manufacturing	26.4%
Housing	20.0%
Transportation	16.1%
Agriculture	11.7%

More detailed information about investments and their distribution for the period 1970-1972 can be seen in Table 5.

3.3. PRODUCTION AND ITS DISTRIBUTION TO INDUSTRIAL AND AGRICULTURAL SECTORS

In general the performance of the agricultural sector in both the first and the second Plans were not very good. Even if the projected increase in fertiliser usage materialises, it is optimistic to expect

cereal yields to rise 3% per annum. Agricultural revenues contribute about 30% of the gross national product. This figure has been decreasing. It was 33.1% in 1968, 31.2% in 1969 and 29.8% in 1970, all at constant prices.

Industrial sector has not contributed to the gross national product as much as it was planned, (30.9% planned versus 18.6% realised) for the period 1967-1971.

Mining sector has also fallen short of the 11.1% increase per annum expected by the Plan.

In the Third Five-year Plan, production will increase at the average rate of 13%-15% per annum.

Also therewill be an average increase of 13%-14% per annum in the energy production.

The increase in the manufacturing industry has been 10% in 1968, 9.4% in 1969, 2.5% in 1970 and 8.7% in 1971. Therefore, the planned rate of 12% per annum has not been realised. The reason for this is that the investments have been saved for larger projects which took a longer time than expected to materialise.

In the Third Five-year Plan, manufacturing industry is planned to increase at the rate of 11.5%-12% per annum.

Production distribution can be seen in Table 6 for the year 1969-1971.

3.4. TRANSPORTATION

The contribution of the transportation sector to the net national product has risen from 7.7% in 1968 to 8.1% in 1970. It is a big investment programme, two thirds of which is investment in roads and road vehicles.

The main questions on the transportation programme are the extent to which road users are to be taxed to help the investments and the extent to which they are to be controlled to see that overloading does not ruin the road bed.

The biggest share in transportation both for freight and passenger belongs to the highways. In 1970 highways were responsible for about [illegible] of freight (in tons/km) and 90% of passenger (in passenger/km) transportation. State railways were responsible for the rest of the freight and passenger transportation, while Turkish Airlines and the Maritime Bank contributed a negligible amount to the transportation as compared to the highways and railways.

Turkish Airlines had the largest increase in freight and passenger volume between 1967 and 1969 , where there was an increase of 97.2% in the freight and 87.8% in the passenger volume.

Table 7 shows the contribution of different types of transportation to domestic passenger transportation. These are estimates of the Second Five-year Plan.

[illegible]. CONSUMPTION AND ITS DISTRIBUTION

In 1970 consumption constituted 81.4% of the gross national product. In the Second Five-year Plan this percentage was planned to decrease to a value of 77.4% by 1972. The average planned consumption increase of [illegible].8% per annum was realised to be 5.4% in 1970 based on constant prices. [illegible] to the new Civil Service Law, public consumption has increase by 16.6% and because of this, it is estimated that in 1971 total consumption will increase by 9.9%.

It was planned (in the Second Five-Year Plan) to increase private consumption by 5.1%; this figure has been 5.2% and 7.9% in the years 1970 and 1971, respectively, based on 1965 prices.

Towards the end of the Second Five-Year Plan period, it is estimated that there will be a change in the structure of private consumption. Particularly, a comparative decrease in agricultural consumption and a comparative increase in food consumption are expected.

Private consumption expenditures in the Second Plan period are shown in Table 8.

3.7. REGIONAL DISTRIBUTION OF INCOME AND INVESTMENT

Turkey can be divided geographically into seven ragions: Black Sea region, Sea of Marmara region, Agean Sea region, Mediterranean Sea region, Central Anatolian Region, Eastern Anatolian region and South-Eastern Anatolian region. Names of the provinces for each region are shown in Table 9. Economic activity is distributed very unevenly throughout these regions. For example, between September 1967 and October 1970, 8.5 billion TL. of the total 13 billion TL,of investment was in the Sea of Marmara region. This constitutes a 61.5% contribution for the Sea of Marmara region which is the smallest (in terms of area) of all the regions.

It is one of the objectives of the State Planning Organisation to establish a regionally balanced growth, economically, socially and culturally. To attain this regional balance, an 'Office of Regions of Priority in Development' has been established within the State Planning Organisation. The functions of this office include the following:

(a) To identify underdeveloped regions within the country, by scientifically sound methods,

(b) Establishment of institutions and manpower organisations for the purpose of attaining rational and productive working conditions in these regions,

(c) Proposals to the Five-Year Development Plans and annual programmes for reducing the economical, social and cultural gap between different regions. Implementation and coordination of these proposals.

The most important index which shows economic development of a region is investment. Table 10 shows investments for different regions for the beginning period of the Second Five-Year Plan.

In a different study it is found that in rural regions of Turkey, average income per household varies between 8,283 TL., and 9,732 TL. per annum, whereas in the major three cities this is much higher (17,950 TL. at Ankara, 28,732 TL in Istanbul, 39,240 TL. in Izmir). When the variation of income between regions is considered, the Eastern regions look like the worst part of the country. But as far as the distribution of income in a given region is concerned, the worst situation is observed in the Mediterranean region where investments are also quite poor.

3.7. PUBLIC FINANCE

Turkish budget has shown a very high increase during the last five years. Consolidated budget expenditures were increased from 16.8 billions in 1966 to 32.0 billions in 1971. Meanwhile, the consolidated budget revenues were increased from 16.35 billions to 29.33 billions.

Tax revenues constituted a portion varying between 82%-98% of the total consolidated revenues. Indirect taxes decreased from 53% in 1967 to 47% in 1971. Direct taxes increased from 29.8% to 33% during the same period.

Variation of the Turkish budget since 1948 is given in Table 11.

A detailed variation of the expendidutes and revenues,and their distribution between the sources during the last five years are given in Table 12.

3.8. DEPOSITS - LOANS

In the period 1966-1971, Turkish banknotes in circulation have arisen from 8.35 billion TL. to 17 billion TL.

The consolidated deposits at banks varied from 18.48 billion in 1966 to 36.24 billion in 1971. While 68%-72% of the deposits came from saving sources, only 20% of the total deposits are commercial deposits.

Meanwhile, the consolidated bank loans increased from 20.2 billion to 37.50 billion in which composite loans constituted all the time, a part around 60%.

In the distribution of the bank loans to the sectors, the part of the private sector increased from 86.4% in 1966 to 91.5% in 1971. This distribution during the last 10 years is given in Table 13.

Interest rates for bank loans did not vary during the last ten years. They remained at 10.50% for ordinary loans and overdrafts, 9.0% for industrial branch loans, export financing loans and agricultural loans, and 7% for agricultural loans of the State Agricultural Bank (T.C. Ziraat Bankası).

3.9. FOREIGN TRADE AND BALANCE OF PAYMENTS

In Turkey, exports and imports were nearly doubled during the last ten years. Total export increased from $ 380 million to $677 million in 1971. During the same period, total import increased from $ 662 million to $ 1.171 million. Totally, exports increased by 79% while imports

increased by 77%. The import/export ratio remained almost constant at 0.575. This caused the deficit in foreign balance of payments to grow gradually in absolute value.

Exports of Turkey are based on agricultural products which constitute 73% of the total exports. However, the percentage of agricultural products decreased, since this was 76% in 1964.

Table 14 illustrates last year's foreign trade, which clearly indicates a trend towards the O.E.C.D. countries and the U.S. , that has been traditional in the Turkish trade. Among imported materials, machinery always takes the first place. The major part of imports is from the U.S. and Germany. All statistical information related to imports are also shown on Table 14.

3.10. PRICE MOVEMENTS

Price movements constitute one of the main indicators of Turkish economy, especially during the periods of inflation. In fact, prices have shown a regular and high rate of increase all the time. During the last 50 years they moved up 800% and during the period 1963-1971, almost 90%.

The movement reached its highest rate during the inflation period 1956-1960 and once again in 1971. The annual rate of price movements for the last 15 years are listed in table 15.

Prices increased considerably since August 1970 devaluation.

Movements of cost of living show slightly different trends in different regions of the country. They are felt more in Eastern Anatolian cities than in the Western cities. A comparative list including the cities located at different seismic regions is given in Table 16.

3.11. GENERAL COMMENTS ON THE TURKISH ECONOMY AND THE PHILOSOPHY OF DEVELOPMENT PLANS

Despite her 35.6 millions of citizens, Turkey has a population density of 46, which is very low in respect to her natural resources and climate.

In terms of all criteria of development, Turkey is an under-developed country. Her gross national product is relatively low. The rate of growth of GNP is also low, as seen in Table 26. This low rate of growth is absorbed by the high rate of population increase.

As explained above, except the year 1966, the rate was always lower than 7%. While the first Five-Year Development Plan of 1963-1967 projected growth rates of 4.2% and 12.3% in agriculture and industry, only 3.2% and 9.7% growth rates were achieved in these sectors.

On the other hand the balance of trade which has shown continual large deficits started to be compensated for from 1970 on by the transfer of the incomes of Turkish workers in various European countries to Turkey. A good proportion of more than half a million workers abroad are qualified workers. Most of them are living and working in Germany.

In terms of 1965 constant prices, national income per capita in 1970 was 2,431 TL. and GNP per capita was 2,854 TL. The variation of NI per capita and GNP per capita for the last 10 years are summarised, using the 1962 constant prices, in Table 17.

The first application of the development plan principle to Turkish economy is dated early 1930's - the plan concept was taken to the official political programme of the Republican Party, the only one existing in that period. The foundation of some national institutions to support the

growth of industry and construction sectors is dated from this period. But, development plans of this period (first starting in 1934, and second in 1936) had covered only some part of the Turkish economy.

The Second World War delayed the start of the third planned economy period until 1947. In the meantime, Turkish political life had witnessed the foundation of the Democratic Party. The plan concept lost its importance and finally was completely abandoned after the 1950 electio.... which was won by the Democratic Party.

After the 1960 revolution, the plan concept was renewed and applied starting in 1962 for a period of five years. This time, plans covered full Turkish economy and took into account interdependence of different sectors. An over all economic growth rate and different sectoral growth rates had been fixed and the precautions had been decided upon in order to reach these targets. A mixed economy policy, largely depending on the activity of the private sector constituted the basis of the new plan concept. A second plan was prepared for the period of 1968-1972 and the third plan of five years is going to start by 1973.

Although the development plans have contributed to the overall economic growth of the country by fixing the targets with deadlines, served very little to overcome the problems of gross unequalities in the distribution of income. The part of the country located at the East of Zonguldak-Gaziantep line has a lower standard of life than the Western part, and in the mountain regions of Tunceli-Bingöl, Muş, Van, Bitlis, Siirt, Hakkari provinces the standard is still lower.

But, in a given region, the distribution of income between different population groups is also very unequal as seen in Table 18.

One of the major problems of Turkish economy is the unemployment problem. Especially, there continues to be a high level of hidden unemployment. Even in July-August, during which unemployment is in its lowest level, hidden unemployment concerns about 1,000,000 persons. But, during the winter season when the demand is least, it becomes as high as 7.8 million. On the other hand, despite the fact that the number of workers sent abroad is continuously increasing, still open unemployment figures approach 2 million.

The recent development of mechanisation in agriculture and the rate of urbanisation both gaining momentum, particularly after the Second World War, have been influential in the decrease of the population proportion living in the country-side. Still 22 million people representing 61.3% of Turkey's population live in 36,000 villages. 90% of these villages have population less than 1,000 - hence, solution of development problems of rural regions seems very difficult.

Despite the rapid development in manufacturing industry since 1960, in Western regions of the country, the progress is still far from a significant qualitative change in the industry in general.

Quite a high percentage of the manufacturing units continue to exist in very small scale establishments. Out of a few large establishments, 10 State enterprises have contributed most to the economy. All efforts made by the State including all measures taken to promote the manufacturing industry, all generousities of channeling of funds into this area, did not lead the private industry to develop large scale manufacturing establishments.

3/ TABLO - 1
3/ TABLE - 1

1. Üretim Faktörleri Kollarına göre Milli Gelir
Industrial origin of national income

Million Turkish Liras

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	Industries and aggregates
Cari Üretim Şartları fiyatlarıyla - Current factor cost											
18.495.0	19.238.1	19.648.0	21.778.8	25.142.5	25.800.1	25.434.4	30.160.9	31.354.7	32.992.3	35.597.7	1. Agriculture - Tarım
6.596.6	6.836.6	7.577.5	8.323.3	9.462.5	10.475.0	11.742.5	13.727.0	16.005.7	17.570.3	20.497.5	2. Industry-Endüstri
2.649.5	2.907.3	2.855.7	3.093.8	3.476.7	3.861.9	4.473.9	5.436.8	6.236.0	7.302.4	8.266.3	3. Construction - İnşaat
3.319.4	3.453.1	3.592.0	4.091.3	4.549.5	5.040.8	5.670.9	6.464.8	7.234.1	7.906.9	8.950.6	4. Wholesale and retail Trade - Ticaret
2.803.4	3.028.9	3.375.6	3.837.0	4.366.5	4.633.4	5.139.1	5.632.5	6.488.6	7.358.1	8.403.0	5. Transportation and communication - Ulaşım
1.105.8	1.403.3	1.501.9	1.433.1	1.630.6	1.981.5	2.132.5	2.567.5	3.111.8	3.678.1	4.288.7	6. Financial institutions - Mali Kurumlar
1.899.5	2.145.4	2.384.8	2.683.2	2.975.7	3.282.2	3.676.1	4.128.3	4.648.5	5.266.7	5.961.9	7. Private professions and services - Özel meslekler
1.619.8	2.028.6	2.275.5	2.466.6	2.713.3	3.006.3	3.325.0	3.690.8	4.115.2	4.724.2	5.380.9	8. Ownership of dwellings - Mesken mülkiyeti
3.491.9	3.580.0	4.417.6	4.631.2	5.484.5	6.198.6	6.771.9	7.833.1	8.718.3	9.842.7	10.846.7	9. Government services Kamu Hizmetleri
42.030.9	44.671.3	46.828.6	52.338.3	59.801.8	64.109.8	68.366.3	79.641.7	87.912.9	96.741.7	108.293.2	10. Domestic income Dahili Gelirler
- 253.1	- 312.6	- 291.2	- 283.2	- 212.4	- 235.8	+ 214.2	+ 598.5	+ 277.2	+ 303.3	+ 566.0	11. Income from the rest of the world Dış Gelirler
41.77.8	44.358.7	46.537.4	52.055.1	59.589.4	63.874.0	68.580.5	80.240.2	88.190.1	97.045.0	108.859.2	12. Net national product (National income) (At factor cost) Milli Gelir (Üretim maliyeti)
4.037.4	4.410.6	4.658.9	5.382.1	6.222.8	6.800.2	7.539.5	9.003.8	10.978.8	12.323.9	13.918.3	13. Indirect taxes Dolaylı Vergiler
45.815.2	48.769.3	51.196.3	57.437.2	65.812.2	70.674.2	76.120.0	89.249.0	99.168.9	109.368.9	122.777.5	14. Net national product (At market prices) Net milli gelir
1.911.2	2.200.2	2.523.4	2.860.6	3.211.8	3.523.5	3.900.0	4.329.0	4.826.8	5.383.5	6.008.0	15. Depreciation allowances - Aşınma
47.726.4	50.969.5	53.719.7	60.300.8	69.024.0	74.197.7	80.020.0	93.578.0	103.995.7	114.752.4	128.785.5	16. Gross national product (At market prices) (G.S.M.H.)
43.600.0	46.558.9	49.060.8	54.918.7	62.801.2	67.397.5	72.480.5	84.569.2	93.016.9	102.428.5	114.867.2	17. Gross national product (At factor cost) (G.S.M.H.) (Üretim maliyeti)

1961 Üretim Maliyeti fiyatlarıyla
At factor cost of 1961

											Industries and aggregates
7.317.4	7.403.5	7.168.5	20.162.1	21.697.3	21.693.8	20.978.7	23.367.8	23.576.7	24.021.6	24.045.6	1. Agriculture - Tarım
1.955.3	1.795.2	1.831.6	8.107.9	8.756.5	9.309.6	10.356.0	11.454.0	12.862.8	14.149.1	15.479.1	2. Industry-Endüstri
981.3	981.5	879.2	3.012.8	3.196.6	3.458.7	3.721.6	4.198.0	4.491.9	4.954.6	5.390.6	3. Construction - İnşaat
1.695.0	1.678.1	1.703.9	3.875.8	4.158.7	4.520.5	4.827.9	5.247.9	5.667.7	6.138.1	6.592.3	4. Wholesale and retail trade - Ticaret
1.228.3	1.223.5	1.310.7	3.676.9	3.905.8	4.236.9	4.533.5	4.873.5	5.214.6	5.631.8	6.127.4	5. Transportation and communication - Ulaşım
428.2	442.6	412.9	1.390.4	1.487.7	1.596.3	1.711.2	1.902.9	2.100.8	2.313.0	2.523.5	6. Financial institutions - Mali Kurumlar
751.6	791.4	859.6	2.572.5	2.752.6	2.950.8	3.169.2	3.406.9	3.669.2	3.955.4	4.263.9	7. Private professions and services - Özel Meslekler
628.7	735.4	843.0	2.382.4	2.544.4	2.735.2	2.978.6	3.231.8	3.522.7	3.846.8	4.196.9	8. Ownership of dwellings - Mesken Mülkiyeti
1.562.8	1.633.9	1.768.3	4.595.5	4.953.1	5.313.5	5.692.9	6.176.8	6.708.0	7.318.4	7.955.1	9. Government services Kamu Hizmetleri
16.348.6	16.715.1	16.777.7	49.776.3	53.542.7	56.017.3	57.969.6	63.859.6	67.814.4	72.328.8	76.574.4	10. Domestic income Dahili Gelirler
-37.0	-37.8	-38.0	- 269.8	- 190.2	- 206.5	+ 182.2	+ 486.0	+ 222.6	+ 243.6	+ 434.1	11. Income from the rest of the world Dış Gelirler
16.311.6	16.677.3	16.739.7	49.506.5	53.352.5	55.810.8	58.151.8	64.345.6	68.037.0	72.572.4	77.008.5	12. Net national product (National income) (At factor cost) Milli Gelir (Üretim maliyeti)
1.691.5	1.729.4	1.735.9	4.946.2	5.327.1	5.684.0	6.047.8	6.531.6	7.086.8	7.540.4	8.181.3	13. Indirect taxes Dolaylı Vergiler
18.003.1	18.406.7	18.475.6	54.452.7	58.679.6	61.494.8	64.199.6	70.877.2	75.123.8	80.112.8	85.189.8	14. Net national product (At market prices) Net milli gelir
748.0	790.0	831.5	2.700.6	2.847.5	3.049.8	3.266.3	3.504.7	3.764.0	4.046.3	4.357.9	15. Depreciation allowances - Aşınma
18.751.1	19.196.7	19.307.1	57.153.3	61.527.1	64.544.6	67.465.9	74.381.9	78.887.8	84.159.1	89.547.7	16. Gross national product (At market prices) (G.S.M.H.)
17.059.6	17.467.3	17.571.2	52.207.1	56.200.0	58.860.6	61.418.1	67.850.3	71.801.0	76.618.7	81.366.4	17. Gross national product (At factor cost) (G.S.M.H.) (Üretim maliyeti)

3/ TABLO - 2

3/ TABLE - 2

7. Nüfus başına millî gelir ve gayri sâfi millî hasıla

Per capita national income and gros national product

Türk Lirası — Turkish Liras

Yıllar Years	Nüfus Population (000)	Cari fiyatlarla At current prices: Nüfus başına millî gelir Per capita national income	Cari fiyatlarla At current prices: Nüfus başına gayri S.M.H. Per capita gross national product	Sabit fiyatlarla At constant prices: Nüfus başına millî gelir Per capita national income	Sabit fiyatlarla At constant prices: Nüfus başına gayri S.M.H. Per capita gross national product
1938	17.016	96	115	432	492
1948	20.049	440	502	440	502
1949	20.487	387	453	382	438
1950	20.947	428	496	434	496
1951	21.634	494	567	485	554
1952	22.219	559	645	513	586
1953	22.818	644	737	555	634
1954	23.433	631	730	489	564
1955	24.065	757	875	513	584
1956	24.771	856	982	532	610
1957	25.498	1.044	1.197	549	630
1958	26.247	1.291	1.467	597	685
1959	27.017	1.545	1.767	604	694
1960	27.755	1.598	1.836	601	692
1961	28.446	1.636	1.888	588	679
				1961 Fiyatlarıyla	
1962	29.154	1.786	2.068	1.698	1.960
1963	29.880	1.994	2.310	1.786	2.059
1964	30.623	2.086	2.423	1.823	2.108
1965	31.391	2.185	2.549	1.852	2.149
1) 1966	32.207	2.495	2.906	1.998	2.309
1) 1967	33.044	2.669	3.147	2.059	2.387
1) 1968	33.903	2.862	3.385	2.141	2.482
2) 1969	34.784	3.130	3.702	2.214	2.574

(1) Geçici tahminler

(2) Ön tahminler

(1) Provisional estimates

(2) Preliminary estimates

3/ TABLO - 3

3/ TABLO - 3

Milli Gelirin Sektörlere Dağılımı (1965 fiyatları)

Distribution of the National Income by Sectors of Origin

(At 1965 Prices) (Million TL)

SEKTÖRLER SECTORS	1962 (1)	1963 (2)	Artış Yüzdesi Rate of Incr. (%) (3)	1964 (4)	Artış Yüzdesi Rate of Incr. (%) (5)	1965 (6)	Artış Yüzdesi Rate of Incr. % (7)	1966 (8)	Artış Yüzdesi Rate of Incr. (%) (9)	1962-1966 Index (10)	Average Annual Rate of Incr. (11)	Ortalama Yıllık artış yüzdesi
Agriculture - Tarım	22.121.7	23.813.7	7.6	23.813.7	-	23.073.0	-3.3	23.095.5	3.6	113.2	3.3	
Industry - Endüstri	8.593.5	9.716.3	8.0	10.551.9	3.6	11.471.0	8.9	12.603.6	9.9	140.4	3.9	
Construction - İnşaat	3.072.6	3.240.0	6.1	3.505.7	8.2	3.776.0	6.0	4.070.4	9.0	132.7	7.3	
Trade- Ticaret	4.918.7	5.200.0	7.3	5.739.4	8.7	6.129.7	6.8	6.595.5	7.6	134.1	7.6	
Transportation- Ulaşım	3.491.3	3.786.3	8.4	4.024.8	6.8	4.306.5	7.0	4.603.2	8.4	133.7	7.5	
Financial Institutions and Professions - Mali Müesseler	3.940.6	4.218.7	7.0	4.522.5	7.2	4.852.6	7.3	5.226.2	7.7	132.6	7.3	
Housing - Konut	1.835.8	1.960.6	6.8	2.107.7	7.5	2.295.3	8.9	2.490.4	8.5	135.7	8.0	
Government Services - Hizmetler	5.351.3	5.783.2	8.0	6.193.8	7.1	6.769.8	9.3	7.257.2	7.2	135.6	7.9	
Domestic Income - Dahili Gelirler	53.705.5	57.798.8	7.6	60.459.5	4.6	62.613.0	3.6	67.552.0	8.5	126.5	6.1	
Income from Abroad Dış Gelir	- 272.2	- 191.9	29.5	- 208.4	- 8.6	+ 214.2	102.8	404.9	106.4	273.1	29.2	
Net National Product (At Factor Cost) Saf Milli Hasıla	53.433.3	57.606.9	7.8	60.251.1	4.6	62.828.1	4.3	63.456.9	8.9	128.1	6.4	
Indirect Taxes - Dolaylı Vergi	5.722.1	6.165.9	7.7	6.579.0	6.7	7.000.1	6.4	7.500.1	8.0	132.1	7.2	
Net National Product (At Factor Cost) Saf Milli Hasıla	59.155.4	63.772.8	7.8	66.830.1	4.8	69.828.2	4.5	75.957.0	8.8	128.5	6.5	
Depreciation - Aşınma	2.727.4	2.876.0	5.4	3.080.2	7.1	3.298.9	7.1	3.539.7	7.3	129.8	6.8	
Gross National Product G.S.M.H.	61.882.8	66.648.8	7.7	69.910.3	4.9	73.127.1	4.6	79.536.7	8.8	128.5	6.5	

3/ TABLO - 4
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Millî Gelir Tahminleri - National Income Estimates

(Milyon TL) (Millions TL)
(1965 Fiyatlarıyla)
(At 1965 Prices)

	1969	%	1970	%	1971	%
	(1)	(2)	(3)	(4)	(5)	(6)
1. Tarım - Agriculture	26.388.1	-0.1	26.757.0	1.4	29.285.6	9.5
2. Endüstri - Industry	17.198.7	9.4	17.637.1	2.5	19.362.8	8.7
3. İnşaat - Construction	5.389.4	8.8	5.675.0	5.3	5.785.7	2.0
4. Ticaret - Trade	8.382.4	7.4	8.956.1	6.8	9.668.2	8.0
5. Ulaştırma - Transportation	5.828.2	8.8	6.203.9	6.5	6.696.3	7.9
6. Malî Kurum, serbest mes. ve hiz. Financial Institutions, Professions, Services	6.757.4	8.3	7.251.5	7.3	7.766.7	7.1
7. Konut - Housing	3.238.1	9.1	3.471.5	7.2	3.716.4	7.1
8. Devlet hizmetleri - Government Services	9.475.6	8.7	10.214.7	7.8	10.914.5	6.9
9. Yurt içi gelir - Domestic Income	82.657.9	5.8	86.171.8	4.3	92.996.2	7.9
10. Dış alem gelir - Income from Abroad	446.6	55.9	1.365.5	205.8	2.888.8	111.6
11. Safi millî hasıla - Net National Product	83.104.5	6.0	87.537.3	5.3	95.885.0	9.5
12. Vasıtalı Vergiler - Indirect Taxes	9.600.9	8.5	10.172.2	6.0	10.970.8	7.9
13. Safi millî hasıla - Net National Product	92.705.4	6.2	97.709.5	5.4	106.855.0	9.4
14. Aşınma eskime - Depreciation	4.406.1	7.7	4.740.9	7.6	5.070.4	7.0
15. G.S.M.H. - GNP	97.111.5	6.3	102.450.4	5.5	111.926.2	9.2
16. G.S.M.H. Cari fiyat - (GNP Current Prices)	117.502.0		136.610.0		173.499.7	

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Yatırımlar 1970 - 1972 - Investments 1970 - 1972

(1971 Yılı fiyatlarıyla)
(1971 Prices)
(Milyon ₺.)
(Million ₺).

Sektörler	1970 Realization 1970 yılı Gerçekleşmesi			1971 Realization 1971 Yılı Gerçekleşme Tahmini			1972 Program 1972 Yılı Programı		
	Kamu	Özel	Toplam	Kamu	Özel	Toplam	Kamu	Özel	Toplam
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tarım - Agriculture	2.243.4	1.318.7	3.562.1	1.873.0	1.456.4	3.329.4	2.239.0	1.620.0	3.859.0
Madencilik - Mining	851.9	206.4	1.058.3	845.0	222.9	1.067.9	1.533.0	250.0	1.783.0
İmalât - Manufacturing	3.284.8	4.461.0	7.745.8	4.296.0	4.850.0	9.146.0	6.701.8	5.960.0	12.661.8
Enerji - Energy	2.853.0	172.0	3.025.0	2.176.0	181.0	2.357.0	2.981.1	200.0	3.181.1
Ulaştırma - Transportation	3.502.2	1.662.8	5.165.0	3.499.0	1.803.0	5.302.0	3.964.1	2.100.0	6.064.1
Turizm - Tourism	208.6	441.5	650.1	192.0	423.6	615.6	211.5	485.0	696.5
Konut - Housing	750.3	5.899.8	6.630.1	621.0	6.380.0	7.001.0	363.6	7.020.0	7.383.6
Eğitim - Education	1.344.2	40.1	1.384.3	1.401.0	28.7	1.429.7	1.553.2	10.0	1.563.2
Sağlık - Health	418.7	40.1	458.8	392.0	42.9	434.9	479.3	45.0	524.3
Diğer Hizmetler - Other Services	1.059.5	550.4	1.609.9	1.092.0	611.5	1.703.5	1.353.1	710.0	2.063.1
Kalkınma fonu - Development	64.6	-	64.6	30.0	-	30.0	10.0	-	10.0
TOPLAM - TOTAL	16.561.2	14.792.8	31.354.0	16.417.0	16.000.0	32.417.0	21.539.7	18.400.0	39.939.7

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Sektörlerde Üretim Değerleri
Production Values By Sectors

(Milyon TL) (Millions TL)
(1971 Fiyatları)
(1971 Prices)

Sektörler - Sectors	1970	1971	1972	1971/70	1972/71
Tarım - Agriculture	60.038.2	64.841.5	67.919.5	108.0	104.5
Madencilik - Mining	3.742.6	3.911.1	4.164.2	104.5	106.5
İmalât Sanayii - Manufacturing Industry	90.743.4	98.772.4	110.654.4	108.8	112.0
Genel Enerji - General Energy	3.613.9	3.976.8	4.403.1	114.5	110.7
Elektrik enerjisi - Electrical Energy	2.816.9	3.200.0	3.595.9	113.6	112.4
Kok - Gaz Sanayii - Coke - Gas Industry	797.0	776.8	807.2	97.5	103.9
Toplam Sanayi (Madencilik, İmalât, Genel enerji) Total Industry (mining, manufacturing, General energy)	98.099.9	106.660.3	119.221.7	108.7	111.8

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Yerli Hatlarda Yolcu Taşımacılığı
Domestic Inter-Insular Carrying Estimates

(Million Yolcu x Kilometre)
(Million Passengers x Kilometers)

Ulaşım Şekli / Mode of Transportation		1963	1967	1. Plan Yıllık Artış % First Plan Period Annual Increase (%)	1968	1972	Yıldız 1972 Index (1968=100)	Second Plan Period Annual Increase (%)	2. Plan Yıllık Artış %
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Deniz Maritime	: Inter-Urban-Dolmuş	19.769	36.100	16.8	40.200	60.400	167.3	10.7	
	Local - İl	1.104	1.045	- 5.0	1.070	1.200	114.8	2.9	
Demiryolu Railroads	: Inter-Urban Şehirler arası	3.005	3.639	4.9	3.779	4.498	121.6	4.1	
	Local - İçi-arası	626	710	3.3	750	880	123.9	4.8	
Deniz Marine	: Inter-Urban Şehirler arası	213	178	-4.6	172	147	82.6	-3.9	
	Local - İçi-arası	965	1.025	1.5	1.040	1.150	112.2	2.6	
Hava Air	: Inter-Urban Şehirler arası	124	203	13.2	226	356	175.3	12.0	
	Local - İçi-arası	-	-	-	-	-	-	-	
TOPLAM TOTAL	Inter - Urban Şehirler Arası	22.711	40.120	15.2	44.377	65.331	162.8	10.0	
	Local - İçi-arası	2.775	2.780	0.01	2.840	3.230	113.2	3.3	

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Private Consumption Expenditures in the Second Plan Period
Özel Tüketim Giderleri (2. Plan Dönemi)

(Million TL) (Milyon TL)
(1965 Fiyatlarıyla)
(At 1965 Prices)

Sectors - Sektörler	1972 Absolute Value Mutlak Değer (1)	1972 % of Total % Toplam (2)	1977 Absolute Value Mutlak Değer (3)	1977 % of Total % Toplam (4)
1. Agricultural Food Products - Tarımsal Gıda	16.1	27.8	19.3	26.0
2. Fuels - Yakıt	0.5	0.9	0.6	0.8
3. Processed Food Products, Beverages and Tobacco Fabrika edilmiş gıda	11.8	20.4	15.9	21.5
4. Textiles and Clothing - Tekstil, Giyim	4.5	7.8	5.2	7.0
5. Other Industrial Products - Diğer Endüstri Ürünü	5.5	9.5	7.9	10.7
6. Electricity - Elektrik	0.2	0.3	0.4	0.5
7. Services - Hizmetler	19.3	33.0	24.8	33.5
TOTAL - TOPLAM	57.9	100.0	74.1	100.0

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Ekli Tablolardaki (Tablo. 10) Bölgeler Aşağıda Belirtilen İlleri İçine Almaktadır.

Regions indicated in the Table. 10 include the following provinces.

KARADENİZ BÖLGESİ : (BLACK SEA REGION)

Amasya

Artvin

Bolu

Çorum

Giresun

Gümüşhane

Kastamonu

Ordu

Rize

Samsun

Sinop

Tokat

Trabzon

Zonguldak

MARMARA BÖLGESİ : (MARMARA REGION)

Balıkesir

Bilecik

Bursa

Çanakkale

Edirne

İstanbul

Kırklareli

Kocaeli

Sakarya

Tekirdağ

EGE BÖLGESİ : (ALGEAN REGİON)

Afyon
Aydın
Denizli
İzmir
Kütahya
Manisa
Muğla
Uşak

AKDENİZ BÖLGESİ : (MEDİTERRENEAN REGİON)

Adana
Antalya
Burdur
Hatay
Isparta
İçel
Maraş

İÇ ANADOLU BÖLGESİ : (CENTRAL ANATOLİA REGİON)

Ankara
Çankırı
Eskişehir
Kayseri
Kırşehir
Konya
Nevşehir
Niğde
Sıvas
Yozgat

DOĞU ANADOLU BÖLGESİ : (EASTERN ANATOLIA REGION)

Ağrı

Bingöl

Bitlis

Elazığ

Erzincan

Erzurum

Hakkâri

Kars

Malatya

Muş

Tunceli

Van

GÜNEYDOĞU ANADOLU BÖLGESİ : (SOUTHEASTERN ANATOLIA REGION)

Adıyaman

Diyarbakır

Gaziantep

Mardin

Siirt

Urfa

3/ TABLO - 10
3/ TABLE - 10

Yatırımların Bölgelere Göre Dağılımı
Regional Distribution of Investments

	1968 Yatırım Programı Investment Program (1)	1968 Toplam içindeki payı % Percent within the total (2)	1969 Yatırım Programı Investment Program (3)	1969 Toplam içindeki payı % Percent within the total (4)	1970 Yatırım Programı Investment Program (5)
smemiş İller (23 İl) erdeveloped Provinces)	1.818.202	25.3	1.997.475	24.6	
rlmiş (44 İl) ns Provinces	5.377.340	74.7	6.126.061	75.4	
AM - TOTAL	7.195.542	100.0	8.123.536	100.0	
deniz Bölgesi - Blacksea Region	1.141.507	15.9	1.382.977	17.0	
ara Bölgesi - Marmara Region	1.643.160	22.8	1.829.956	22.5	
Bölgesi - Aegean Region	1.055.399	14.7	1.164.457	14.3	
niz Bölgesi - Mediterrenean Region	583.818	8.1	654.079	8.1	
nadolu Bölgesi - Southeastern olia Region	1.232.335	17.1	1.520.602	18.7	
Anadolu Bölgesi - Eastern Ana- a Region	1.049.904	14.6	1.117.975	13.8	
ıydoğu Anadolu Bölgesi heastern Anatolia Region	489.419	6.8	453.490	5.6	
AM - TOTAL a/	7.195.542	100.0	8.123.536	100.0	
elif Yatırımlar (x) rted Investments	2.885.365		3.275.188		
l Toplam - Grand Total	10.080.907		11.398.724		

"Toplam İçindeki Payı" sütunundaki yüzdeler bu toplama göre alınmıştır.
ercentages in the "Percentage within the total are based on this total

Programda yer alan İller tasnifine girmeyen makina techizat ve taşıt alımları, etüd ve proje masrafları, projelerle ilgili teknik personel ücret ve yollukları ile bütün yurt yüzeyini ilgilendiren merkezî harcamaları kapsamaktadır.
Includes such things as purchase of machinery, equipment and vehicles, conducted studies and projects, salaries of the technical personnel in these projects and central expenditure which concerns the country as a whole and cannot be regionally classified.

3/ TABLO - 11

3/ TABLE - 11

Son 25 Yılda Türkiye Bütçesi

Turkish National Budget During the Last 25 Years

Yıl Years	Bütçe (Milyar TL.) State Budget (In Billion TL)
1948	1.243
1950	1.487
1952	1.751
1954	2.288
1956	3.325
1958	4.476
1960	7.282
1962	10.112
1963	12.102
1964	13.484
1965	14.421
1966	16.775
1967	18.813
1968	21.612
1969	25.696
1970	28.860
1971	37.093
1972	51.250

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Gelir ve Gider Dağılımı (Milyar T.)

Distribution of Revenues and Expenditures in (Billion T.)

	1966	1967	1968	1969	1970	1971
Konsolide Gelir Consolidated Budget Revenues	16.35	19.32	21.12	24.03	28.26	36.29
Vergi Income from: 1. Direct Taxes - Dolaylı	4.20	5.07	5.69	6.80	8.81	11.93
2. Indirect taxes - Dolaysız	8.26	9.82	10.54	12.34	14.05	18.68
Toplam Total taxes	12.46	14.89	16.23	19.14	22.86	30.61
Diğer Kaynak - Other Sources	3.89	4.43	4.89	4.89	5.40	5.68
Bütçe Giderleri Consolidated Budget Expenditures	16.87	18.78	22.08	25.91	30.50	37.24
1. Cari Giderler - Current Exp.	8.64	9.67	10.95	12.33	12.50	16.75
2. Yatırım Giderleri - Investment Exp.	4.41	4.93	5.94	6.66	3.25	2.88
3. Sermaye Giderleri - Capital	3.81	4.19	5.20	6.93	14.65	17.61
Denklik - Budget Balance	- 0.516	+ 0.537	- 0.965	- 1.888	- 2.24	- 0.95
İç Borçlar - Domestic Debts	17.59	18.26	22.05	22.65	24.96	
Dış Borclar - Foreign Debts	14.00	15.39	16.95	18.46	42.30	
Toplam Borclar - Total Debts	31.59	33.65	39.00	41.21	67.26	

3/ TABLO - 13

3/ TABLE - 13

Banka Kredilerinin Sektörlere Dağılımı - (Milyar T.)

Distribution of the Bank Loans by Sectors (Billion T.)

Yıl Year	Toplam Total	Genel Katma Bütçe General Annexed Budget	İktisadi Devlet Teşekkülü State Economic Enterprises	Toplam Kamu Sektörü Total Public Sector	Özel Sektör Private Sector
1962	10.362	1.194	0.257	1.451	8.911
1963	11.886	1.221	0.504	1.725	10.161
1964	13.444	1.324	0.637	1.965	11.483
1965	16.100	1.410	1.129	2.539	13.561
1966	20.191	1.510	1.070	2.574	17.617
1967	23.368	1.413	1.364	2.777	20.591
1968	27.575	1.446	1.225	2.671	24.904
1969	33.182	1.610	1.387	2.997	30.185
1970	37.005	1.545	1.460	3.005	34.000
1971	39.000	2.200	1.700	3.900	35.100

3/ TABLO - 14 .A
3/ TABLE - 14 .A

DIŞ TİCARET (Milyon Dolar)	1966	1967	1968	1969	1970
İhracat (Fob) ($ 1 = TL.9)	490.5	522.3	496.4	536.8	588.2
İthalât (Cif) ($ 1 = TL.9.08)	718.3	684.7	763.7	801.2	947.7
Dış ticaret denkesi	- 227.8	-162.4	-267.3	-264.3	-359.5
İhracatın Bölgeler İtibariyle Dağılışı (%)					
O.E.C.D. Memleketleri	75	76	71	71	73
E.E.C.	35	34	33	40	40
E.F.T.A.	19	17	17	15	18
A.B.D. + Kanada	16	18	15	12	10
Diğer	5	7	6	4	5
Anlaşmalı Memleketler	19	19	22	20	17
Diğer Memleketler	6	5	7	9	10

FOREIGN TRADE (Million Dollars)	1966	1967	1968	1969	1970
Exports (fob) ($ 1 = TL.9)	490.5	522.3	496.4	536.8	588.2
Imports (cif) ($ 1 = TL.9.08)	718.3	684.7	763.7	801.2	947.7
Trade balance	-227.8	-162.4	-267.3	-264.3	-359.5
Distribution of Exports by Regions (%)					
O.E.C.D. Countries	75	76	71	71	73
E.E.C.	35	34	33	40	40
E.F.T.A.	19	17	17	15	18
U.S.A. + Canada	16	18	15	12	10
Other	5	7	6	4	5
Bilateral Agreement Countries	19	19	22	20	17
Other Countries	6	5	7	9	10

3/ TABLO - 14.B
3/ TABLE - 14.B

Madde Grupları İtibariyle İhracat (Milyon Dolar)

	1966	1967	1968	1969	1970
Tarım Ürünleri	379.1	420.4	399.4	405.0	442.5
Hububat, Bakliyat	12.3	8.7	9.8	6.8	9.8
Meyveler ve Sebze.	98.2	132.2	126.4	161.7	137.7
Sanayide Kullanılan Ürünler (Tütün, Pamuk, Diğer)	242,4	254.0	238.7	204.0	261.3
Canlı Hayvan ve Hayvan Ürünleri	26.2	25.5	24.5	32.5	33.7
Madenler	23.1	20.7	26.0	34.8	45.4
Sanayi Ürünleri	88.3	81.2	71.0	93.6	98.2
Diğer	.	.	.	3.3	2.1
Toplam	490.5	522.3	496.4	536.7	588.2

İthalâtın Bölgeler İtibariyle Dağılışı (%)

	1966	1967	1968	1969	1970
O.E.C.D. Memleketleri	78	76	77	77	78
E.E.C.	33	35	37	36	34
E.F.T.A.	18	20	21	21	17
A.B.D. + Kanada	24	18	17	18	23
Diğer	3	3	2	2	4
Anlaşmalı Memleketler	16	20	19	15	13
Diğer Memleketler	6	4	4	8	9

Exports by Commodity Groups (Million Dollars)

	1966	1967	1968	1969	1970
Agricultural products	379.1	420.4	399.4	405.0	552.5
Cereals, leguminous seeds	12.3	8.7	9.8	[illegible]	9.8
Fruits and vegetables	98.2	132.2	126.4	161.7	137.7
Industrial Crops (Tobacco, Cotton, Other)	242.4	254.0	238.7	204.0	261.3
Livestock and animal products	26.2	25.5	24.5	32.5	33.7
Minerals	23.1	20.7	26.0	34.8	45.4
Industrial products	88.3	81.2	71.0	93.6	98.2
Other				3.3	2.1
Total	490.5	522.3	496.4	536.7	588.2

Distribution of imports by regions (%)

	1966	1967	1968	1969	1970
O.E.C.D. Countries	78	76	77	77	78
E.E.C.	33	35	37	36	34
E.F.T.A.	18	20	21	21	17
U.S.A. + Canada	24	18	17	18	23
Other	3	3	2	2	4
Bilateral Agreement Countries	16	20	19	15	13
Other Countries	6	4	4	8	9

3/ TABLO - 14.C
3/ TABLE - 14.C

Madde Grupları İtibariyle İthalât (Milyon Dolar)

	1966	1967	1968	1969	1970
Makinalar	227	228	254	224	274
Demir-Çelik	67	47	44	51	93
Akaryakıt	55	54	64	61	67
İlâç - Boya	56	62	72	80	91
Nakil Vasıtaları	74	60	85	86	114
Mensucat - İplik	41	42	42	38	37
Sunî Plastik Madd. ve Tabii Sentetik Kauçuk	34	37	38	32	35
Hayvanî ve Nebatî Yağlar	17	5	3	6	7
Gübreler	28	37	48	52	31
Diğer	119	113	114	171	199

Imports by Main Commodity Groups (Million Dollars)

Machinery	227	228	254	224	274
Iron and steel	67	47	44	51	93
Liquid fuel	55	54	64	61	67
Medicines and dyes	56	62	72	80	91
Vehicles	74	60	85	86	114
Textiles and yarns	41	42	42	38	37
Artificial plastic goods and natural synthetic rubber	34	37	38	32	35
Fats and oils	17	5	3	6	7
Commercial fertilizers	28	37	48	52	31
Others	119	113	114	171	199

3/ TABLO - 15

3/ TABLE - 15

Yıllık Fiyat Artışları (%)

Annual Rates of Prices Increases (%)

Yıl Year	Toptan Wholesale	Geçim İndeksi Cost of living
1956	16.8	11.4
1957	18.1	12.5
1958	15.2	15.7
1959	19.5	22.6
1960	5.3	7.4
1961	2.9	1.3
1962	5.7	3.8
1963	4.2	6.4
1964	1.2	0.8
1965	8.1	6.7
1966	4.8	5.5
1967	7.5	6.2
1968	3.2	4.1
1969	7.2	5.1
1970	6.7	11.7
1971	21.8	27.0

3/ Tablo : 16

3/ Table : 16

(1968 Prices=100) (1968 Fiyatı=100)

(Ay, Yıl) Month, year		İstanbul	Bursa	İzmir	Antalya	Adana	Erzurum
	1968	100	100	100	100	100	100
	1969	100.8	108.5	106.9	107.9	105	108.0
March	1970	113.9	118.3	111.6	113.2	112.1	116.3
August	1970	114.7	119.1	116.3	115.8	109.9	118.3
December	1970	120.7	121.9	122.7	122.3	118.2	123.4
March	1971	129.0	130.4	127.0	130.0	124.2	132.3
August	1971	135.5	141.3	141.4	134.2	131.4	144.6
December	1971	142.0	150.8	148.8	144.1	140.6	151.8
January	1972	143.[illegible]	-----	149.4	145.8	-----	155.8

(3) TABLO 17

(3) TABLE 17

YEAR	NI PER CAPITA		GNP PER CAPITA	
	TL.	Index	TL.	Index
1962 (Ref. Year)	1,698	100.0	1,960	100.0
1970	2,270	133.7	2,644	134.9
1971	2,422	142.6	2,815	143.6
1972 (guessed)	2,600	150	3,100	150
1975 (Projection)	3,250		4,100	
1978 (Projection)	,200		5,250	

(3) TABLO 18 -

(3) TABLE 18 -

HANE HALKI Family Household %	GELİR GURUBU Income %	KÜMÜLATİF AİLE Family Cumulative %	KÜMÜLATİF GELİR Cumulative Income %
20	3.0	20	3.0
20	7.0	40	10.0
20	10.0	60	20.0
20	20.0	80	40.0
20	60.0	100	100.0

4. DEMOGRAPHIC ANALYSIS

4. DEMOGRAPHIC ANALYSIS

Turkey has a high birth rate and is in a demographical transition period. The death rate decreases as a result of improved health conditions but the birth rate does not decrease at the same rate.

Between the 1960 and 1965 censuses, the population increased by a rate of 24.9 per thousand. As the estimated rate for this period was 27.9 per thousand, the 24.9 per thousand rate is much lower than the birth rate of the previous five years. The estimates did not include the workers going abroad and this caused the difference between the actual and the estimated figures. When the definite results of the 1960 census are taken as a basis for calculation and the workers abroad are included in the calculations, the rate of increase for the period 1960-1965 is 26.1 per thousand.

A large proportion of the fertile female population during the period 1960-1965 were born in the period 1940-1945. This female population, which affects the births in the 1960-1965 period, is small because their parents belong to a small population group since they were born during the years of World War I and the War of Independence, when there was a fall in the birth rate. Therefore, the fall in the birth rate of the 1960-1965 period was directly related to the birth rate during World War I. This affected the size of the fertile female age group of the 1940-1945 period, resulting in the small size of the

fertile female population of the 1960-1965 period. The effect of the present decrease will appear 20-25 years henceforth. When factors such as the low fertility level in the cities and the rapid progress of urbanisation are considered, it is seen that the fall in the rate of increase results, to a certain extent, from the decreased fertility.

A change was deemed necessary in the population policy to slow down the rate of increase and in 1965 a new population policy was put into effect. The core of this new population policy is "Family Planning".

According to provisional results of the 1965 census the population of Turkey is 31 million. Because of the rapid population increase and high fertility rate, the density of the young-age group increases. Table 1 explains the distribution of the three main age groups. The percentage of the 0-14 age group within the total population rose as a consequence of high fertility. Because of the economically unproductive nature of this group, all their burden falls on the economically productive 15-64 age group. In developed countries the 0-14 age group constitutes 25-30 percent of the total population. In Turkey, however, this ratio is 42 percent. Therefore, the burden of the economically productive age group which contribute to economic development increases. This burden, called "dependency ratio", increases under the effect of the rise in population. The changes in the dependency ratios are shown in Table 2.

TABLE 1. DISTRIBUTION OF THE THREE MAIN AGE GROUPS (%)

Age Group	1945 (1)	1950 (2)	1955 (3)	1960 (4)	1965 (5)
0-14	39.54	38.32	39.37	41.25	41.74
15-64	57.12	58.35	57.05	55.22	54.16
65 and over	3.34	3.33	3.58	3.53	4.10
TOTAL	100.00	100.00	100.00	100.00	100.00

Source: State Planning Organisation

TABLE 2. CHANGE IN THE DEPENDENCY RATIO (Per Thousand)

Years	Under 15 (1)	Over 65 (2)	15-65 (3)	Rate of Dependency (%) (4)
1955	9,475	860	13,729	75
1960	11,427	1,029	15,299	81
1965	13,102	1,286	17,003	85

Source: State Planning Organisation

The dependency ratio will fall with fertility since the reduction in fertility will result in the decrease of the proportion of children in the population while the proportion of the work force will increase. The estimates of the changes in the dependency ratio are shown in Table 10.

Another subject related to the age composition is labour supply. The population increase in Turkey is a very important factor in relation to employment since labour supply increases as a result of the high rate

population increase. When the employment created falls short of the labour supply, the difference results in an excessive number of people working in agriculture, or in other words, in disguised unemployment. Moreover, it results in open unemployment in the non-agricultural sector.

An analysis of the distribution of labour among the various sectors indicates the economic structure of Turkey. Seventy percent of the population lives in rural areas and most of this population works in agriculture. According to the results of the 1965 census, 75 percent of the economically productive population works in the agricultural sector, 12 percent in the industrial sector and 13 percent in services. However, the proportions of those working in industry and services has followed a constant upward trend. The population working in the three main sectors is shown in Table 3.

TABLE 3. POPULATION IN THE THREE MAIN SECTORS (%)

Sectors	1955 (1)	1960 (2)	1965 (3)
Agriculture	82	79	75
Industry	9	10	12
Services	9	11	13

Source: State Planning Organisation

In Turkey the population over the age of six is 25 million, 48 percent of whom are literate. In the period 1960-1965 the literate population increased from 8.7 million to 12.2 million.

58.4 percent of the literate population has completed primary training, 6.7 percent secondary training, 2.5 percent vocational training, and 1.6 percent collage and university training. The remaining 28 percent is composed of those who have not graduated from a formal educational institution.

The percentage of the children of primary school age attending school rose from 67 percent in 1960 to 78 percent in 1965.

The location and size of population settlements creates, among the people forming such settlements, a differentiation in the living patterns, interrelationships and methods used to secure their subsistence.

In addition to the characteristics stemming from the size of settlement, social and economic elements as well have an important weight in the differentiation of the rural and urban populations. These social and economic elements are: industrialisation, non-agricultural activities, production depending on energy, specialisation, institutionalisation, reduction in the size of the family, deterioration of traditions needed for division of labour, and vertical and horizontal social mobility. Since a population of 10,000 has the characteristics of a city in Turkey it has been selected as the limit to differentiate between a village and city. Based on the assumption, 30 percent of the population lives in cities. There is an increase in the ratio of city population with every successive year.

TABLE 4. URBAN AND RURAL POPULATION RATIOS (%)
(1950-1965)

Years	Urban Population (1)	Rate of Urbanisation (2)	Rural Population (3)
1950	18.5		81.5
1955	22.1	6.5	77.9
1960	26.3	6.5	73.7
1965	29.9	5.1	70.1

The increase in the ratio of urban to rural population is shown in Table 4 as an indicator of urbanisation. At the same time, the number of settlements with the characteristics of a city is also increasing. The number of cities, by their population, is shown in Table 5.

TABLE 5. NUMBER OF CITIES BY POPULATION

Population	1945 (1)	1955 (2)	1965 (3)
10-20.000	62	72	79
20-50,000	30	38	68
50-100,000	6	11	16
100,000 and over	4	6	14

Source: State Statistical Institute

During the period 1960-1965, the annual rate of increase in urban population was 51.5 per thousand, thus exceeding the rate of increase in total population. The increase in the urban population is the result of migration to the cities rather than the difference between births and deaths.

The relation between dwellings and population is also related to settlement. There are 2,36 people per room in Turkey, with 21.8 percent of the urban population living in squatter houses (gecekondu). In 1965 the average family was composed of 5-6 persons, five in the cities and six in the villages.

The censuses are used as a source for calculation of birth rates since there are not sufficient birth and death statistics in Turkey. The approximate birth and death rates are given in Table 6.

TABLE 6. APPROXIMATE BIRTH AND DEATH RATES (Per Thousand)

Years	Death Rate (1)	Birth Rate (2)
1935-1940	19.4	38.3
1940-1945	27.2	37.1
1945-1950	17.6	38.8
1950-1955	14.1	42.2
1955-1960	12.6	44.0

Source: State Planning Organisation

Demographic, social and economic factors play an important role in the changes in the birth rates. The level of the fertile female population effects the number of births. The general changes in the birth rate depend on the proportion of women in the 15-49 age group. When the rate of marriage of these women rises, the births increase in number. While eighty percent of the fertile female population was married in 1960, this ratio was 75.3 percent in 1965. The transition

from agriculture to industry entails a decrease in the birth rate since the large number of children in a family was considered an economic support in the preindustrial society. Child-women ratios, which are another indicator of fertility, prove this difference between the villages and the cities. Child-women ratios are given in Table 7.

TABLE 7. CHILD-WOMEN RATIOS (Per Thousand)

Years	Places with Population Over 10,000 (1)	Places with Population Less than 10,000 (2)	Average for Turkey (3)
1955	565.8	812.0	758
1960	585.4	825.4	762
1965	553.3	790.0	718

Child-women ratios are decreasing with time, indicating the tendency of a decrease in fertility. As explained by the indicators above, this decrease in the result of the changes in the social structure and the changes in the economic importance attributed to children in the family. On the other hand, economic and social development has a faster effect on the reduction of death rates.

Infant mortality is high in Turkey because of poor care and contagious disease. Even in the provincial centres, 30 percent of the deaths are of children less than 1 year old.

Although there is no definite figure for the deaths of children less than one year old, studies indicate that this figure is between 120-150 per thousand.

The reduction in infant mortality is connected with reduction of the overall death rate and longer life expectancy. The increases in life expectancy are given in Table 8.

TABLE 8. AVERAGE LIFE EXPECTANCY AT BIRTH (1935-1965)

Periods	Male (1)	Female (2)	Both (3)
1935-1940	42.3	47.3	44.9
1940-1945	33.5	35.6	34.5
1945-1950	42.2	50.4	46.3
1950-1955	50.7	54.8	52.7
1955-1960	53.7	56.6	55.7
1960-1965(*)	56.1	59.2	57,6

Source: State Planning Organisation

(*) According to another estimate which accepts a higher infant mortality, these figures are 51.8 for males and 53.4 for females.

Development of the Turkish Population:

When estimates for the First Five-Year Plan were made, careful consideration was given to factors like the effects of workers abroad on the population, the fertile female population and the fact that the exact results of the 1960 census would not be ready in time to be utilised. With these considerations and the available information, it is clear that the level of fertility for the 1960-1965 period should not be included in estimates made for the future. The birth rate adjusted as to age and sex and used in the above mentioned estimates was 440,6 per thousand for the 1960-1955 period. However, based on the definite results of the 1960 census and on 1965 sampling results, this figure has been calculated as 41.3 per thousand. Therefore, in the new projections a high fertility rate has been used for all periods. In medium and low fertility projections, the high fertility rate has been decreased by 5 percent and 10 percent, respectively, for each five-year period beginning from 1965.

It is not necessary to make a change in the factors used for the calculation of death rates. Part of the workers that went to foreign countries in the 1960-1965 period are expected to return. But it is assumed that workers will continue going abroad, though at a slower rate. A fall in the fertility level is expected in the long run because of social and economic factors which are caused by the rapid social change, urbanisation tendencies and family planning. Therefore, estimates used in the Second Plan are based on the assumption of medium fertility.

TABLE 9. ESTIMATE OF THE DEVELOPMENT OF THE TURKISH POPULATION (1965-1985) (Per thousand)

Population	1965 (1)	1967 (2)	1970 (3)	1972 (4)	1975 (5)	1980 (6)	1985 (7)
High Fertility(*)	31,391	33,091	35,603	37,801	41,005	47,[illegible]	55,[illegible]
Medium Fertility	31,391	32,[illegible]	35,5[illegible]	37,469	40,420	45,767	52,[illegible]
Low Fertility	31,391	32,[illegible]	35,[illegible]5	36,855	39,375	43,874	46,[illegible]
Rate of Increase:							
High Fertility	26,6		27,5		29,4	31,3	
Medium Fertility	25,1		26,1		25,2	25,9	
Low Fertility	23,5		22,2		21,9	21,7	
Approximate Birth Rate:							
High Fertility	35,5		35,9		36,7	37,5	
Medium Fertility	34,6		34,5		33,4	32,2	
Low Fertility	33,4		30,5		29,2	28,2	
Approximate Death Rate:							
High Fertility	9,9		8,4		7,3	6,2	
Medium Fertility	9,7		8,4		7,2	6,3	
Low Fertility	9,9		8,3		7,3	6,5	

Source: State Planning Organisation

(*) According to another study, at this rate of fertility the population will be 31,391, 32,894, 36,034, 37,927, 41,891, 49,285, 58,568, respectively, by the indicated years.

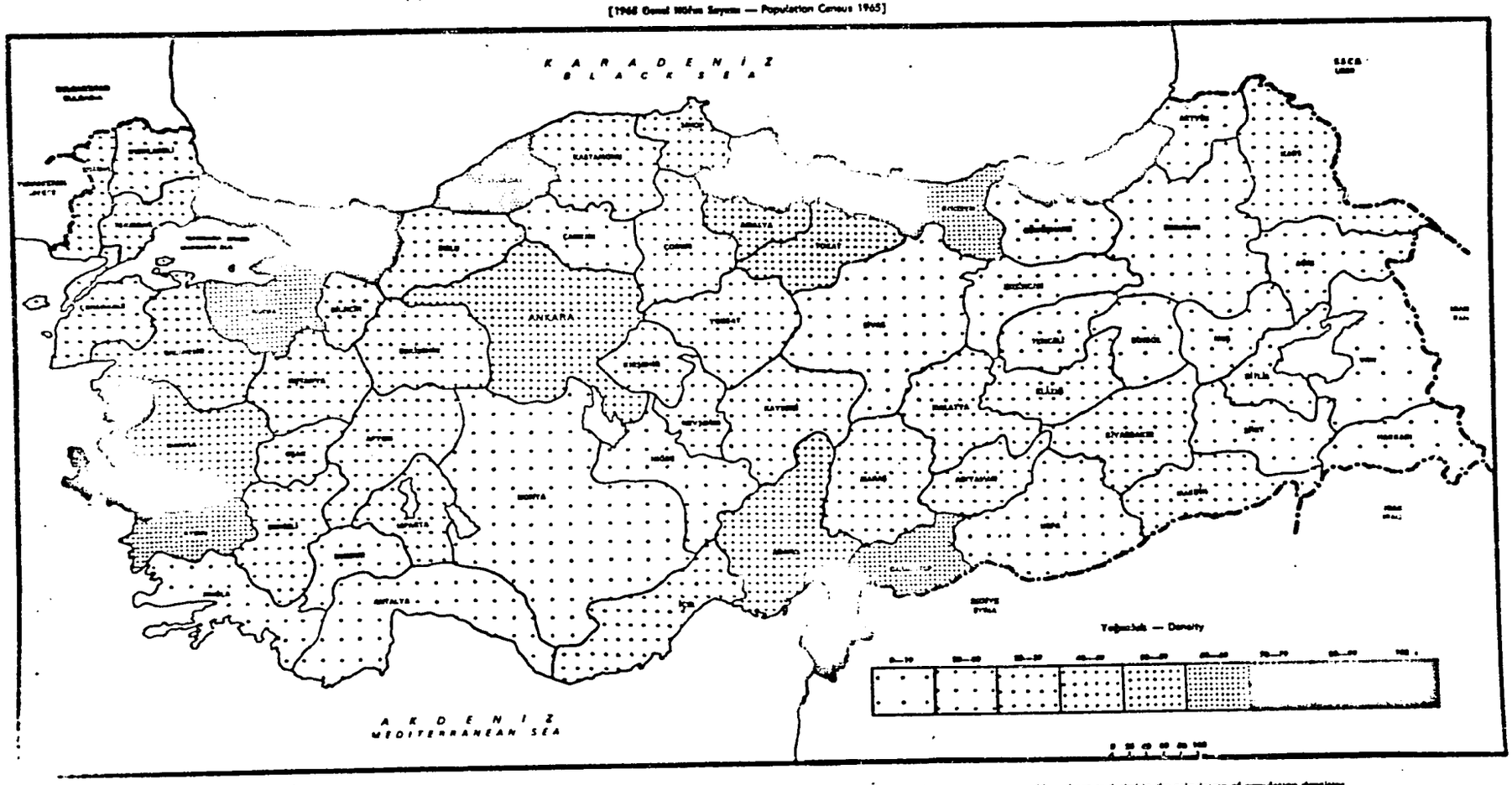
TABLE 10. ESTIMATES OF THE AGE COMPOSITION OF TURKEY (Per thousand)

	1965 (1)	(%) (2)	1970 (3)	(%) (4)	1975 (5)	(%) (6)	1980 (7)	(%) (8)	1985 (9)	(%) (10)
0-14										
High Fertility	13,337	42,5	14,966	41,8	16,772	40,8	19,438	41,0	23,118	41,8
Medium Fertility	13,337	42,5	14,691	41,4	16,137	39,9	17,803	38,9	20,102	38,7
Low Fertility	13,337	42,5	14,448	40,9	15,002	38,3	15,910	36,3	17,165	35,2
15-64										
High Fertility	16,767	53,5	19,749	55,8	22,404	54,6	25,767	54,4	29,257	54,2
Medium Fertility	16,767	53,5	19,949	54,1	22,404	55,4	25,767	56,3	29,691	57,1
Low Fertility	16,767	53,5	19,249	54,6	22,404	56,9	25,767	56,6	29,445	60,3
65 and Over										
High Fertility	1,267	4,0	1,589	4,4	1,879	4,6	2,177	4,6	2,217	4,6
Medium Fertility	1,267	4,0	1,589	4,5	1,879	4,7	2,177	4,8	2,217	4,2
Low Fertility	1,267	4,0	1,589	4,5	1,879	4,8	2,177	4,9	2,217	4,5

Source: State Planning Organisation

(4) IV. İLLERE GÖRE NÜFUS YOĞUNLUĞU — POPULATION DENSITY BY PROVINCE

[1965 Genel Nüfus Sayımı — Population Census 1965]



NOT Yoğunlukların hesaplanmasında büyük göllerin yüzölçümleri hesaplanmamıştır.
Sınıf aralıkları yoğunluk dağılımına gösterdiği eğilime göre saptanmıştır.

NOTE Lakes of which the surface areas are measured have been excluded in the calculation of population densities.
Class intervals are determined according to the trend of the frequency distribution.

6 VE DAHA YUKARI YAŞLARDAKİ OKURYAZAR NÜFUS
LITERATE POPULATION 6 YEARS OLD AND OVER

(4) Tablo II
(4) Table II

[Sayım yılları — Census year]

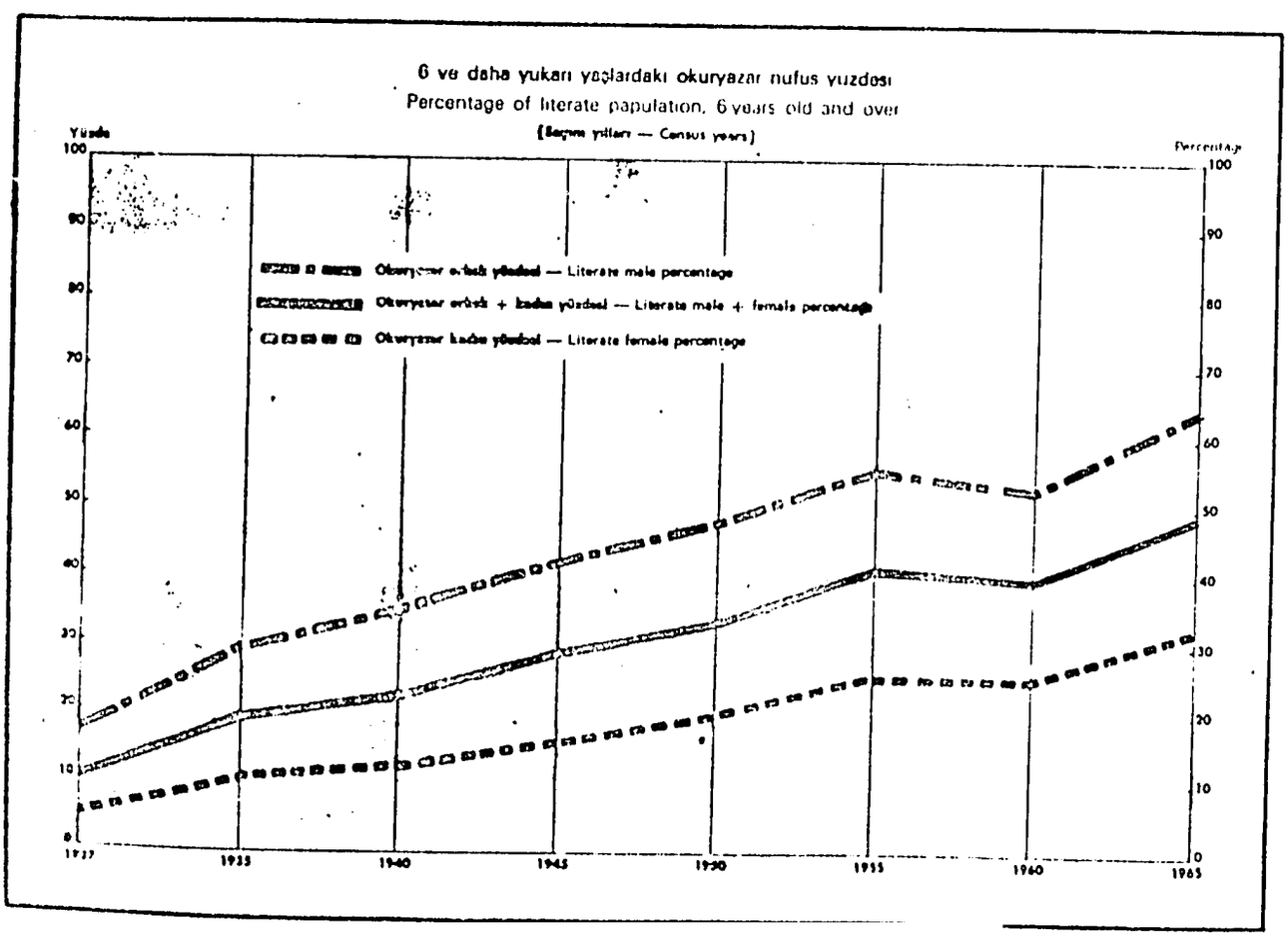
T. Toplam E. Erkek K. Kadın — *T. Total E. Male K. Female*

Bin — Thous.

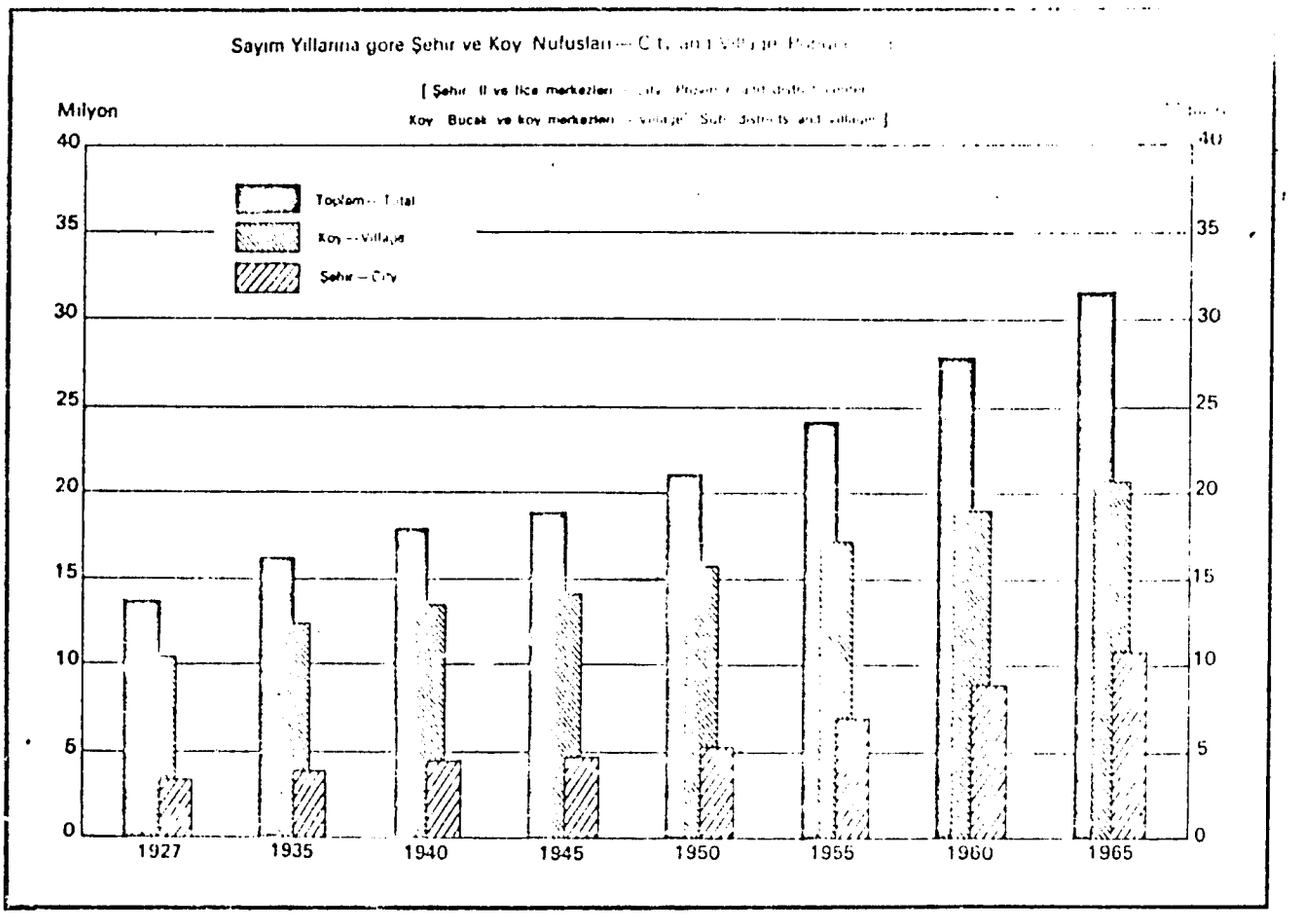
		1927	1935	1940 (1)	1945	1950	1955	1960	1965
Toplam nüfus — Total population	T	13 648	16 158	17 821	18 790	20 947	24 065	27 755	31 391
	E	6 564	7 937	8 899	9 446	10 527	12 234	14 164	15 997
	K	7 084	8 221	8 922	9 344	10 420	11 831	13 591	15 394
6 ve daha yukarı yaşlardaki nüfus *Population 6 years old and over*	T	10 516	12 863	14 574	15 714	17 194	19 367	22 542	25 664
	E	4 895	6 213	7 198	7 847	8 607	9 820	11 491	13 073
	K	5 621	6 650	7 376	7 867	8 587	9 547	11 051	12 591
6 ve daha yukarı yaşlardaki okuryazar nüfus — *Literate population 6 years old and over*	T	1 112	2 476	3 268	4 557	5 780	7 915	8 901	12 505
	E	852	1 823	2 439	3 292	4 055	5 479	6 158	8 572
	K	260	653	829	1 265	1 725	2 436	2 743	4 133
Okuryazar nüfus yüzdesi — *Percentage of literate population*	T	10.6	19.2	22.4	29.0	33.6	40.9	39.5	48.72
	E	17.4	29.3	33.9	41.9	47.1	55.8	53.6	64.04
	K	4.6	9.8	11.2	16.1	20.1	25.5	24.8	32.82

(1) % 2,5 örnekleme — 2,5 % *Sampling*

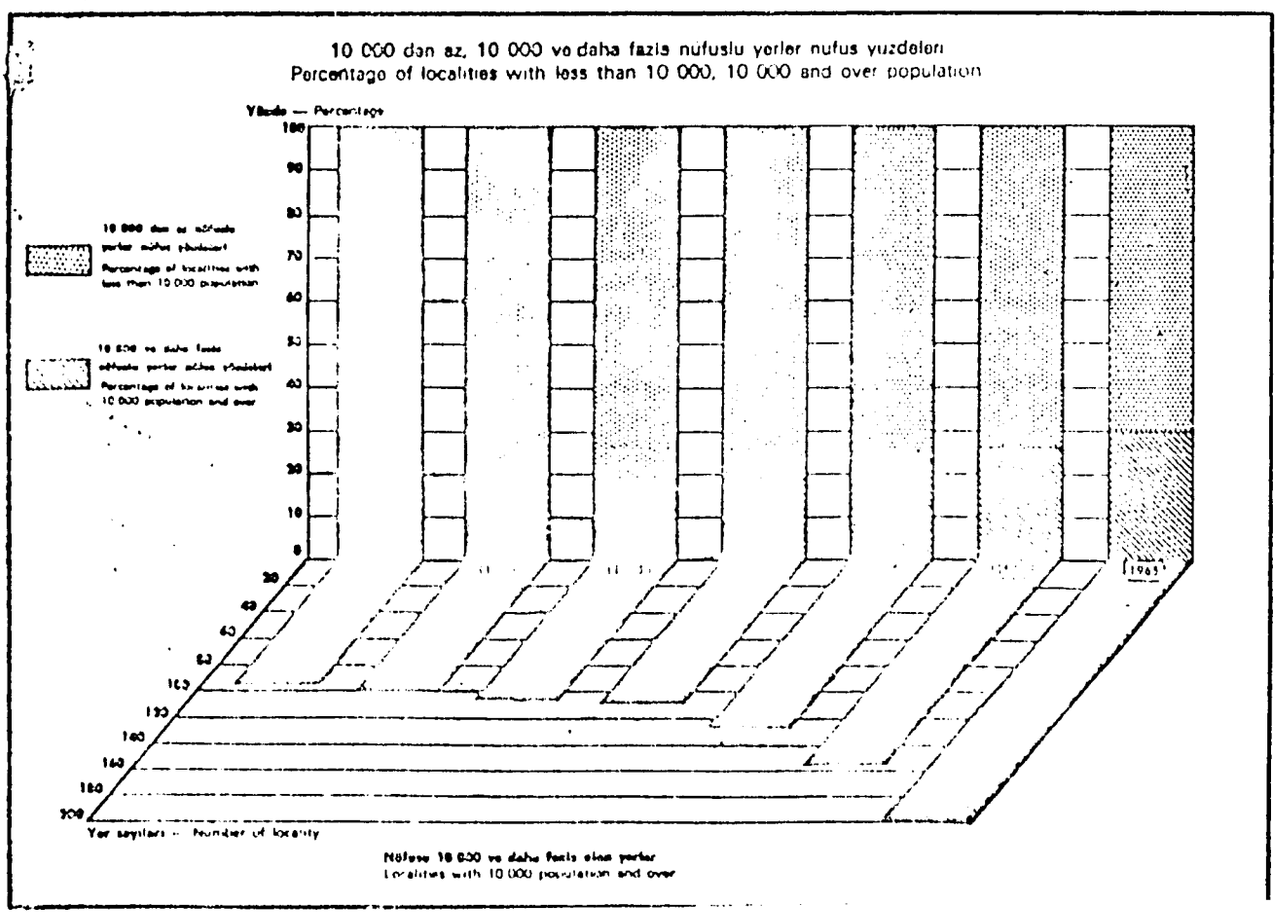
(4) Diagram I.



(4) Diagram II.



(4) Diagram III.



5. RURAL DWELLING INVENTORY

5.1. INTRODUCTION TO THE PROBLEM OF HOUSING

5.2. PROGRESS OF THE NUMBER OF RURAL DWELLING UNITS

5.3. RURAL DWELLINGS FROM THE POINT OF VIEW OF SETTLEMENT SHELTERING DENSITY

5.4. NUMBER OF ROOMS IN RURAL DWELLINGS

5.5. STRUCTURAL CONDITION OF RURAL DWELLINGS

5.6. HEALTH AND SANITARY CONDITIONS IN RURAL DWELLINGS

5.7. RURAL DWELLINGS AS REAL ESTATE AND RENTAL

5.8. PRODUCTION OF DWELLINGS IN RURAL REGIONS

5.9. HOUSING PROBLEM FROM THE POINT OF VIEW OF DEMOGRAPHIC CONDITIONS

5.10. ANNUAL HOUSING REQUIREMENTS IN VIEW OF DIFFERENT FACTORS

APPENDICES

(5.2) Fig. 1 - Growth of Rural Dwellings' Manufacturing
(5.3) Fig. 2 - Number of Persons in Rural Dwellings
(5.4) Fig. 3 - A typical Rural Dwelling Plan
(5.4) Fig. 4 - Number of Rooms in Rural Dwellings

5.1. INTRODUCTION TO THE PROBLEM OF HOUSING

"Dwelling", which is one of the basic rights of man is one of the most important factors of social life. Therefore it has a very close relationship with socio-economic conditions.

The following clauses from the 49th Chapter of the Constitution of the Republic of Turkey pertain to the solution of this problem:

"-State is responsible for the physical and psychological well-being of all its constituents as well as their medical care."

"-State takes necessary measures to provide low income families with dwellings fulfilling proper health requirements."

In general, the following factors influence the quality and quantity of dwelling potential in Turkey:

1. Population increase,
2. Urbanization tendencies due to efforts of industrialization, population transfers,
3. Regional availability of construction material,
4. Proximity to production centres of construction material of the urban type,
5. Socio-economic capacity of the region,
6. Construction traditions of the region (from the point of view of design and technology).

Within the framework of all the above factors, dwellings are being built not only to provide a shelter, but also to create the physical basis of a social and cultural surrounding in which the man of tomorrow will be raised and will live.

Generally rural dwellings are built with regional possibilities (material and workmanship) and their quality depends on their proximity to centres of production of construction material.

Aside from certain regions and certain reasons, services of architecture and engineering cannot be taken to rural dwellings and the State does not reach these areas.

If constructed properly it is an expensive product. Therefore its ownership should require State participation and control.

Therefore, directly or indirectly State is obliged to furnish this product.

5.2. PROGRESS OF THE NUMBER OF RURAL DWELLING UNITS

According to the 1960 census:

Number of dwelling units in towns with population 10,000 or more	1,879,032
Number of dwelling units in places with population 10,000 or less	3,374,093
Total dwelling units in Turkey.	5,253,125

The number of dwelling units in villages and rural areas is 3,136,700. Hence, of the total dwellings 59.71- 60%, and of the dwellings located in places with population 10,000 or less, 92.9-93% can be classified as rural.

In 1965: Rural type dwellings numbered 3,464,542 with an increase of 10.4%

In 1970: It is estimated that this number reached 3,878,996(*) with an increase of 12% (Fig.1).

(*) As a result of industrialization-urbanization, there is also the problem of squatters' settlements aside from urban and rural dwellings. There are about 550,000 - 600,000 dwellings of this type in Turkey.

5.3. RURAL DWELLINGS FROM THE POINT OF VIEW OF SETTLEMENT SHELTERING DENSITY

Average number of persons per dwelling in villages:

5.07 in 1965 while in 1960 this was 6.02. In the same years, in the cities average number of persons per dwelling was 5.07 in 1960 and 5.00 in 1965.

Number of persons per room was 2.70 in 1960 and 2.66 in 1965 in the villages, showing a small decrease. In the cities this number stayed constant at 2.05 for both 1960 and 1965.

The distribution of dwellings in places with less than 5,000 population with respect to the number of persons living in them is given in Table 1 and Figure 2. These are according to the definitive results of the 1963 census.

5.4. NUMBER OF ROOMS IN RURAL DWELLINGS

In the villages, number of rooms per dwelling was 2.23 in 1960 d it stayed almost constant and was 2.24 in 1965.

These two-roomed dwellings, from which the prototypes are illustrated, ...e made of piled masonry (stone or adobe) and constituted 35% of the total number of dwellings (in places with population less than 5.000) in 1963.

If 'S' is the total area of the dwelling, then it can be expressed by the relationship:

$$S = 2 \cdot S_{room} + S_{hall}$$

$$S_{room} = 0.445\ S \qquad S_{hall} = 0.11\ S$$

In other words, two symmetrical rooms on either side of a hall which constitutes 25% of the room areas make up the type of dwelling which is most widely used in Turkey (Figure 4).

Our inventories and plans also concur with this result. This is due to the facility of construction of this type of dwelling within the present socio-economic conditions and available material (Fig. 3).

In Table 2 and Figure 4, the distribution of dwellings in places with population less than 5,000 with respect to the number of rooms, are illustrated according to the definitive results of the 1960 census.

5.5. STRUCTURAL CONDITION OF RURAL DWELLINGS

According to the results of the 1960 census, the following classification is made for village dwellings:

50%	good condition (*)
19.5%	repairable (**)
31.5%	bad condition (***)

According to the results of the 1963 census the same figures are as follows:

55.85%	good condition
27.4%	repairable
16.75%	bad condition

(*) Dwelling in good condition: Dwellings whose load carrying system and roof are in good condition, and which have uncracked walls.

(**) Repairable dwelling: Dwellings whose load carrying walls do not contain obvious cracks, roof and bracings need some attention and can be repaired at reasonable cost.

(***) Dwelling in bad condition: Dwellings whose load carrying system has cracks and floor has caved in. The roof is bent and can be repaired only at high cost.

5.6. HEALTH AND SANITARY CONDITIONS IN RURAL DWELLINGS

According to the 1963 census the following conditions exist for rural dwellings:

79.74% of the dwellings have no kitchen and 26.85% of them have no toilet. 51.76% have the toilet outdoors.

Also 97.76% of rural dwellings have no running water and 97.59% have no electricity. In other words only 2.24% of rural dwellings have running water and 2.41% have electricity.

Aside from this, 16,400 families live in caves, and tents which cannot be classified as house-dwellings. (This is also mentioned in the locative evolution of rural dwellings).

5.7. RURAL DWELLINGS AS REAL ESTATE AND RENTAL

While the ratio of rental rural dwellings was 4.00%, this ratio has gone up to 5.97% in 1965.

The fact that this ratio has gone up almost 50% in a five-year period can be interpreted as an indication of the increase in social activity in rural areas.

5.8. PRODUCTION OF DWELLINGS IN RURAL REGIONS

Year	Increase in Rural Population	Family Size	Net Increase in the Number of Dwellings	Net Increase per 1,000 Persons
1961	322,000	6.02	55,150	2.87
1962	334,000	6.00	55,670	2.85
1963	337,000	6.00	56,170	2.82
1964	339,000	5.99	56,590	2.80
1965	345,000	5.97	57,790	2.81

During the last ten years, the average total housing requirement due to the population growth was estimated around 163,000 unit dwelling a year from which 119,000 at the urban regions, and 44,000 at the rural regions. This estimation is based upon the average number of persons per dwelling, known as 5.97 for rural population and 5.00 for urban population. For the most recent period, the second five years planned development period of 1968-1972, the average requirement of dwelling per year is estimated of the order of 44,600.

B. Renovation:

The increase of requirement due to the need of renovation of the existing dwellings is quite important too. At the beginning of the second five years' period of planned development 1968-1972, total unit dwelling existing in Turkey has been known as 3,745,800. The dwellings in good condition constituted only 50% of this total. A percentage of 19.5% was corresponding to the repairable houses and 30.5% of the houses in poor service condition. Putting a 75 years of average service duration for dwellings in good condition, 50 years average for repairable dwellings and 25 years average for houses in poor construction service condition, the requirement due to the renovation needs, per year can be approximated as:

$$\frac{1,873,000 \times 80}{100 \times 50} + \frac{730,500}{35} + \frac{1,142,000}{25} = 73,400$$

C. Natural Disasters:

The housing requirement due to the natural disasters, has been computed for the period of 1960-1965, as 7,000 rural dwellings a year. But most of ruined dwellings by natural disasters belong to the group of dwellings in poor condition. Finally, a requirement of only 2,000 a year in addition to the requirement due to other factors can be taken into consideration.

Nevertheless, the requirement due to the natural disaster effects was increased in the last five years during which the seismic activity of Turkey reached a peak for several past decades. Then it might be considered that the requirement due to the natural disasters' effect is doubled now, for a temporary period.

D. Conclusion:

As a result of all these factors, it may be concluded that the total annual number of rural dwellings needed is:

$$44,600 + 73,400 + 2,000 = 120,000$$

1963 "Rural Dwelling Census" results confirm this conclusion.

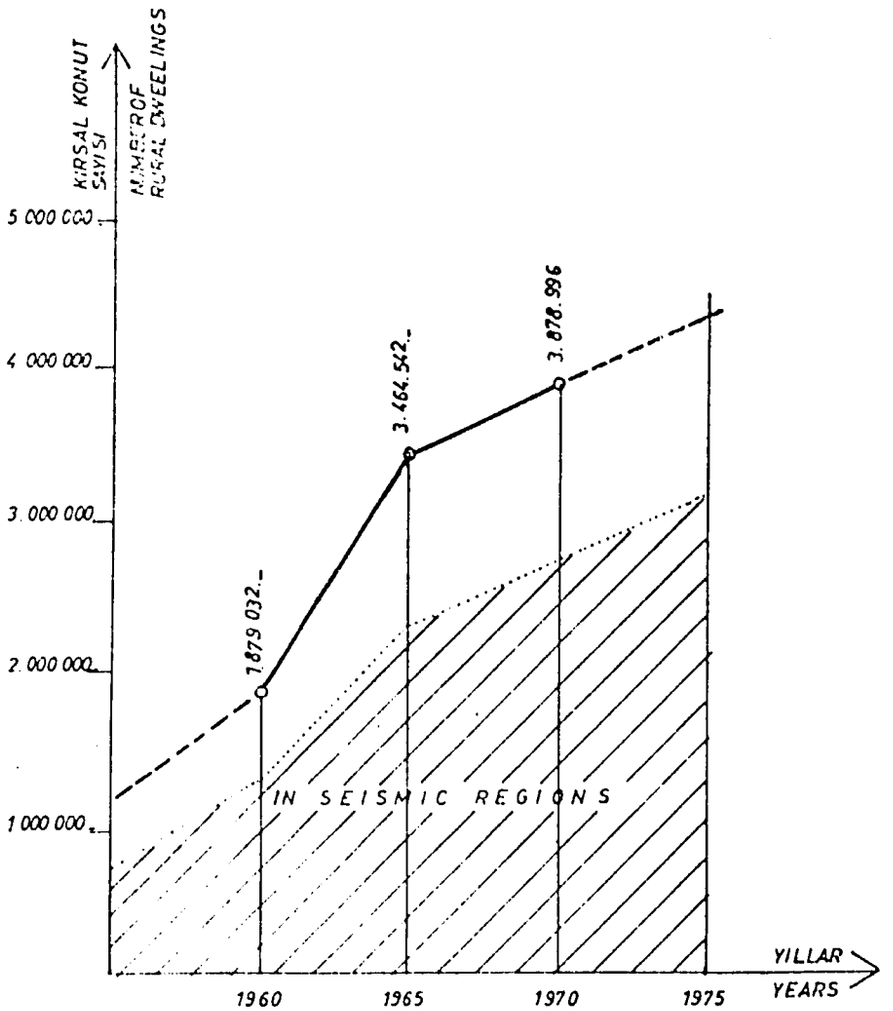
Assuming that half of this amount can be constructed by people with their own means, then the required number of rural dwellings that the State should construct or finance decreases to 60,000.

(5.3) TABLE 1. DISTRIBUTION OF NUMBER OF DWELLINGS WITH RESPECT TO THE NUMBER OF PERSONS PER DWELLING IN PLACES WITH POPULATION LESS THAN 5,000 (1963)

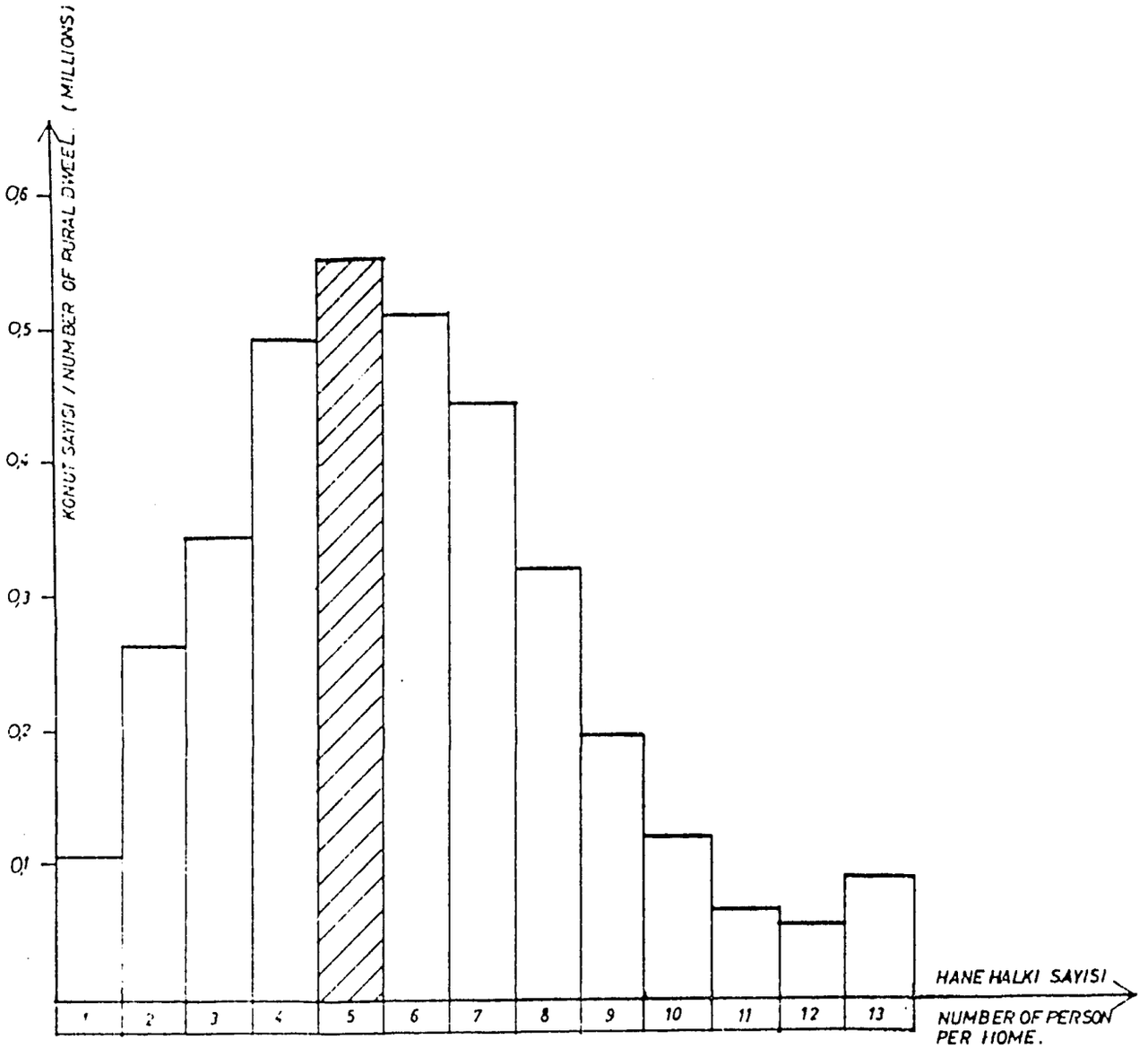
Number of Persons per Dwelling	Number of Dwellings
1	101,350
2	264,323
3	341,753
4	496,075
5	546,229
6	511,904
7	431,926
8	313,815
9	183,062
10	103,557
11	57,882
12	52,312
13 and	91,159
TOTAL	3,495,347

(5.4) TABLE 2. DWELLINGS IN PLACES WITH POPULATION LESS THAN 5,000 WITH RESPECT TO THE NUMBER OF ROOMS (1963)

Number of Rooms	Number of Dwellings	%
1	795,764	22.76
2	1,244,981	35.62
3	759,814	21.74
4	441,171	12.62
5	124,591	3.56
6	81,627	2.34
7 and more	47,399	1.36
TOTAL	3,495,347	100



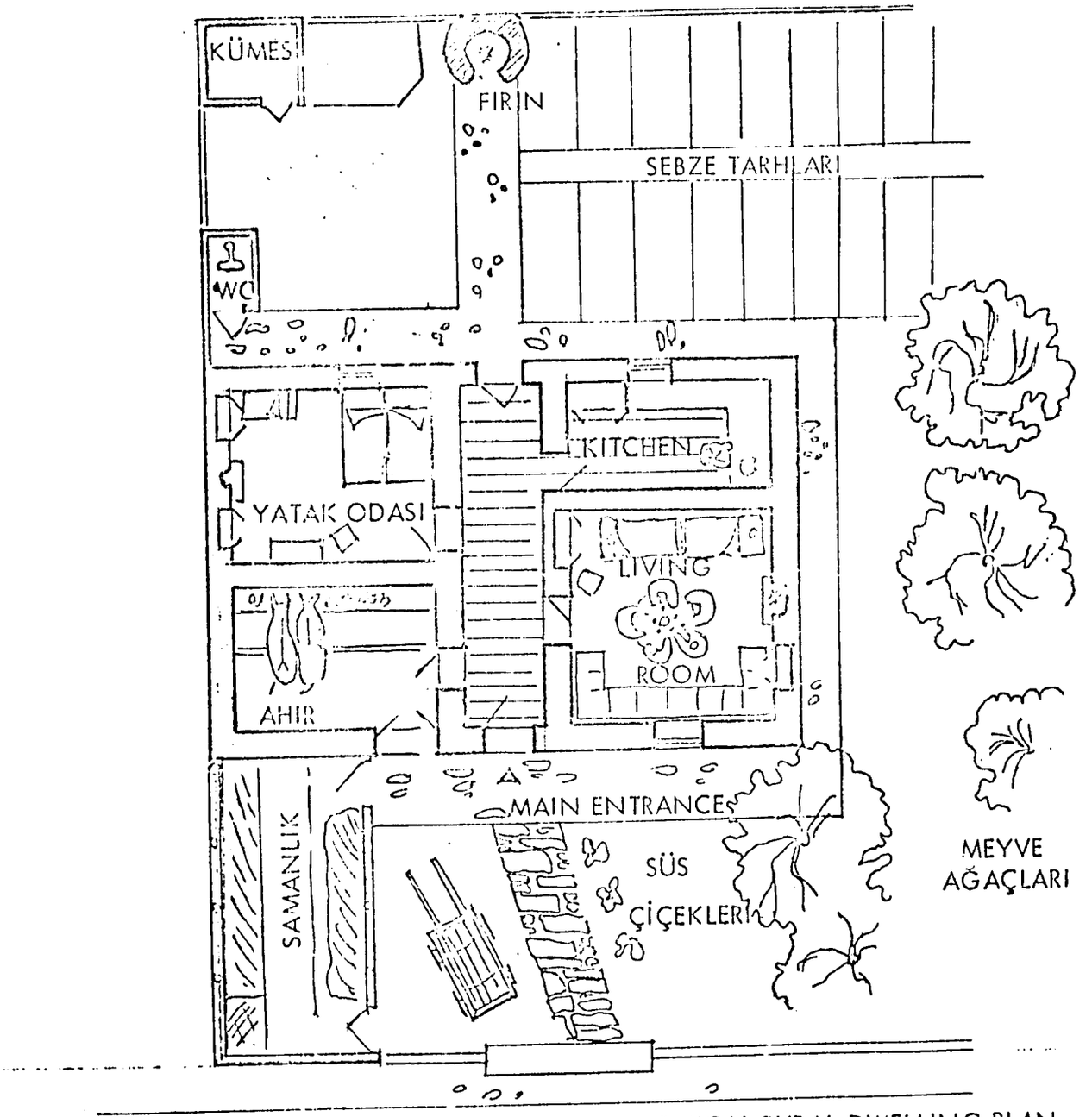
Kırsal Konut Üretiminin Yıllara göre artışı / Growth of Rural Dwellings' manufacturing.



(5.3) Şekil: 2 / Figure: 2

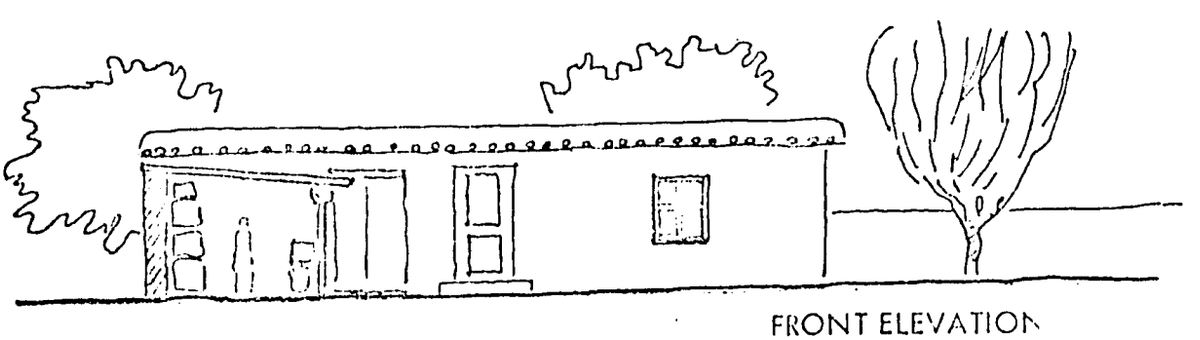
Kırsal Konutta Hane Halkı Sayısı Durumu (1963)

(Number of Person in Rural Dwellings - 1963)

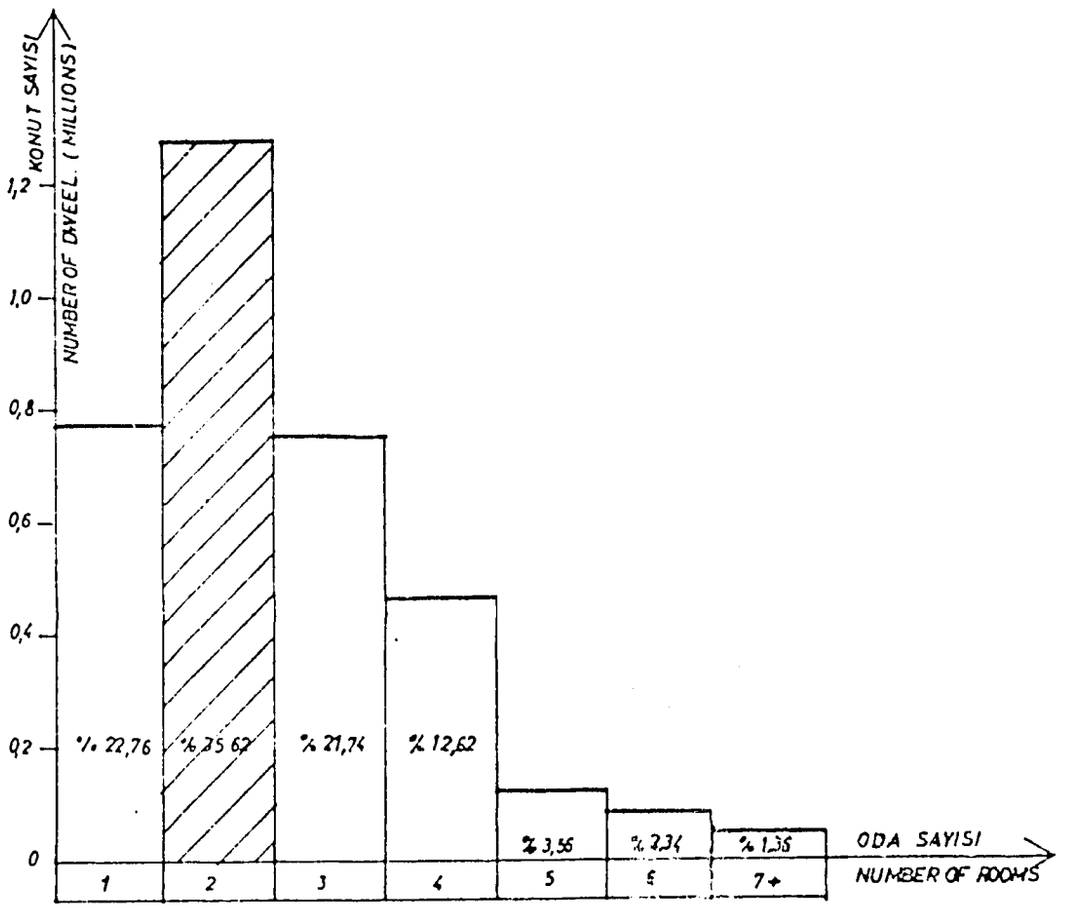


A TYPICAL RURAL DWELLING PLAN
(MEDIUM SIZE)(CENTRAL ANATOLIA)

(5.4) şekil: 5 / figure: 5

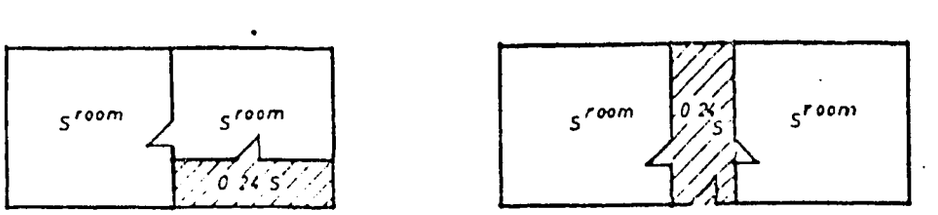


FRONT ELEVATION



(5.4) Şekil: 4 / Figure: 4

Kırsal Konutta Oda Sayısı Durumu (1963) / Number of Rooms in Rural Dwellings (1963)



Tipik Kırsal Konut Plan Tipi (İstatistiki bilgilere göre)

(Typical Rural Dwelling's plan -according to the statistical knowledges-)

6. THE HORIZONTAL EXPANSION AND THE INCREASE IN HEIGHT OF RURAL DWELLINGS

6.1. SOME IDEAS ON THE SOURCES OF THE TURKISH RURAL DWELLING TYPE

6.2. PROTOTYPE OF RURAL DWELLINGS

6.3. THE TENDENCY TOWARD ERECTING A NEW HOUSE FOR A NEW FAMILY AND THE HORIZONTAL EXPANSION OF RURAL DWELLINGS

6.4. THE POSSIBILITY OF INCREASING THE HEIGHT OF RURAL DWELLINGS

6.5. RESULTS - COMMENTS

6. THE HORIZONTAL EXPANSION AND THE INCREASE IN HEIGHT OF RURAL DWELLINGS

In the preceding section, the population density in rural dwellings were studied in detail. In this section the horizontal expansion and the increase in height of the rural houses, due to the increase in the size of families will be examined.

6.1. Some Ideas on the Sources of the Turkish Rural Dwelling Type

The first Turkish tribes coming to Anatolia were composed of nomadic people living in tents or even in caves and wandering around continuously because of climatic, agricultural, political and other reasons, to find the most suitable place to live.

Even today, in certain regions of Turkey where the conditions are unfavourable, these types of dwellings can be seen (according to the results of 1965 census, 16,400 families are living in such dwellings) (Fig.1).

6.2. Prototype of Rural Dwellings

In time, tent type of housing developed into one-room dwelling unit with walls made of adobe and roofs made of branches and rushes (Fig.2).

6.3. The Tendency Toward Erecting a New House for a New Family and the Horizontal Expansion of Rural Dwellings

In general, in rural regions, it is a common tradition in Turkey to build a new house when a son gets married in a family, instead of adding new units to the old one. As a result of this, the horizontal expansion of houses has been limited and a new dwelling type (2 rooms +

1 hall) has developed. When there is a shortage of field, the horizontal expansion of the main unit or the increase in height can possibly take place. The maximum horizontal expansion of a single storey house is shown in Figure 2.

As it is seen from the classification of rural dwellings, given in Section 5, the most common type of dwelling unit in rural regions is the one with 2 rooms and one hall. This fact clearly shows the above mentioned limitation in the horizontal expansion.

The largest houses (in horizontal direction) have 4 rooms and one hall (Fig. 2).

6.4. The Possibility of Increasing the Height of Rural Dwellings

According to the results of 1963 census, out of 3,495,347 rural dwellings, 1,920,194 have one storey (58%), 1,432,358 have 2 storeys (41%), and 28,505 have 3 or more storeys (1%).

The construction of several storeys of rural dwellings is commonly practiced in Northern and Western Anatolia and in the surroundings of Marmara region where it is possible to build framed structures. In the Central and Eastern Anatolia, it is technically impossible to build a second storey on the single storey houses having soil roofing (Fig.3).

In the two-storey houses, the first storey is generally used as stable or store-room and the second storey is used by the people.

6.5. Results-Comments

In Turkey the horizontal expansion of rural dwellings is restricted because of socio-economic conditions. People prefer to build a new unit, instead of adding divisions to an old one.

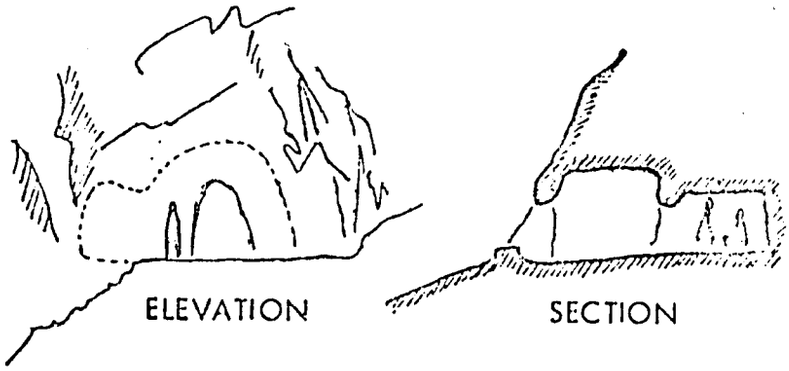
The increase in height is only possible in regions where technical conditions are favourable. In such cases each storey is occupied by a family.

The results obtained from census confirm these facts: 58 percent of the rural dwellings in Turkey have one storey (57.6 percent of these having 1 or 2 rooms), 41 percent have two, and 1 percent have three or more storeys.

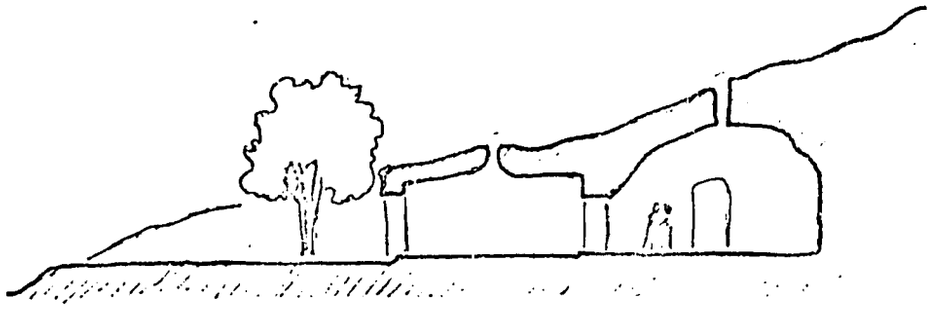
HORIZONTAL AND SPACE DEVELOPMENT OF TURKISH RURAL DWELLINGS.

(6) Şekil I
(6) Figure I

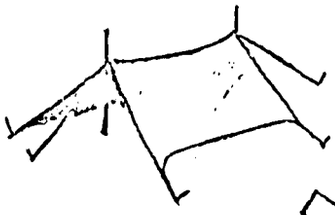
PRIMITIVE DWELINGS...



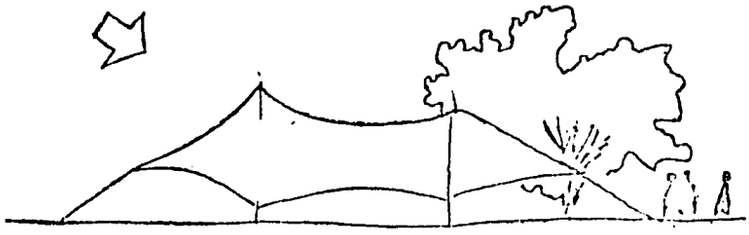
KAYA İÇİNE OYULMUŞ KONUTLAR
NEVŞEHİR BÖLGESİ



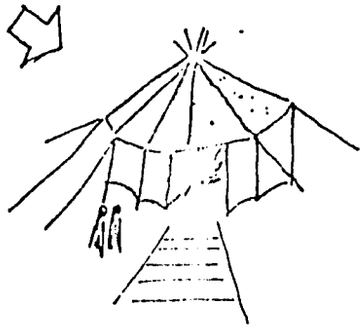
TOPRAK ALTINDA OLUŞMUŞ KONUTLAR
HAKKARİ BÖLGESİ



YÖRÜK
ÇADIRI

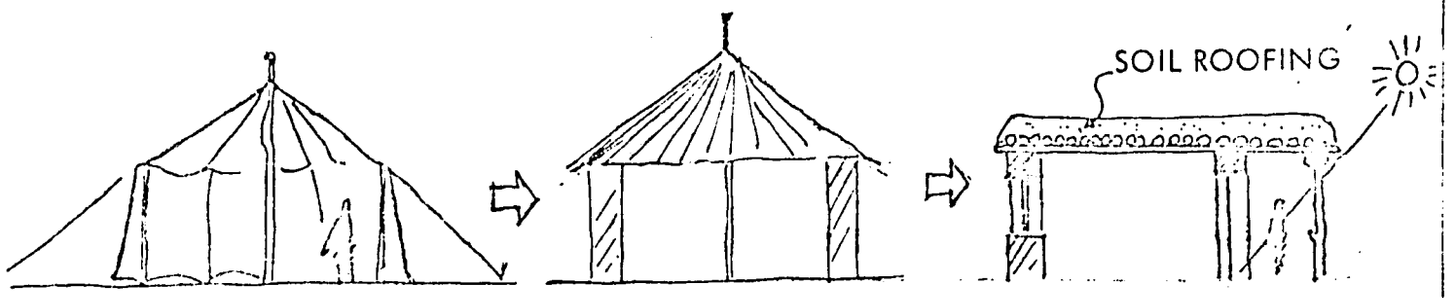


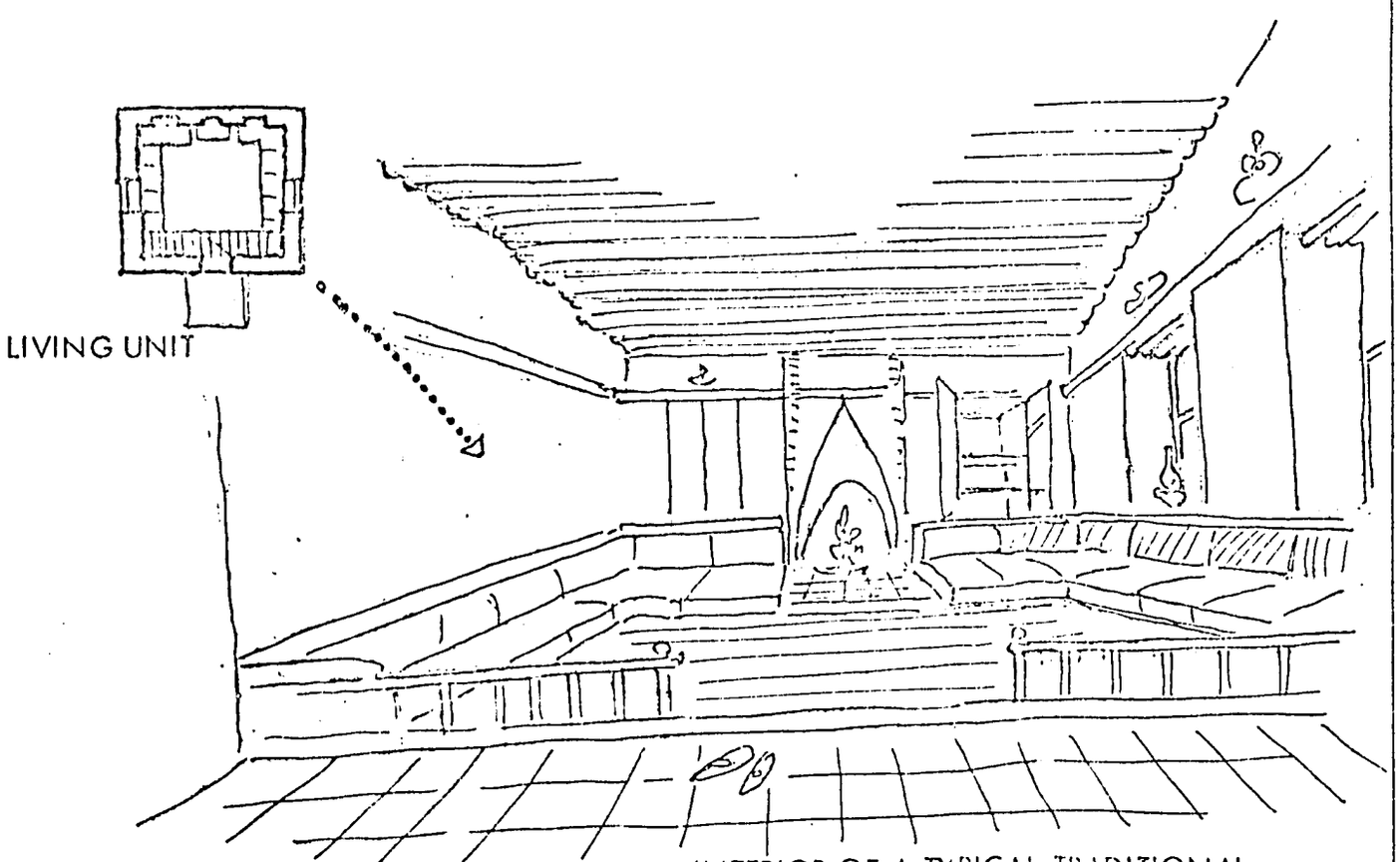
TOROSLAR - KARA ÇADIR



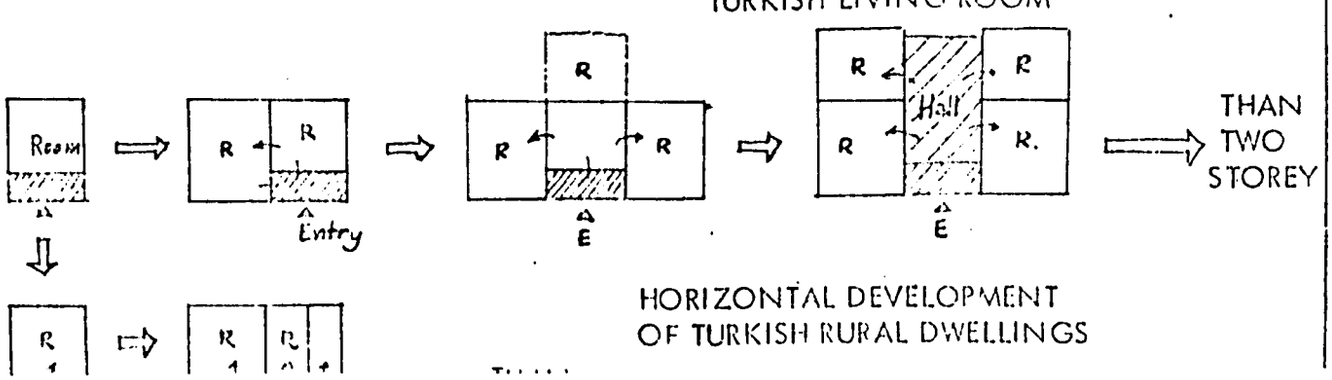
HORIZONTAL AND SPACE DEVELOPMENT OF TURKISH RURAL DWELLINGS.

(6) Şekil 2
(6) Figure 2





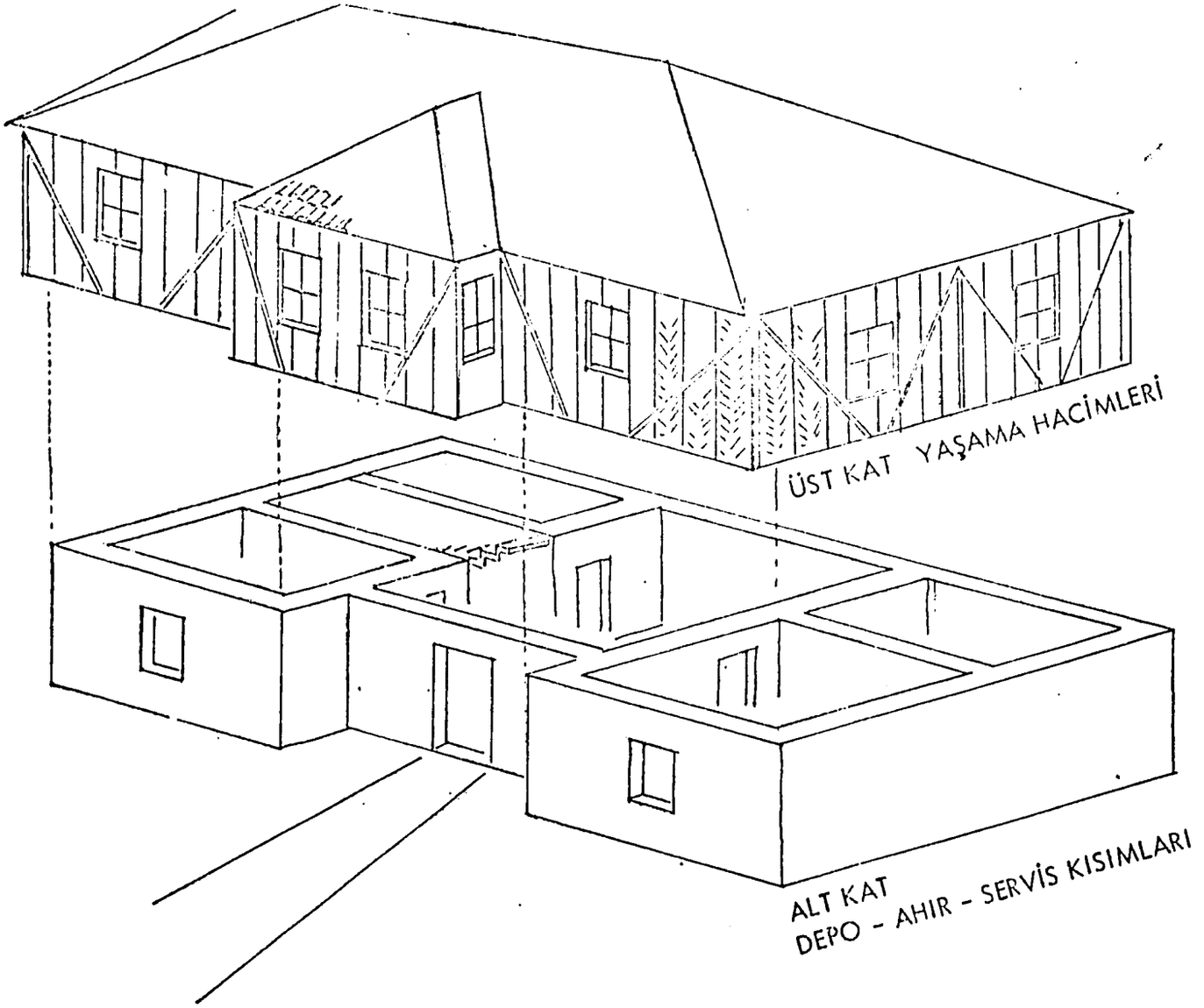
INTERIOR OF A TYPICAL TRADITIONAL TURKISH LIVING ROOM



HORIZONTAL DEVELOPMENT OF TURKISH RURAL DWELLINGS

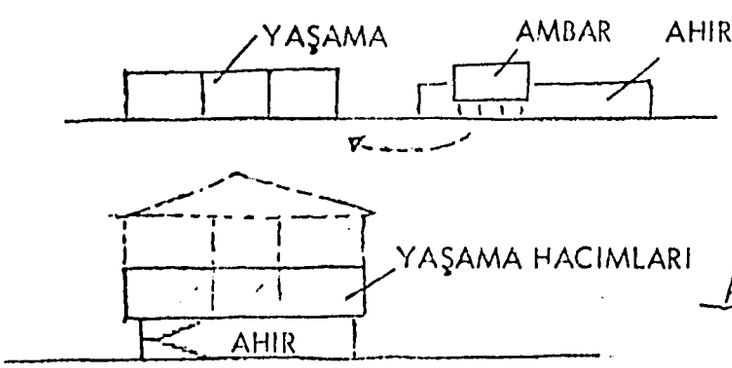
VERTICAL DEVELOPMENT OF TURKISH RURAL DWELLINGS

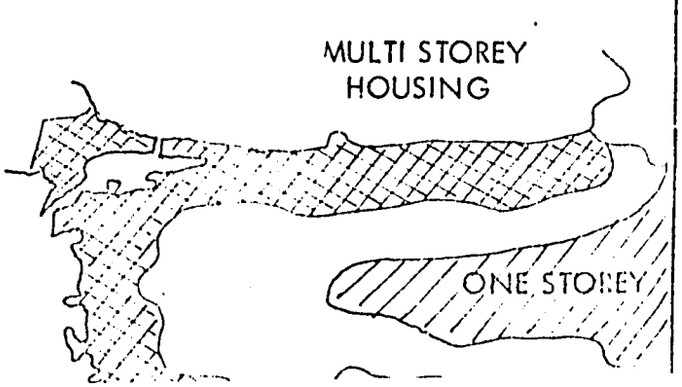
(6) Şekil 3
(6) Figure 3



VERTICAL DEVELOPMENT OF TURKISH RURAL DWELLINGS

Not: Üst katların inşaası bir konstrüksiyon problemi de olduğu için (ahşap) mevcut olan bölgelerde daha çok gelişmiştir.





7. INFRASTRUCTURE IN RURAL AREAS OF TURKEY

7.1. INTRODUCTION

7.2. GOVERNMENTAL ORGANIZATION

7.3. PLANNING ASPECTS

7.4. PLANNED SERVICES AND ESTIMATED INVESTMENTS

7. INFRASTRUCTURE IN RURAL AREAS OF TURKEY

7.1. INTRODUCTION

Such infrastructures as drinking water, road and electric networks are of vital importance in promoting economic, social and cultural development in rural areas.

At present, of the total villages 80% lack in roads, 60% lack in drinking water and 98% lack in electric energy. It is believed that these major gaps can only be filled through a keen planning, followed by serious implementation.

The State's activities in this respect stem from the related articles of the Turkish Constitution (Ref. 1), especially from Article 41 thereof, which reads:

> "The economic and social life shall be regulated with such an aim as to assure a standard of living for everyone, conforming the human dignity, adhering to the principles of justice and full employment.
>
> It is the State's duty to assure economic, social and cultural development through democratic processes, to enhance national savings for this purpose, to direct the investments within a priority system aiming at the public welfare, and to draw up development plans."

Article 53 of the Turkish Constitution reads:

> "The State shall carry out its duties to attain the social and economic goals set forth in this section, only in so far as the economic development and its financial resources permit."

It is needless to say that improvement in rural infrastructure will provide numerous benefits in many respects.

7.2. GOVERNMENTAL ORGANIZATION

The formerly separate units responsible for road, water and electric works (i.e., Directorates of Village Roads, Village Drinking Water and Village Electrification, respectively) were brought together in July 1968, to form a General Directorate of Roads, Water and Electric Affairs (Y.S.S. in short form), under the Ministry of Village Affairs. The branches of this organisation are shown on Map 1. The Ministry of Village Affairs is a Governmental institution mainly involved in the field of infrastructure in rural areas.

Present Situation:

At the beginning of 1968, the inventory of the existing infrastructure services were as follows:

Service	Kind	Quantity	%	Population involved
VILLAGE ROADS Quantity: km.	Stabilised	33,055	20.4	
	Levelled	35,108	21.6	
	Raw	93,892	58.0	
	TOTAL	162,055	100.0	
VILLAGE DRINKING WATER Quantity: No. of Villages	Villages with sufficient water	26,183	40.1	8,158,132
	Villages without sufficient water	39,094	59.9	11,410,165
	TOTAL	65,277	100.0	19,568,297
VILLAGE ELECTRIFICATION Quantity: No. of villages	Villages electrified	906	2.5	450,000
	Villages not electrified	34,971	97.5	19,118,977
	TOTAL	35,877	100.0	19,568,297

At present, rural population lives in 65,277 settlements of various sizes. 35,877 of them are covered by the village definition given in the Village Act. The remaining 29,400 are connected or individual settlements such as separated districts, farms, etc.

Such services as road, water and electricity could not be supplied yet to most of these settlements. The above table (as at beginning of 1968) shows that the need for village roads is 162,055 km. but the existing roads are only 33,055 km.

Of the 65,277 settlements, only 26,183 have sufficient and clean drinking water.

Of 35,877 villages, only 906 have electric energy.

7.3. PLANNING ASPECTS

The Ministry of Village Affairs has prepared a long-term plan, in fact a sequence of three five-year plans, for the fulfillment of development requirements in this respect, in accordance with the objects and principles adopted in Economic Development Plan (Ref.2). People's contribution to the activities of the State has been considered an important feature of the Plan.

The aims of the long-term plan for the road, water and electric networks are as follows:

"1. The villages with no roads or with roads of inadequate quality will be provided with roads that will be practically open to traffic at all seasons.

2. The villages without or lacking in sufficient drinking water facilities will be provided with sufficient drinking water.

3. The villages without electricity will be provided with electric energy."

The principles adopted in providing these services have been determined as follows:

"1. Available sources will be united and directed to get the maximum efficiency. Allocation of the resources will be balanced by considering the inequalities in the development of the regions.

2. Group solutions will be preferred to individual solutions and voluntary contribution of the people and local administrations will be encouraged.

3. Coordination of the other services and institutions will be provided and various services will be offered in harmony."

The Ministry of Village Affairs has set a priority criteria as follows:

<u>Village Roads</u>:

The following points are given in evaluating the priority of each village:

Criteria	Points
Existence of Schools	25
Existence of Health Centres. . .	25
High Population	25
Agricultural Importance.	20
Touristic Importance.	20
TOTAL	100
People's Contribution	100
Cost (per 5,000 TL.).	1

Village Drinking Water:

The following features are considered in evaluating priorities in accordance with paragraph 3 of the Act No.7478 on Village Drinking Water Affairs:

a. Degree of urgency
b. High population
c. Low cost per person
d. Contribution of people or donation of sources, money or land for the purpose.

Village Electrification:

The following features are considered in evaluating the priority of the villages:

a. The distance of the vollage to the energy source
b. The economic situation and resources of the village
c. The population and settlement characteristics of the village
d. Contribution of the village people.

Numerous economic, social and cultural benefits are expected from the development of the rural infrastructure. Inevitably, administration, ducation, health and economy of rural people will be improved by providing good services of road, water and electricity. Accomplishment of village roads envisaged in the 15 year plan (Ref. 2), is expected to yield a 2% increase in the agricultural income or TL. 800,000,000. It is also estimated that the reduction in transportation cost will add another 2%.

A 2% increase in the labour power of the country is expected with the accomplishment of the planned drinking water projects. This is equivalent to an increase of 377,000,000 TL in the yearly national income.

Village electrification is expected to provide an increase of 2% in the industrial income, i.e., 1,800,000 TL.

The total increase in the national yearly income, through the proper implementation of rural infrastructure plans (village roads, drinking water and electricity) is expected to reach 3,057,000,000 TL.(in 1968 rates).

The improvement in rural infrastructure will undoubtedly have a positive effect on rural housing.

All these contributions are expected to amortise the investment expenditures approximately in eight years.

7.4. PLANNED SERVICES AND ESTIMATED INVESTMENTS

In the following Tables (No.s 1, 2, 3, 4, 5, 6,), planned services and estimated investments for village roads, drinking water and electric cilities are shown.

(7) TABLE 1. CONSTRUCTION OF VILLAGE ROADS, BRIDGES, RELATED INSTALLATIONS AND REPAIR WORK, AS PLANNED FOR 2ND, 3RD AND 4TH FIVE-YEAR PERIODS

Years	Group village roads (km.)	Individual village roads (km.)	Total roads (km.)	Repair work (km.)	Bridge (m.)	Installations ($m.^2$)
1968	3,100	2,400	5,500	3,306	11,000	16,720
1969	4,189	3,200	7,389	4,856	14,778	111,080
1970	5,389	3,900	9,289	4,594	18,578	58,290
1971	6,422	4,500	10,922	5,523	21,844	10,800
1972	7,122	3,500	10,622	6,616	21,244	-
TOTAL	26,222	17,500	43,722	24,895	87,444	196,890
1973	7,863	1,950	9,813	7,677	19,626	-
1974	7,432	1,900	9,332	8,659	18,664	-
1975	7,546	1,850	9,396	9,592	18,806	-
1976	7,603	1,800	9,403	10,532	18,806	-
1977	7,634	1,700	9,334	11,472	18,668	-
TOTAL	38,078	9,200	47,278	47,932	94,556	-
1978	-	9,161	9,161	12,406	18,322	-
1979	-	9,161	9,161	13,322	18,322	-
1980	-	8,132	8,132	14,238	16,264	-
1981	-	6,920	6,920	15,051	13,340	-
1982	-	4,626	4,626	15,743	9,252	-
TOTAL	-	38,000	38,000	70,760	76,000	-
Total for 15 years	64,300	64,700	129,000	143,587	258,000	196,890

(7) TABLE 2. ESTIMATED INVESTMENTS FOR VILLAGE ROADS, BRIDGES, RELATED INSTALLATIONS AND REPAIR WORK FOR 2ND, 3RD AND 4TH FIVE-YEAR PERIODS

(In million TL., 1968 rates)

Years	Group village roads	Individual village roads	Total roads	Repair work	Bridges	Installations
1968	310	192	502	33	77	8
1969	419	256	675	49	103	56
1970	539	312	851	46	130	29
1971	642	360	1.002	55	153	5
1972	712	280	992	66	149	-
TOTAL	2,622	1,400	4,022	249	612	98
1973	786	156	942	77	137	-
1974	743	152	895	87	131	-
1975	755	148	903	96	132	-
1976	760	144	904	105	132	-
1977	763	136	899	115	131	-
TOTAL	3,807	736	4,543	480	663	-
1978	-	733	733	124	128	-
1979	-	733	733	133	128	-
1980	-	651	651	142	114	-
1981	-	554	554	151	97	-
1982	-	370	370	157	65	-
TOTAL	-	3.041	3,041	707	532	-
Total for 15 years	6,429	5,177	11,606	1,436	1,807	98

The total investment in 15 years is estimated as 14,947,000,000 TL. (1968 rates).

(7) TABLE 3. PROVISION OF DRINKING WATER FOR VILLAGES, AS PLANNED FOR 2ND AND 3RD FIVE YEAR PERIODS

(Number of Villages)

Second Five-Year	1968	1969	1970	1971	1972	Total
	3,400	3,513	3,704	3,912	4,021	18,550
Third Five-Year	1973	1974	1975	1976	1977	Total
	4,362	4,632	4,854	5,198	5,404	24,450
Total for ten Years						43,000

(7) TABLE 4. ESTIMATED INVESTMENTS FOR VILLAGE DRINKING WATER, FOR 2ND AND 3RD FIVE-YEAR PERIODS

(In million TL., 1968 rates)

Second Five-Year	1968	1969	1970	1971	1972	Total
	408	422	445	448	483	2,226
Third Five-Year	1973	1974	1975	1976	1977	Total
	523	556	583	624	648	2,934
Total for ten Years						5,160

(7) TABLE 5. PROVISION OF VILLAGE ELECTRIFICATION, AS PLANNED FOR 2ND, 3RD, AND 4TH FIVE-YEAR PERIODS

(Number of Villages)

Second Five-Year	1968	1969	1970	1971	1972	Total
	1,212	1,473	1,619	1,708	1,841	7,853
Third Five-Year	1973	1974	1975	1976	1977	Total
	1,943	2,014	2,050	2,127	2,193	10,327
Fourth Five-Year	1978	1979	1980	1981	1982	Total
	2,223	2,241	2,296	2,395	2,503	11,658
Total for 15 Years						29,838

(7) TABLE 6. ESTIMATED INVESTMENTS FOR VILLAGE ELECTRIFICATION, FOR 2ND, 3RD AND 4TH FIVE-YEAR PERIODS

(In million TL., 1968 rates)

Second Five-Year	1968	1969	1970	1971	1972	Total
	194	236	279	273	294	1,256
Third Five-Year	1973	1974	1975	1976	1977	Total
	350	362	369	383	395	1,859
Fourth Five-Year	1978	1979	1980	1981	1982	Total
	445	448	460	480	501	2,334
Total for 15 Years						5,449

REFERENCES

1. "The Turkish Constitution", Official Gazette No.10859, dated 20th July 1961 as Law No.334.

2. "Second Five-Year Development Plan", State Planning Organisation of Turkey, Ankara 1969, (in Turkish and English).

3. "Long Term (15 year) Plan for Roads-Water and Electric Networks in Villages", General Directorate of Roads, Water and Electric Affairs (Y.S.E.), Ministry of Village Affairs, Ankara 1968 (in Turkish).

YSE ORGANIZATION IN TURKEY (7) MAP I

YSE ÖRGÜTÜ (7) HARITA I

8. FINANCIAL CONTRIBUTION OF PEOPLE TO CONSTRUCTION INDUSTRY

8.1. INTRODUCTION

8.2. RANGE OF PRICES THAT PEOPLE CAN AFFORD FOR HOUSING

8.3. HOUSING FOR RENT

8.4. THE STATE'S POLICY OF HELPING PEOPLE TO BUILD THEIR OWN DWELLING

8.1. INTRODUCTION

Contribution of people to construction activities shows different characteristics in urban and rural settlements, irrespective of the geographic regions. The cost varies quite much as well.

Costs given in the following table (Table 1), may increase by a factor of 2 or 2.5 in buildings other than standard social housing, if some additional luxury construction materials and some import materials are used. Especially in the cities, the landowners are given flats by the contractors who build several sotey houses on their land. The rest is paid either immediately or by yearly instalments.

8.2. RANGE OF PRICES THAT PEOPLE CAN AFFORD FOR HOUSING

The following table shows the average size, cost per unit, and cost per square metre, for urban dwellings:

TABLE 1.

Year	Average Size Sq. m.	Average Cost (TL., 1968 rates)	Cost per Sq. m. (TL., 1968 rates)
1956	88.56	12.070	136
1957	96.17	14.663	152
1958	110.25	19.713	179
1959	94.50	20.617	218
1960	89.59	20.777	232
1961	98.68	23.738	241
1962	105.20	26.752	254
1963	103.04	26.676	259
1964	100.07	25.790	258
1965	99.39	26.036	262
1966	98.94	27.362	276

It is clearly seen that the cost per sq. metre increases rapidly. This is because the building industry is composed of small individual enterprises. There is a tendency for luxury housing in urban areas. Recently, a few group-dwelling construction companies have been established.

The official dwelling credits constitute only 13% of the total dwelling investments. For that, the cosial standards and the measures for improvement of low-cost housing were not effective, during the Second and First Five-Year Plan periods

As can be observed in the following table, public housing investments declined considerably, both in absolute amounts and in percentage. The main reason for this is that the measures to limit the private sector investments have been ineffective. The number of dwellings estimated in the Plan was realised, but the cost was much more than expected. Therefore, public housing investments have been intentionally reduced in order to keep the total constant. This has limited the State's activities in the field of housing. It is suggested that the standards should bring cost limitations instead of area limitations.

TABLE 2. Distribution of Housing Investments Between the Public and Private Sectors (in million TL., 1968 rates)

Year	Private		Public		Total Value
	Value	Percentage	Value	Percentage	
1963	2,160	88.1	293	11.9	2,453
1964	2,100	91.2	203	8.8	2,303
1965	2,500	95.2	126	4.8	2,656

The above figures can give an idea about the amount that people can afford for housing.

8.3. HOUSING FOR RENT

The ratio of rent housing in urban areas, increased from 36 per cent in 1955 to 42 percent in 1960. This rate continues to increase as a result of urbanisation. This also indicates the tendency to construct housing under the influence of social security and investment habits.

The ratio of people living in rental houses is greater in large cities. In 1960, this ratio was 42% in Turkey while 61.4 percent in Istanbul and 62.4 percent in Ankara.

On the average, 13.4 percent of the total family income is spent for rent in Turkey. Compared with Western countries, this is quite high. For those who receive salaries, the average rate of income spent on rent is 20%. It can easily be understood that rent is a heavy burden for medium and low-income groups.

The rent ratio of rented village dwellings was 4% in 1960 and 6% in 1965.

8.4. THE STATE'S POLICY OF HELPING PEOPLE TO BUILD THEIR OWN DWELLING

The Ministry of Reconstruction and Resettling provides support for people who have lost their dwellings after a natural disaster.

To realise the support, the Ministry either provides financial aid to the people who build their own dwellings or give them dwellings to live in, for a certain period of time.

Especially in the earthquake regions, the families who have completely lost their houses are paid 80% of the cost of a dwelling.

The owner builds his dwelling himself and pays his debt to the Ministry in 20 - 30 years. This aid is also provided for bakers and shop owners. In their case the debt has to be paid in 5 to 15 years. This money is not subject to interest.

Aside from this, we may mention the aid system applied by the General Directorate of Housing of the Ministry of Reconstruction and Resettlement under the heading "Four System Applications". These are explained hereunder:

1. Giving land and design project: Upon request, those who have the right(*) are given land credit and technical assistance.

2. Giving land, design and 5,000 TL. credit: In addition to land and design, 5,000 TL. is given as a credit without any financial contribution of the person.

3. Giving land, design and 5,000 - 10,000 TL. credit: In addition to land and design, the person is given 5,000 - 10,000 TL. credit provided that he deposits 25% of it.

4. Economical 'Build-Home' System (T.E.V.): Upon request, those who have the right are given dwellings that cost 35,000 TL. on the average, provided that they pay 2,000 TL. at the beginning, 100 TL. per month for a 14 months' period and 2,000 TL. when they get the dwelling. The term to pay the debt is 20 years.

(*) The term 'having the right to get help from this system' mentioned in this section is described in detail in a reference book published by the Ministry.

9. STATE'S POLICY ON HOUSING AND THE AVAILABILITY OF CAPITAL SOURCES

9.1. STATE'S POLICY ON HOUSING

9.1.1. Introduction

9.1.2. The Housing Problem in General

9.1.3. Planning Aspects of Housing

9.1.4. Conclusion

9.2. GOVERNMENTAL ORGANISATION AND CREDIT MECHANISM FOR HOUSING

9.2.1. Introduction

9.2.2. Governmental Organisation

9.2.3. Social Insurance Institution

9.2.4. Real Estate and Credit Bank

9.1. STATE'S POLICY ON HOUSING

9.1.1. Introduction:

To live in a dwelling that meets the social and sanitary requirements and provides protection from environmental effects (climate, natural disasters, etc.) is one of the essential needs of human beings.

The home, being the centre of family life, has a direct influence on it and the satisfaction of housing requirements accelerates economic and cultural development.

As a Turkish tradition too, the home is considered to be a sacred place that represents the honor of the family. House ownership is respected. The Turkish family has always been proud of its home and having guests in it, no matter what the level of income is. This feature is reflected in old and new legislations, rules and statements.

The following article of the Turkish Constitution (Ref.1) can give an idea about the basic attitude of the State with respect to housing:

"Article 49 - It is the responsibility of the State to ensure that everyone leads a healthy life both physically and mentally, and receives medical attention.

The State takes measures to meet the housing need of poor and low-income families in accordance with sanitary standards.

Article 35 - The family is the basis of Turkish society. The State and the other public juridicial persons take the requisite measures and establish the organisations required for the protection of the family, the mother and the child.

Article 36 - Every individual is entitled to the rights of property ownership and inheritence.

These rights may only be restricted by law, for the welfare of the public.

Article 48 - Every individual is entitled to the right of social security. The establishment of social insurance and social welfare organisations is among the duties of the State.

Article 51 - The economic and social life shall be regulated with such an aim as to assure a standard of living befitting human dignity and adhering to the principles of justice and full employment for everyone.

It is the State's duty to assure economic social and cultural development through democratic processes, to enhance national savings for this purpose, to direct investments within a priority system aiming at the public welfare, and to draw up development plans.

Article 53 - The State shall carry out its duties to attain the social and economic goals set forth in this section, only in so far as the economic development and its financial resources permit. "

0.1.2. The Housing Problem in General:

During the 1940-1960 period, the rural population increased by 17.6 percent while the growth of the urban population reached 82.4 per cent. This was the same pattern observed in other neighbouring countries after the Second World War. Such a trend in the growth of urban population created a rapidly increasing housing demand, especially in big cities. Housing problems encountered by the migration of people from villages to cities are of special importance. The inability to meet the housing demand of migrants and low-income families in cities within supply and demand rules of the market has resulted in a housing shortage and caused the emergence of squatter houses. The existing housing supply was directed towards meeting the demands of higher income groups. There was no establishment that could supply cheap houses. Institutions that can assume responsibility in this field had not shown any initiattive.

The housing requirement is generally the result of demographical changes, elimination of squatter houses, natural disasters and

expropriation. Distribution of the requirement is shown in the following table (Ref. 2).

Estimated Urban Housing Requirements for the Second Five-Year Plan Period (1968-1972)

Year	Population Increase	Removal of Squatter Houses	Renovation	Natural Disasters and Expropriation	Elimination of Overcrowding	Total
1968	112,800	7,500	12,000	4,000	5,100	141,400
1969	145,500	7,500	12,000	4,000	5,100	174,100
1970	155,400	7,500	12,000	4,000	5,100	184,000
1971	166,000	7,500	12,000	4,000	5,100	194,600
1972	177,300	7,500	12,000	4,000	5,100	203,900
Total	757,000	37,500	60,000	20,000	25,500	900,000

Based on the estimation that the rural population will increase by 1,332,000 and the average family size will be 5.97 persons during the Second Five-Year Plan period, the rural housing requirement resulting from demographic changes will be 44,600 units per year. With the requirement resulting from natural disasters and renovation, the total village housing requirement will be 60,000 units per year. This is less than half of the urban housing requirement.

Rural housing is much cheaper than urban housing because of the utilisation of local building materials and manpower. The State Planning Organisation estimates that the above mentioned amount of urban housing will cost 24.3 billion TL., and the rural housing will cost

1.2 billion TL. (with certain assumptions at 1965 prices). This necessitates studies to reduce building costs.

9.1.3. Planning Aspects of Housing:

Facts about the First Five-Year Plan Period (1963-1967):

As some of them were mentioned before, the housing problems faced by the First Five-Year Plan were numerous. They were: (Ref.5)

(a) The high rate of population growth.

(b) The rapid urbanisation and the growth of squatter areas on the outskirts of almost all of the major cities.

(c) The inefficiency of the small scale building industry.

(d) The difficulties that low-income groups meet in getting low-cost housing and low-interest credits.

(e) The excess amount of savings and investment going into luxurious real estates, due mainly to the absence of a capital market which could channel these savings into more productive uses.

(f) The large capital gains made by land speculation in the fast growing cities and towns.

It was necessary to set a limit for the housing investments in order to use sources for more productive industrial purposes. The First Five-year Plan primarily aimed at:

(a) Restraining housing investment to 20% of the total investments. That is a smaller and more reasonable ratio than the 25% of the former years,

(b) Diverting most of this 20% to low-cost housing.

At the end of the First Five-Year Plan period, the realised percentage was 21% (3.6% of the Gross National Product). Land speculation did not stop and the social objectives were not reached. There was

not a great impetus for low-cost housing, construction techniques were not improved. Although the estimated number of dwellings were achieved, the cost was much more than expected. So the State had to cut down its own building expenditures as a measure. Since policies to be implemented were related, to a large extent, to the activities of the private sector, the State's role was quite passive and was in form of following the situation. This resulted in reduction of State's own building expenses, to keep the total balance.

The Second Five-Year Plan:

During the Second Five-Year Plan period, the national income is expected to increase by 7 percent each year, and per capita income is expected to rise to TL.3,200 from TL.2,600 (1968 rates).

The Plan aimes at a high growth rate, by changing the general structure of the economy from an agricultural character to one, where the industrial sector is predominant. Also, raising the standards of living and welfare of the community has been set as a target. These two targets contradict in general. In other words, the future economic strength and welfare of the Turkish community depend upon the extent of the restriction that the present generations can impose upon their consumption and the size of the increase in total savings and investments they can achieve.

The rate of growth clearly defines the choice made by the n nation between these two targets. The Second Plan aims at increasing the domestic savings by 77.6%, while stipulating a rise of only 28.2% in five years' period (5.1% per annum) in private consumption expenditures.

The population is estimated to increase 2.5% per annum. Consequently, the standard of living of the present generations will increase only by 2.6%. The increase in gross national product will be 4.4% per annum. It can then be stated that the Second Five-Year Plan aims at strengthening the structure of the Turkish economy to a state capable of sustaining a high rate of growth, through efforts consistent with the principles of social justice and equality in opportunity, by raising the standard of living of the future generations rather than the physical welfare or consumption level during 1968-1972 period.

The long-term objective is to provide the economy with a structure permitting it to sustain the stipulated growth rate through its own resources, without the need of foreign aid. So this period will be critical years of efforts to attain economic self-sufficiency.

The following table shows the share of housing investment in the total picture: (Ref. 2)

(9.1.) TABLE 1 - DISTRIBUTION OF INVESTMENTS AMONG SECTORS IN THE FIRST AND SECOND FIVE-YEAR PLAN PERIODS

(in million TL. and 1965 rates)

Sector	1963 - 1967				1968 - 1972	
	Public	Private	Total	%	Total	%
Agriculture	6,548	3,466	10,014	15.4	16,900	15.2
Metal Products	2,131	745	2,786	4.4	4,100	3.7
Manufacturing Industry	4,948	7,773	12,721	19.4	25,000	22.4
Power	4,445	263	4,708	7.3	8,900	8.0
Communication	7,391	2,238	9,629	14.8	18,000	16.1
Housing	1,042	12,342	13,384	20.6	20,000	17.9
Education	4,210	64	4,274	6.6	7,500	6.7
Health	1,129	57	1,186	1.8	2,000	1.8
Tourism	617	631	1,248	1.9	2,600	2.3
Other Services	3,851	1,102	4,953	7.6	6,100	5.5
Development Fund	-	-	-	-	400	0.4
	36,312	28,681	64,993	100.0	111,500	100.0

The Second Five-Year Plan aimed to provide 1.2 million new dwelling units over the Plan period. This number came from an estimate of the needs to arise as a result of population growth, urbanisation, clearance of sum houses and renovation of very old buildings. The cost is expected to be 20 billion TL., which is 50% more than that was spent on housing in the First Five-Year Plan period. However, since the total investments expected are still higher, the share of housing will be only 17%.

The other aims of the Second Five-Year Plan in relation to housing sector are as follows:

(a) Reorganising the construction industry so as to operate in bigger enterprises to build bigger blocks, in order to economise in a large scale and to achieve lower costs.

(b) Reorganising the credit mechanism in order to see that funds are really channeled to low-cost housing for low income people.

(c) Increasing the taxation on luxurious houses so as to help divert resources from this field.

(d) Diminishing land speculation with the help of the State by buying up the areas on the outskirts of fast growing cities and reselling later at moderate prices.

(e) Encouraging self-help for people living in squatter houses by providing roads, basic services, etc., and allocating certain plots to each family, giving them loans in the form of essential parts of their houses, when they build themselves. It will be helpful if the loans are repaid over a long period.

9.1.4. Conclusion:

The housing industry is almost entirely composed of private enterprise and the administrative difficulties involved in diverting to low-cost housing are very great. Therefore, it would be optimistic to expect great changes from the Second Five-Year Plan period.

REFERENCES

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4. "Second Five-Year Development Plan (1968-1972), Programme for 1972" (in Turkish), State Planning Organisation, Publ. No. Ankara, March 1972.

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9.2. GOVERNMENTAL ORGANISATION AND CREDIT MECHANISM FOR HOUSING

9.2.1. Introduction:

The State's attitude towards the housing problem has been explained under the heading "State's Policy on Housing". In this section, the governmental organisation and the credit mechanism as tools of implementation of this policy will be explained.

9.2.2. Governmental Organisation:

At present, the Ministry of Reconstruction and Resettlement is the main governmental institution responsible for all aspects of urban planning and housing. The General Directorate of Housing is the involved organ of the Ministry. It has various departments dealing with squatter houses, construction, research, etc.

Recently, a General Directorate of Land Office was established to prevent speculation and to regulate the land prices. This is done by buying land and then reselling it at moderate prices.

The General Directorate of Natural Disaster Affairs provide housing (both rural and urban) to people after a natural disaster (flood, earthquake, landslide, rockfall, avalanche, etc.).

The General Directorate of Building Materials conducts all kinds of work on construction materials (registration, research, information, laboratory tests, etc.).

Recently, a General Directorate of Municipal Technical Affairs was established to provide technical assistance (training, funds, information, etc.) to municipalities. This was strongly needed, because most of the municipalities lack in qualified technical personnel.

The Ministry of Village Affairs is responsible for the rural infrastructure work, which is essential for rural settlements.

Various banks provide housing credits. Most of these are private banks. In this field the Social Insurance Institution, the Real Estate and Credit Bank, and the Pension Fund are the main organisations. There are some other smaller institutions that provide credit to their employees too.

9.2.3. A brief explanation about the Social Insurance Institution:

The Social Insurance Institution is a large organisation that provides medical and social care for workers. Dwelling credits are also provided to the insured. This aid is given in accordance with the Article 20 of the Act No. 4792-344, dated 8.8.1961. The conditions and the procedures of dwelling credits are shortly given in the following:

(a) The insured individuals who want dwelling credits must form a cooperative in accordance with the Cooperative Act No. 1163 and the Main Contract form of the Institution.

(b) To be entitled to a dwelling credit, the insured, his wife or husband or children should possess no dwelling and have received no credit from the Institution.

(c) The insured or his relatives should not be members of any cooperatives formed for similar purposes.

(d) The insured should have paid a certain amount of premium to the Institution (details are given in the manual, prepared by the Institution).

(e) The dwellings to be built should befit the social dwelling standards.

(f) No credit is provided for dwellings out of the municipal areas of cities or towns or in settlements with a population less than 10,000. However, the Institution may approve exceptions, after conducting a survey.

(g) No credit is given for dwellings with a gross area, larger than 100 square meters.

(h) The maximum amount of dwelling credit is TL. 60,000, whatever the income of the insured is.

(i) The term of credit is 20 years and the rate of interest is 4%. The term starts from the date the housing permission is given.

(j) The payment is done according to a paymant plan, based on equal monthly payments.

(k) The dwellings may not be sold to another person for a 10-year period.

The credits provided by the Institution in the years 1969 and 1970 are as follows:

Year	No. of Dwelling Units	Value (TL.)
1969	1,449	45,527,129.00
1970	1,649	55,000,495.00

9.2.4. A brief explanation about the Real Estate and Credit Bank:

The Real Estate and Credit Bank is the main bank that provides credit for dwellings. It is connected to the Ministry of Reconstruction and Resettlement. The requirements and procedures are shortly given below:

(a) The Bank opens a "Dwelling Saving Blocked Account" upon the request of the individual.

(b) This money is not subject to interest or to any kind of lottery for encouraging savings.

(c) The quality of the dwelling should conform to the related regulations.

(d) The person, his wife or husband or children should not possess a dwelling and should have received no credit from the Bank.

(e) The nominal value of the saving account can be between 10,000 TL., and 50,000 TL.; this is called the contract amount. This includes the amount deposited in the bank by the individual as 25% of the total amount.

(f) The contract amount can be increased or decreased, provided that it remains between the upper and lower limits, and the approval of the Bank is obtained.

(g) No money can be drawn from this account. Only under obligatory conditions the Bank may approve a partial payment. In this case, the priority points of the person are reduced accordingly.

(h) The individual may cancel the contract any time, with a written application.

(i) The individuals who can preserve the account in the Bank for at least two years, who deposit 25% of the contract amount in cash, and deemed as qualified to receive dwelling credit.

(j) These rights can be transferred to children, father, mother, wife or husband, provided that the Bank approves. A second transfer is not accepted.

(k) The term is 15 years and the annual interest is 6%. The interest rate may be, however, subject to change if new rates are stipulated by the State.

(l) The money can only be used within the boundaries of the municipalities and the urban reconstruction areas: The credit can be used:

(i) For one flat that the account owner will build on his own land,

(ii) For dwellings to be built on jointly owned land (one flat for the individual), or

(iii) For purchase of the dwellings built by the Bank.

The Real Estate and Credit Bank provided credit for 2,456 dwelling units in the 1966-1970 period; the total value of the dwellings built and sold by the Bank was 284,611,965.- TL.

The credits provided by the Bank in the years between 1969-1971 were as follows:

Year	No. of Dwelling Units	Value (TL.)
1969	632	33,848,565.00
1970	492	63,543,500.00
1971	757	76,823,126.00

REFERENCES

1. "Second Five-Year Development Plan (1968-1972)", State Planning Organisation, Publ. No.752, Ankara 1959.

2. "Second Five-Year Development Plan (1968-1972), 1971 Programme", State Planning Organisation, Publ. No.1004, Ankara March 1971, (in Turkish).

3. "General Conditions for Dwelling Saving Accounts", The Real Estate and Credit Bank, Ankara 1970 (in Turkish).

4. "The Manual for Dwelling Credits extended to Insured Persons", The Social Insurance Institution, Ankara, March 1970, Publ. No.71, (in Turkish).

IO CONSTRUCTION TECHNOLOGY AND BUILDING MATERIALS IN TURKEY

IO. CONSTRUCTION TECHNOLOGY AND BUILDING MATERIALS IN TURKEY

Introduction:

In Turkey, the construction industry is not organised yet for large scale building. The industry is mainly composed of individual enterprises with limited utilities. Therefore, the utilisation of local building material and manpower is essential for the economy.

In the following tables, information about various building material such as ceramic brick, roof-tile, glass, cement, timber, limestone, fiber-board, chip-board, plywood, plaster-of-paris and glass-wool will be given.

In Table 1, the urban buildings are classified according to their structural system and material. It is seen that reinforced concrete and brick buildings constitute the majority.

But in rural areas the most popular materials are stone and adobe (Table 2.)

In Table 3, it is seen that, 57.8% of the rural dwellings are of one storey.

Table 4 gives an idea about new rural construction.

In Table 5, the production of main construction materials and the utilisation rates are shown (for cement, limestone, timber, structural steel, glass, roof-tile and brick).

The following tables are:

Table 6: Production and Utilisation of Asbestos-cement pipes, asbestos-cement plates, concrete piles and traverses, light concrete, welded pipes, drawn pipes, cast pipes, plywood, fiber-board and chip-board.

Table 7: Brick utilisation in Buildings in Urban Areas.

Table 8: Roof Tiles and Brick Factories

Table 9: Roof Tile Utilisation in Buildings in Urban Areas.

Table 10: Roof Tile Utilisation

Table 11: Limestone Utilisation in Buildings

Table 12: Limestone Production

Table 13: Cement Factories

Table 14: Timber Processing Installations

10/ TABLO - 1

10/ TABLE - 1

Ruhsatlı Binalar - 1969

Buildings For Which Permission is Taken (As Of 1969)

İlin Adı Province	1000 m^2 Toplam Total Area	1000 m^2 Çelik Steel	1000 m^2 B. Arme B. Concrete	1000 m^2 Ahşap Timber	1000 m^2 Taş Stone	1000 m^2 Tuğla Brick	1000 m^2 Kerpiç Adobe	1000 m^2 Briket Con. Bloc
Türkiye Top.	17.158.7	230.7	8.896.5	166.1	388.5	6.383.9	397.6	690.9
Adana	299.7	-	189.7	1.2	4.3	69.5	1.0	33.8
Adıyaman	76.6	-	1.6	-	13.2	13.7	14.1	34.0
Afyon	210.8	-	32.5	5.8	16.1	128.3	21.0	7.2
Ağrı	33.4	-	4.3	-	10.6	2.4	2.9	13.3
Amasya	54.4	-	11.2	6.4	0.5	34.2	0.7	1.4
Ankara	2.151.4	0.8	1.225.7	6.6	20.7	877.7	8.8	11.1
Antalya	300.5	0.1	166.6	0.5	3.9	123.0	1.5	4.9
Artvin	30.0	3.0	13.5	0.7	0.2	4.5	-	8.2
Aydın	329.5	-	93.7	0.9	3.0	224.3	0.6	7.0
Balıkesir	348.0	0.4	140.0	1.2	4.0	189.6	3.8	8.9
Bilecik	29.3	1.3	7.1	0.5	0.1	13.4	4.9	2.1
Bingöl	9.9	-	1.6	0.6	2.7	4.8	-	0.1
Bitlis	35.4	-	2.5	0.1	3.0	5.9	0.6	23.4
Bolu	105.5	-	31.3	23.8	0.6	37.5	-	12.4
Burdur	91.6	-	19.7	2.1	5.9	51.0	6.3	6.6
Bursa	537.7	2.4	328.8	9.5	0.4	128.4	1.4	12.7
Çanakkale	115.7	0.2	36.1	0.5	2.4	73.9	0.4	2.2
Çankırı	37.8	-	4.0	5.7	2.6	16.8	4.8	3.6
Çorum	146.4	0.8	28.4	7.6	0.2	88.1	18.0	3.2
Denizli	167.2	0.6	40.4	1.1	9.8	91.2	12.2	11.7
Diyarbakır	81.6	-	27.7	-	17.9	33.8	0.6	1.8
Edirne	85.5	-	9.6	0.2	3.1	66.1	2.9	3.6
Elazığ	163.9	-	50.9	0.7	17.1	90.5	3.5	1.3
Erzincan	78.6	-	4.0	1.2	2.3	67.8	0.5	2.8
Erzurum	97.4	-	4.0	1.2	6.9	82.7	0.9	1.6
Eskişehir	305.2	-	126.4	0.3	1.5	169.6	5.8	1.6
Gaziantep	279.5	0.1	126.9	-	3.6	18.2	2.1	128.5
Giresun	57.6	-	26.7	0.3	0.1	14.1	-	16.2
Gümüşhane	13.5	-	1.8	0.8	2.7	5.4	0.6	2.1

İlin Adı Province	1000 m^2 Toplam Total Area	1000 m^2 Çelik Steel	1000 m^2 B. Arme R. Concrete	1000 m^3 Ahşap Timber	1000 m^2 Taş Stone	1000 m^2 Tuğla Brick	1000 m^2 Kerpiç Adobe	1000 m^2 Briket Con. Blo.
Hakkâri	1.9	-	-	-	0.4	1.0	0.5	-
Hatay	204.5	2.0	82.4	0.3	3.5	50.6	4.5	61.0
Isparta	128.2	-	60.3	1.8	3.3	88.4	14.0	10.4
İçel	223.3	-	122.1	0.5	13.2	72.4	1.0	13.0
İstanbul	4.122.6	5.4	3.335.8	0.4	2.0	761.2	0.3	17.3
İzmir	1.457.1	130.5	828.7	1.1	4.1	468.7	1.7	21.6
Kars	41.0	-	7.2	1.2	18.6	11.5	2.7	0.8
Kastamonu	61.5	1.5	15.4	2.2	0.5	37.2	0.1	4.5
Kayseri	426.3	-	233.9	-	19.5	157.2	9.8	6.0
Kırklareli	83.2	-	21.1	0.7	1.4	49.9	0.8	9.3
Kırşehir	41.6	-	13.5	-	2.3	18.4	7.3	-
Kocaeli	545.0	68.5	283.4	1.1	1.1	178.1	0.1	10.7
Konya	715.0	-	140.8	3.4	51.2	375.8	138.3	5.5
Kütahya	126.4	0.2	23.8	2.0	2.7	91.0	1.2	5.4
Malatya	155.6	2.5	71.0	1.0	6.0	53.2	17.9	3.9
Manisa	320.7	0.4	95.0	1.7	3.3	206.7	5.8	7.9
Maraş	83.0	-	10.4	0.4	4.7	50.5	8.8	7.7
Mardin	26.2	-	3.1	-	7.3	5.4	3.8	6.6
Muğla	128.4	-	38.9	2.0	4.2	70.4	1.0	11.9
Muş	7.4	-	4.9	0.5	0.2	0.4	0.6	0.8
Nevşehir	61.9	-	-	0.2	13.5	43.2	4.2	0.8
Niğde	94.0	-	16.1	0.3	20.6	43.6	10.5	2.9
Ordu	86.4	-	54.5	1.0	0.6	28.4	-	1.9
Rize	112.7	-	92.9	0.3	0.2	13.6	-	5.8
Sakarya	163.2	3.6	31.9	33.0	1.4	88.8	0.8	3.7
Samsun	209.1	0.6	87.2	0.6	1.0	113.6	0.8	5.3
Siirt	67.3	-	5.5	0.1	2.5	41.8	3.1	14.3
Sinop	37.1	-	13.3	0.1	0.8	19.5	-	3.4
Sivas	128.2	-	39.7	3.5	11.3	60.2	7.5	6.2
Tekirdağ	105.0	1.7	27.0	0.5	1.0	67.1	0.2	7.6
Tokat	113.9	-	29.8	22.8	1.0	53.7	2.9	3.6
Trabzon	148.6	0.1	89.5	0.3	0.5	48.3	-	9.8
Tunceli	12.4	-	3.5	0.1	2.3	4.6	1.9	0.1
Urfa	71.9	-	24.8	0.1	9.5	13.9	3.7	20.0
Uşak	50.4	-	6.4	-	1.6	38.1	2.0	1.7
Van	33.9	-	13.0	-	1.1	4.3	9.4	6.2
Yozgat	72.5	1.2	7.1	0.2	9.9	29.9	9.7	14.3
Zonguldak	368.2	2.7	151.9	4.5	0.4	197.2	0.1	10.7

Nüfusu 5000 den az olan yerlerdeki
Mevcut Evlerin Duvar Durumu (*)

In Settlements With a Population Less than 5000
Material of Wall in Existing Buildings (*)

Duvar Ana Malzemesi Wall Material Used in Walls	Ev Sayısı No. of Buildings	Nisbet % Percentage
Taş Yığma - Stone Masonry	1.590.941	45.5
Kerpiç Yığma - Adobe Masonry	879.436	25.1
Ahşap Karkas - Timber Frame	702.325	20.1
Ahşap Yığma - Timber Masonry	117.034	3.4
TOPLAM - TOTAL	3.495.347	100.0

10/ TABLO - 3
10/ TABLO - 3

Mevcut Evlerin Kat Durumu (*)
Number Of Stories in Existing Dwellings (*)

Kat Sayısı - Number Of Stories	Evlerin Sayısı No. Of Dwellings	Nisbet % Percentage
1 katlı (1 story)	2.010.742	57.8
2 katlı (2 stories)	1.447.100	41.4
3 katlı (3 stories)	28.505	0.8
TOPLAM - TOTAL	3.495.347	100.0

10/ TABLO - 4
10/ TABLO - 4

Yılda Yapılan (Ortalama) Bina Miktarı (**)
Number Of Annual Construction (**)

Number and Area - Sayı ve Alan	Sayı Number	m^2
Muhtarlık Sayısı - No. Of Villages	36.663	-
Yapılan Ev Sayısı - No. Of Construction	140.969	-
Ortalama Ev Alanı - Average Area of a Dwelling	-	83.3
Yıllık Yapılan Alan - Annual Total Area	-	11.742.717

(*) DİE. yayın no. 497 (1963 muhtarlık bina sayımı)
(**) DİE. yayın no. 498 (1963 örnekleme sonuçları)

10/ TABLO - 5
10/ TABLE - 5

Ana Yapı Malzemesi Üretim ve Tüketimi
Production and Utilization of Major Building Materials in Turkey

Yıllar Year	Çimento Cement		Kireç Limestone		Kereste Timber		Yapı Çeliği Structural Steel		Cam Glass		Kiremit Roof Tile		Tuğla Brick	
	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption	Üretim Production	Tüketim Consumption
963	2698	2789	389	389	1106	-	279	315	20,9	19,8	151	151	1156	1156
964	2940	3031	417	417	1361	-	315	342	32,9	28,2	160	160	1258	1258
965	3244	3291	523	523	1380	-	370	391	36,3	32,6	187	187	1639	1679
966	3865	3915	627	627	2010	-	430	459	37.2	37.5	206	206	1978	1978
967	4249	4349	635	635	2113	-	436	453	46.8	459	215	215	2002	2002
968	5060	5499	661	661	2578	2520	653	714	53,7	46,1	238	238	2196	2196
969	5795	6080	725	725	2700	2690	688	800	46,1	54,3	279	279	2680	2680
970	8000	7252	805	805	2930	2850	720	860	74,0	64,0	320	320	2750	2750
971	8850	8317	883	883	3150	3020	811	930	85,0	75,0	340	340	3100	3100
972	10110	9565	950	950	3513	3080	886	1050	83,3	77,5	357	357	3287	3287
973	13005	11000	987	987	3790	3287	959	1151	93,1	84,2	304	304	3307	3307
974	13735	12650	1044	1044	4066	3412	1031	1250	100,9	90,9	410	410	3723	3723
975	15303	15424	1102	1102	4342	3557	1104	1349	108,7	97,6	456	456	3959	3959
	1000 ton 1000 tons		1000 ton 1000 tons		1000 m^3 1000 m^3		1000 ton 1000 tons		1000 ton 1000 tons		10^6 adet 10^6 tiles		10^6 adet 10^6 bricks	

10/ TABLO - 6

10/ TABLO - 6

Ana Yapı Malzemesi Üretim ve Tüketimi
Production And Utilization of Main
Building Materials

Asbestli Çimento Boru Asbestos-Cement Pipe 1000 ton		Asbestli Ç. Levha Asbestos-Cement Plate 1000 m²		B. Direk, Boru, Trave, Concrete pile, pipe, travers etc, 1000 ton		Hafif Beton Light Concrete 1000 m³		Dikişli Boru Welded Pipe 1000 ton	
Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization
19.7	19.7	500.0	500.0	71.0	71.0	82.3	82.3	62.2	65.6
29.9	29.9	608.0	608.0	90.3	90.3	163.9	163.9	75.0	75.8
35.7	35.7	1.551.0	1.551.0	96.4	103.4	195.2	187.3	78.8	78.7
38.0	38.0	1.570.0	1.570.0	127.0	127.0	138.0	138.0	108.8	100.0
40.0	40.0	600.0	600.0	135.0	135.0	200.0	200.0	115.0	115.0
42.0	42.0	1.650.0	1.650.0	145.0	145.0	290.0	290.0	120.0	130.0

Çekme Boru Drawn Pipe 1000 ton		Dökme Boru Cast Pipe 1000 ton		Kontrplak Plywood 1000 m³		Lif Levha Fiber Board 1000 ton		Yonga Levha Chip Board 1000 ton	
Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization	Üretim Production	Tüketim Utilization
-	21.9	27.4	21.8	34.0	34.0	30.0	28.7	14.5	14.5
-	12.9	20.5	24.8	45.5	45.5	32.5	32.5	27.0	27.0
-	15.0	14.7	21.7	55.0	55.0	38.0	38.0	38.0	38.0
-	20.0	13.5	-	35.0	35.0	40.0	40.0	32.0	32.0
-	26.0	14.0	-	38.0	38.0	41.0	41.0	40.0	40.0
-	32.0	15.0	-	48.0	48.0	43.0	43.0	115.0	110.0

10/ TABLO - 7
10/ TABLE - 7

Ruhsatlı Binalarda Tuğla Tüketimi (Milyon Adet) (*)
Brick Utilization in Buildings, in Urban Areas (in millions)

İlleri Provinces	1969	1961	1962	1963	1964	1965	1966	1967	1968
Adana	43,1	22.9	25.6	27.9	28.4	43.1	42.9	42.0	30.3
Adıyaman	3,1	0,6	0,8	0,5	0.6	1.0	6.2	4.4	4.6
Afyon	32,0	11.4	9.6	9.2	12.0	12.6	16.6	17.1	19.4
Ağrı	1.1	0.6	0.4	0.4	0.6	2.0	1.7	1.3	1.9
Amasya	9.0	5.7	7.5	2.8	3.8	5.9	6.2	8.4	6.2
Ankara	368.4	179.6	251.0	186.7	210.5	337.2	293.3	240.4	269.9
Antalya	59.0	11.4	14.6	14.1	19.3	21.7	37.4	44.5	37.7
Artvin	3.0	0.9	2.3	1.8	2.9	2.6	2.9	2.6	3.5
Aydın	41.2	28.8	31.0	32.5	28.0	36.5	51.7	55.0	45.5
Balıkesir	60.8	25.9	23.9	21.3	25.4	41.7	41.8	45.9	60.3
Bilecik	3.9	1.0	2.6	4.8	1.1	2.7	3.2	3.3	5.4
Bingöl	1.3	0.5	0.3	0.5	0.6	0.4	0.9	1.0	1.4
Bitlis	1.6	1.0	1.8	0.9	3.6	2.3	3.7	1.1	0.3
Bolu	13.3	6.6	6.0	7.9	7.5	8.1	12.0	13.6	15.6
Burdur	13.7	4.0	4.7	5.6	10.0	11.2	15.4	10.7	9.1
Bursa	84.7	34.7	29.1	29.0	35.9	42.2	70.7	62.6	52.0
Çanakkale	21.0	7.3	8.5	8.8	13.1	8.7	12.8	13.4	15.3
Çankırı	4.3	2.0	1.8	1.7	2.0	2.1	2.9	4.0	5.9
Çorum	23.0	5.0	6.1	3.9	6.3	10.0	15.1	21.2	26.9
Denizli	25.2	8.2	10.5	9.6	10.1	10.0	18.9	21.5	26.5
Diyarbakır	11.2	0.2	4.6	8.0	7.5	9.8	15.2	17.8	8.2
Edirne	15.3	5.4	7.7	4.0	5.9	9.0	12.5	15.3	18.9
Elâzığ	26.6	1.5	3.1	5.0	6.5	14.8	15.9	17.1	22.4
Erzincan	14.9	7.7	6.7	4.6	7.9	5.3	11.8	6.8	8.7
Erzurum	1 .0	6.6	7.2	6.5	10.1	1 .8	17.3	18.3	12.0
Eskişehir	54.6	24.6	19.7	19.	31.6	34.4	22.4	20.2	26.4
Gaziantep	22.9	3.5	4.2	6.2	14.9	16.3	21.6	17.1	16.5
Giresun	9.0	3.9	4.3	5.8	7.2	7.6	5.9	5.2	7.2
Gümüşhane	1.4	0.2	0.6	0.7	1.3	0.9	1.4	2.3	2.8
Hakari	0.7	0.3	-	-	10.1	0.1	0.6	0.2	0.2

Illi Provinces	1960	1961	1962	1963	1964	1965	1966	1967	1968
Eskişehir	23.0	13.2	10.[illegible]	16.1	13.2	16.0	21.6	16.7	19.6
Gaziantep	33.6	10.9	9.4	9.1	10.9	16.1	20.6	26.7	28.0
Isparta	27.7	8.6	12.4	9.[illegible]	10.9	15.9	21.4	26.8	3[illegible]
İstanbul	660.2	262.4	325.6	396.1	278.5	353.9	435.2	478.3	550.9
İzmir	222.6	69.5	83.1	107.9	106.3	127.2	175.0	172.1	21[illegible].1
Kars	2.5	1.1	1.1	3.0	2.5	3.1	7.[illegible]	5.3	[illegible]
Kastamonu	10.2	5.3	3.3	5.7	4.0	7.3	5.5	6.6	6.4
Kayseri	68.1	11.9	12.2	14.1	16.8	29.0	37.9	5[illegible].6	41.[illegible]
Kırklareli	13.7	8.2	9.1	6.7	6.2	8.2	11.9	11.7	14.3
Kırşehir	5.9	1.5	2.8	2.4	1.9	1.7	3.6	4.3	6.3
Kocaeli	79.0	16.7	21.1	23.0	41.2	52.2	57.7	64.9	81.2
Konya	100.1	50.7	40.0	37.0	36.5	41.1	64.0	57.4	[illegible].0
Kütahya	22.7	11.5	11.7	11.8	13.0	16.6	22.4	19.4	[illegible]
Malatya	21.9	7.1	11.2	13.7	17.6	22.0	22.6	19.2	18.4
Manisa	57.7	22.3	33.8	3[illegible].7	29.2	33.0	39.2	40.2	47.2
Maraş	12.2	4.7	4.4	3.3	5.1	9.8	10.8	12.5	12.7
Mardin	1.6	0.4	0.9	1.3	0.7	0.9	2.2	1.9	1.9
Muğla	20.7	3.4	6.1	3.7	3.7	7.4	7.2	11.2	13.6
[illegible]	0.8	0.4	-	-	0.2	0.4	0.4	0.6	1.1
Nevşehir	0.1	0.1	0.4	0.8	1.9	1.3	5.9	5.5	5.8
Niğde	11.6	4.8	1.8	1.8	5.9	6.0	8.7	7.7	7.8
Ordu	14.2	6.7	10.5	7.0	7.5	9.1	12.8	15.2	11.1
Rize	16.8	4.1	3.3	7.4	6.0	7.1	4.6	10.1	24.9
Sakarya	24.4	12.6	10.6	10.5	17.5	18.1	28.0	26.1	3[illegible].4
Samsun	37.0	16.6	19.4	16.6	21.7	30.[illegible]	33.0	32.6	[illegible]
Siirt	9.6	2.4	1.5	1.3	2.2	5.8	7.3	5.5	4.0
Sinop	6.1	2.9	2.8	3.9	3.9	5.6	5.6	8.3	[illegible]
Sivas	18.7	6.7	7.2	5.4	4.6	9.2	20.0	12.8	[illegible]
Tekirdağ	16.2	5.3	7.4	7.5	7.0	8.6	13.8	11.6	13.7
Tokat	16.4	4.9	4.3	3.6	3.5	6.7	6.3	7.5	4.4
Trabzon	23.6	4.5	4.6	11.6	11.2	36.[illegible]	29.1	27.4	31.6
Tunceli	1.5	0.1	0.3	0.7	0.2	1.3	0.8	1.0	1.6
Urfa	6.6	0.3	0.7	3.3	6.5	6.7	3.8	3.8	4.9
Uşak	9.0	3.2	5.1	3.9	6.8	6.1	9.7	8.3	7.9
[illegible]	2.8	0.1	1.5	0.5	2.0	1.1	6.6	3.2	1.1

İli Provinces	1960	1961	1962	1963	1964	1965	1966	1967	1968
[illegible]at	7.4	2.1	2.7	3.1	1.9	3.6	5.4	8.6	7.9
Zonguldak	64.3	12.6	21.7	38.3	29.8	62.1	46.2	49.3	51.1
TOPLAM - TOTAL	2.660.2	1.006.9	1.198.9	1.196.4	1.258.3	1.879.3	1.978.3	2.008.2	2.196.4

(*) Betonarme karkas binaların tuğla dolgulu olduğu kabul edilmiştir
Reinforced concrete framed structures with brick walls.

(*) Tuğlalar ebatları (6 x 10.5 x 22)
Brick sizes are (6 x 10.5 x 22)

(*) Birimler:

Betonarme karkas binalar için	150 Adet/m^2
Ahşap karkas binalar için	30 Adet/m^2
Tuğla yığma binalar için	210 Adet/m^2

Units:

In Reinforced concrete framed structures	150 bricks/m^2
In Timber framed structures	30 bricks/m^2
In Block structures	210 bricks/m^2

1969 Iller [illegible] Kiremit ve Çatı Tuğlası Kapasite, Toplam ve Çeşitli Fiktarları

Number, Capacity and Production of Roof Tile and Brick Factories in Turkey, as of 1969

(Milyon Adet)
(in millions)

Iller Provinces	Fabrika Sayısı Number	Kapasite - Capacity Toplam Total	Kapasite - Capacity Kiremit Roof - Tile	Kapasite - Capacity Tuğla Brick	Üretim - Production Toplam Total	Üretim - Production Kiremit Roof-Tile	Üretim - Production Tuğla Brick
Adana	2	49,6	9,4	40,2	42,0	9,5	32,5
Afyon	1	1,0	1,0	-	0,9	0,9	-
Ankara	2	2,0	1,4	0,6	2,0	1,2	0,8
Antalya	8	77,2	7,9	69,3	70,6	7,2	63,4
Aydın	2	3,0	2,5	0,5	4,4	2,2	2,2
Balıkesir	2	18,2	6,7	11,5	16,3	5,3	11,0
Bilecik	2	3,5	3,5	-	3,4	3,4	-
Bolu	4	11,0	4,1	6,9	5,8	3,8	2,0
Bursa	4	31,0	12,5	18,5	24,2	11,1	13,1
Çanakkale	1	1,0	1,0	-	1,0	1,0	-
Çankırı	9	16,5	12,1	4,4	12,1	8,0	4,0
Denizli	3	17,5	12,5	5,0	17,5	12,5	5,0
Diyarbakır	1	2,0	2,0	-	2,0	2,0	-
Edirne	2	16,5	6,5	10,0	9,7	6,2	3,5
Erzincan	1	8,0	4,0	4,0	2,0	-	2,0
Erzurum	2	7,0	3,0	4,0	7,0	3,0	4,0
Eskişehir	8	60,0	47,1	12,9	51,6	43,3	8,3
Giresun	2	13,5	2,0	11,5	13,5	2,0	11,5
Göksun	2	9,0	1,0	8,0	13,0	-	13,0
Isparta	3	10,3	4,5	5,8	4,2	1,9	2,3
İstanbul	7	211,1	7,4	210,7	241,8	7,5	234,3
İzmir	11	75,4	24,[illegible]	46,[illegible]	49,9	1[illegible],3	31,[illegible]
Kahramanmaraş	1	4,4	3,0	1,4	4,0	2,0	1,0
Karabük	1	5,0	-	5,0	4,5	-	4,5
Karaman	1	3,0	3,0	-	1,0	1,0	-
Kayseri	4	30,0	1[illegible],[illegible]	1[illegible],8	20,7	10,6	10,1
Kırıkkale	7	27,0	20,[illegible]	6,[illegible]	2[illegible],2	1[illegible],4	[illegible]
Kırşehir	2	2,0	2,0	-	1,4	1,4	-
Konya	11	100,0	[illegible]	[illegible],5	[illegible]	30,[illegible]	[illegible]
Malatya	1	1,0	1,0	-	0,0	0,0	-

[illegible]	Ayisi Number	Toplam Total	MARKET - [illegible] Hiromit Foot-File	[illegible] Tuğla Brick	MONTH - PRODUCTION Toplam Total	Hiromit Foot-File	Tuğla Brick
[illegible]	[illegible]	1,9	[illegible]	[illegible]	1,9	1,7	[illegible]
[illegible]		1[illegible],4	[illegible]	[illegible]	1[illegible],4	[illegible],3	10,1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7,7	5,3	2,4
[illegible]	1	3,3	-	3,3	3,3	-	3,3
[illegible]	[illegible]	4,0	1,5	[illegible]	4,0	1,5	2,5
[illegible]	1	5[illegible],5	1[illegible],4	[illegible]	13,5	4,0	9,5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5,4	3,9	1,5
[illegible]	[illegible]	1[illegible],0	[illegible]	[illegible]	13,0	-	13,0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible],9	2,2	1,7
[illegible]	[illegible]	20,5	1[illegible],[illegible]	[illegible]	1[illegible],0	10,4	7,4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	255,[illegible]	5[illegible]7,4

10/ TABLO - 9
10/ TABLE - 9

Ruhsatlı Binaların Kiremit Tüketimi (Bin Adet)

Roof Tile Utilization in Buildings (in thousands) in Urban Areas

İller Province	1961	1962	1963	1964	1965	1966	1967	1968	1969
Adana	1.850	2.150	2.480	2.470	3.550	3.870	3.710	3.100	4.450
Adıyaman	60	80	70	90	100	600	480	860	840
Afyon	1.470	1.340	1.180	1.410	1.470	1.980	1.900	2.320	3.160
Ağrı	-	-	-	-	-	-	-	-	-
Amasya	630	490	540	540	680	740	840	1.010	820
Ankara	8.600	10.100	10.500	11.700	16.200	15.500	11.900	15.780	19.360
Antalya	850	1.030	1.030	1.360	1.560	2.630	3.340	2.920	3.830
Artvin	10	10	10	10	10	10	30	20	20
Aydın	2.600	2.840	2.950	2.620	3.390	3.210	4.910	3.990	5.270
Balıkesir	2.640	2.250	2.040	2.510	3.980	3.750	4.090	5.410	5.570
Bilecik	250	400	630	230	410	380	370	630	470
Bingöl	-	-	-	-	-	-	-	-	-
Bitlis	-	-	-	-	-	-	-	-	-
Bolu	720	740	910	720	860	1.160	1.470	1.490	1.480
Burdur	530	470	620	990	1.250	1.240	1.090	910	1.190
Bursa	2.870	2.430	2.410	3.270	3.660	5.680	5.220	4.790	7.530
Çanakkale	800	890	880	1.310	1.060	1.180	1.310	1.400	1.970
Çankırı	300	310	310	350	370	450	500	690	570
Çorum	700	760	560	830	1.340	1.560	1.660	2.560	2.200
Denizli	1.470	1.400	1.280	1.630	1.690	1.970	2.370	2.970	2.340
Diyarbakır	390	620	640	660	780	1.190	1.430	780	1.010
Edirne	750	970	640	720	1.140	1.420	1.650	2.010	1.540
Elâzığ	140	270	720	340	1.530	1.260	1.350	2.220	2.760
Erzincan	230	610	390	770	440	490	580	760	1.190
Erzurum	20	30	20	30	60	50	50	510	510
Eskişehir	2.160	1.750	1.700	2.440	2.000	1.930	1.860	2.570	4.[illegible]
Gaziantep	880	870	980	1.[illegible]	1.[illegible]	2.950	3.520	3.680	4.380
Giresun	310	420	460	500	720	470	450	700	600
Gümüşhane	20	20	20	30	20	30	40	270	160
Hakkari	-	-	-	-	-	-	-	-	-

Ili Province	1961	1962	1963	1964	1965	1966	1967	1968	1969
Ankara	1.150	1.260	1.260	1.570	1.790	1.910	2.140	3.060	3.[illegible]
Adana	1.140	1.070	970	1.050	1.380	2.180	2.140	2.680	3.340
Istanbul	1.080	1.230	960	1.340	1.900	2.040	2.110	2.760	2.320
Izmir	13.600	14.400	14.300	14.300	19.800	24.300	26.750	30.700	37.100
Izmir	6.100	7.000	8.300	8.300	8.700	12.430	13.050	16.620	18.640
Kars	-	-	-	-	-	-	-	240	240
Kastamonu	420	300	450	330	250	460	510	510	740
Kayseri	600	590	750	1.030	1.430	1.910	4.730	3.520	5.960
Kirklareli	1.070	1.150	900	770	1.010	1.310	1.250	1.590	1.500
Kirşehir	160	290	250	560	190	340	430	710	560
Kocaeli	1.050	1.420	1.430	2.700	3.300	4.520	4.590	6.660	6.540
Konya	5.010	3.570	3.250	4.680	4.860	5.570	6.980	7.420	10.730
Kütahya	790	850	890	900	1.350	1.540	1.270	1.820	1.520
Malatya	480	810	910	1.180	1.490	1.780	1.410	1.590	1.920
Manisa	2.370	3.260	3.050	2.600	3.060	3.460	3.490	4.400	5.130
Maraş	410	420	360	450	790	840	1.010	1.100	1.090
Mardin	-	-	-	-	-	-	-	130	130
Muğla	690	860	760	610	1.050	990	1.350	1.580	2.510
[illegible]	-	-	-	-	-	-	-	-	-
Nevşehir	40	40	50	80	70	120	100	110	110
Niğde	520	470	460	740	780	1.020	730	870	920
Ordu	430	630	540	470	640	790	840	770	930
Rize	230	280	600	390	450	520	780	960	1.100
Sakarya	1.530	1.540	1.350	1.820	1.940	2.510	3.440	3.330	2.450
Samsun	1.510	1.540	1.780	1.600	2.430	2.520	2.600	2.070	2.930
Siirt	-	-	-	-	-	-	-	130	130
Sinop	300	290	360	380	490	460	560	450	560
Sivas	350	530	490	440	660	1.560	1.030	630	1.400
Tekirdağ	640	890	770	730	910	1.370	1.180	2.140	1.700
Tokat	880	910	650	510	1.010	1.150	1.080	1.290	1.600
Trabzon	510	590	800	710	2.100	1.650	1.590	1.530	1.550
Tunceli	-	-	-	-	-	-	-	-	-
Urfa	30	50	320	600	610	480	550	880	1.000
Uşak	310	450	340	430	530	760	620	780	910
Van	-	-	-	-	-	-	-	150	150
Zonguldak	230	300	300	310	400	560	1.190	1.220	1.[illegible]
Denizuldak	1.040	1.830	3.100	2.790	5.200	3.630	3.950	4.090	5.160
TURKEY -TOTAL	75.[illegible]	82.060	85.480	94.370	120.940	140.380	149.670	171.970	205.1[illegible]

10/ [illegible] - 10

10/ [illegible] - 10

Türkiye Çimento (in Adet)

Roof-Tile Utilization in Turkey (in thousands)

	1961	1962	1963	1964	1965	1966	1967
Flat-tile for roofing	75.000	82.000	88.400	94.370	120.940	140.380	149.670
Tile for roofing	58.960	58.960	58.960	58.960	58.960	58.960	58.960
Corrugated roofing	6.850	6.850	6.850	6.850	6.850	6.850	6.850
G. N. TOTAL - TOTAL	141.710	147.370	151.[illegible]	160.180	186.750	206.190	215.480

	1968	1969
Flat-tile for roofing	171.970	203.120
Tile for roofing	58.960	58.960
Corrugated roofing	6.850	6.850
G. N. TOTAL - TOTAL	237.780	270.930

10/ TABLO - 11
10/ [illegible] - 11

Ruhsatlı Madenlerin Kireç Üretim (Bin Ton)
Limestone Utilization in Quarries with Permission (Thousand tons)

Province	1961	1962	1963	1964	1965	1966	1967
Adana	6.2	7.0	7.8	7.9	11.1	12.3	12.0
Adıyaman	0.2	0.3	0.3	0.5	0.5	2.0	1.5
Afyon	3.6	3.2	2.0	3.4	3.7	4.9	4.6
Ağrı	0.6	0.2	0.2	0.3	0.7	0.6	0.5
Amasya	1.6	1.2	1.3	1.4	1.9	1.9	2.3
Ankara	40.7	54.1	43.2	46.0	70.6	72.5	78.3
Antalya	3.0	3.2	1.8	4.9	5.5	9.4	12.4
Artvin	0.3	0.7	0.	1.0	0.8	0.8	1.1
Ardahan	2.0	9.0	7.3	8.1	10.6	10.0	15.0
Aksaray	6.0	6.3	.0	7.1	11.6	11.0	11.3
Bilecik	0.4	0.9	1.7	0.3	0.8	0.9	0.9
Bingöl	0.2	0.2	0.1	0.4	0.2	0.3	0.5
Bitlis	0.5	0.5	0.5	1.4	0.8	1.4	0.8
Bolu	1.9	1.9	2.6	2.1	2.5	3.3	4.2
Burdur	1.2	1.4	1.7	2.9	3.3	4.0	3.0
Bursa	9.3	7.9	7.8	10.6	12.1	19.5	17.9
Çanakkale	2.0	2.2	2.3	3.5	2.8	3.3	3.5
Çankırı	0.6	0.6	0.6	0.6	0.7	0.9	1.1
Çorum	1.5	1.8	1.3	2.0	3.3	4.2	4.6
Denizli	3.9	3.9	3.9	4.9	5.1	6.0	7.1
Diyarbakır	0.4	1.7	2.1	2.3	2.7	4.0	4.9
Edirne	1.5	2.1	1.2	1.6	2.6	3.3	4.0
Elâzığ	0.5	0.9	2.2	1.8	4.5	4.6	4.8
Erzincan	0.7	1.9	1.2	2.2	1.1	3.1	1.8
Erzurum	3.1	2.3	1.7	2.9	5.3	4.4	4.5
Eskişehir	3.4	5.2	5.3	7.0	9.6	6.6	5.3
Gaziantep	1.5	2.1	1.1	2.9	3.1	4.5	6.6
Giresun	1.7	1.7	2.0	2.5	2.3	2.1	1.8
Gümüşhane	0.1	0.2	0.5	0.4	0.3	0.5	0.8
Hakkâri	0.0	0.0	0.0	0.1	0.1	0.2	0.1
Hatay	3.7	3.8	3.6	4.8	5.6	7.6	6.1
Isparta	3.5	3.2	3.0	3.4	4.5	7.1	6.9
İçel	3.6	3.6	3.1	4.0	4.9	6.3	7.2

Province	1961	1962	1963	1964	1965	1966	1967
Istanbul	59.3	73.1	66.0	64.7	83.1	126.6	137.9
Izmir	19.2	21.7	27.2	27.0	31.2	48.3	42.8
Ars	0.4	0.4	1.1	0.9	1.2	2.5	1.8
Kastamonu	1.7	1.0	1.7	1.2	2.4	1.6	1.9
Kayseri	5.2	4.3	[illegible]	[illegible]	9.7	1[illegible].3	16.6
Çanakkale	[illegible]	2.6	[illegible]	1.[illegible]	2.4	3.3	3.2
Kırşehir	0.5	0.9	[illegible]	0.7	0.6	1.1	1.4
Kocaeli	4.9	5.7	[illegible]	12.[illegible]	12.9	15.9	17.3
Konya	15.0	11.7	11.7	13.6	14.6	16.3	15.4
Kütahya	3.0	[illegible].1	[illegible]	[illegible]	5.1	6.1	4.9
Malatya	1.8	2.9	[illegible]	4.4	5.[illegible]	5.9	5.1
Manisa	[illegible].8	8.8	9.0	7.3	8.4	9.4	10.3
Maraş	1.4	1.5	1.[illegible]	1.[illegible]	2.7	2.9	3.3
Mardin	0.4	0.7	0.5	0.4	0.5	0.7	1.0
Muğla	1.6	2.4	1.8	1.6	2.7	2.5	3.5
Muş	0.2	0.1	0.0	0.1	0.2	0.2	0.2
Nevşehir	0.6	0.5	0.8	1.0	1.2	2.3	2.0
Niğde	1.8	1.4	1.4	2.5	2.6	3.4	2.8
Ordu	1.7	2.7	2.5	2.1	2.7	3.5	3.7
Rize	1.1	1.2	2.0	1.8	2.1	2.0	3.5
Sakarya	4.0	3.9	3.7	5.3	5.6	7.2	8.4
Samsun	4.8	4.9	4.3	5.5	7.9	8.7	9.0
Siirt	0.7	0.4	0.5	0.7	2.0	2.2	1.6
Sinop	0.8	0.8	1.1	1.1	1.5	1.4	1.7
Sivas	2.0	2.1	1.8	1.7	2.8	5.9	3.8
Tekirdağ	1.5	2.1	2.0	2.0	2.4	3.8	3.2
Tokat	1.9	1.8	1.3	1.5	2.5	2.5	2.6
Trabzon	2.4	2.4	5.[illegible]	3.3	9.8	7.9	7.5
Tunceli	0.1	0.1	0.1	0.4	0.5	0.3	0.3
Urfa	0.6	1.0	1.9	2.9	2.7	2.0	2.2
Uşak	0.9	1.4	1.0	1.6	1.6	2.5	2.1
Van	0.4	0.5	0.9	0.7	1.0	2.3	1.6
Yozgat	0.9	1.0	1.1	1.0	1.5	1.8	2.7
Zonguldak	3.5	8.2	10.7	9.0	13.0	12.3	13.1
Turkey Total	260.1	312.2	312.6	340.5	446.8	550.7	557.0

Yurdumuzun Kireç Tüketimi
Limestone Utilization in Turkey

Ruhsatlı Binalar Buildings with permission	260	312	313	341	447	551	557
Köyler tüketimi Villages	62	62	62	62	62	62	62
Gecekondular Squatter houses	14	14	14	14	14	14	14
GENEL TOPLAM TOTAL	336	388	389	417	523	627	633

10/ TABLO - 13
10/ TABLE - 13

A. FAAL ÇİMENTO FABRİKALARI

CEMENT FACTORIES ALREADY IN OPERATION

İli Province	Tam Adresi Address	1970 Kapasite (ton) Capacity (tons, 1970)	1969 Üretim (ton) Production (tons, 1969)
Adana	Çukurova Çimento Sanayii T.A.Ş.	450.000	419.500
Afyon	T. Çimento Sanayii T.A.Ş.	400.000	400.000
Ankara	Ankara Çimento Sanayi T.A.Ş.	500.000	444.1[illegible]
	Bastas Çimento Sanayii T.A.Ş.	500.000	414.130
Aydın	T.Çimento Sanayii T.A.Ş. ATÇ	220.000	2[illegible].000
Balıkesir	T.Çimento Sanayii T.A.Ş.	135.000	135.000
Bursa	Bursa Çimento Fabrikası A.Ş.	250.000	186.4[illegible]
Çorum	T.Çimento Sanayii T.A.Ş.	500.000	221.800
İçel	T.Çimento Sanayii T.A.Ş.	380.000	391.000
Denizli	Aslan Çimento Fabrikası	350.000	
Kırşehir	Çukurhisar Çimento Sanayii T.A.Ş.	180.000	155.377
Gaziantep	T.Çimento Sanayii T.A.Ş.	600.000	236.014
	Boyan Çimento Sanayii-TARSUS	20.000	10.390
İstanbul	Ak Çimento Ticaret A.Ş.	950.000	293.800
	Anadolu Çimento Sanayii T.A.Ş.-KARTAL	550.000	382.634
	T.Çimentosu ve Kireci A.Ş. BAŞİNİ-NİŞ	200.000	127.001
İzmir	Batıanadolu Çimento Sanayii A.Ş.	400.000	96.600
	Çimentaş İzmir Çimento Sanayii T.A.Ş.	400.000	345.300
Kırklareli	T.Çimento Sanayii T.A.Ş. İPSALA	130.000	136.970
Kocaeli	Aslan ve Eskihisar Hüttehit Çimento ve Su Kireci A.Ş. DARICA	600.000	377.700
	Nuh Çimento Sanayii A.Ş. [illegible]	400.000	94.231
Konya	Konya Çimento Sanayii T.A.Ş.	180.000	191.523
Niğde	T.Çimento Sanayii T.A.Ş.	135.000	124.995
Sivas	Sümerbank Çimento Sanayii T.A.Ş.	350.000	280.279
Tokat	T.Çimento Sanayii T.A.Ş.	300.000	255.000
Van	T.Çimento Sanayii T.A.Ş.	225.000	76.021
Zonguldak	T.Çimento Sanayii T.A.Ş. KARTİN	250.000	222.000

B. İNŞA HALİNDE OLAN FABRİKALAR : FACTORIES UNDER CONSTRUCTION (AS OF 1972)

İli Province	Tam Adresi Address	Kapasite (ton) Capacity (tons)	Açıklama (Remarks)
Erzurum	Aşkale Çimento Fb.	350.000	
Kars	T. Çimento Sanayiî T.A.Ş.	300.000	
Mardin	T. Çimento Sanayiî T.A.Ş.	600.000	

C. İKİNCİ PLANA ALINAN FABRİKALAR : SECOND PLAN FACTORIES

Bolu	Bolu Çimento Fabrikası	600.000	
Isparta	Isparta Çimento Fabrikası	600.000	
Ordu	T. Çimento Sanayii T.A.Ş.	600.000	

D. İKİNCİ PLANDAN ÇIKARILAN FABRİKALAR :

Adana	Kastas Çimento Fabrikası	600.000	
Manisa	Akhisar Çimento Fabrikası	600.000	
Zonguldak	Bartın (II)	600.000	

E. ÖZEL ÇİMENTO FABRİKALARI : PRIVATE CEMENT FACTORIES

Adana	Çukurova Çimento San.T.A.Ş.	900.000	1973 de
Balıkesir	T.Çimento Sanayii T.A.Ş.	650.000	1973 de
Eskişehir	Çukurhisar Çimento Sanayii T.A.Ş.	400.000	1974 de
Kırklareli	T.Çimento Sanayii T.A.Ş.	400.000	1973 de
Konya	Konya Çimento Sanayii T.A.Ş.	250.000	1972 de
Niğde	T.Çimento Sanayii T.A.Ş.	400.000	1973 de
İstanbul	T.Çimento Sanayii T.A.Ş.	450.000	1973 de

Bölgelerin Kereste İmalâthane Sayısı ve Üretim Miktarı (1968)

Timber Processing Installations and Production in Zones (as of 1968)

Bölgenin Kapsadığı İller Provinces Covered by Zones	İmalathane Sayısı 1964	 1968	Yıllık Kapasite 1000	Tomruk 1000 m^3	Üretim Kereste 1000 m^3
Adana-Maraş-Hatay-Gaziantep-Adıyaman Kayseri-Nevşehir-Niğde	232	324	611	199	143
Mersin	172	246	368	141	103
Antalya	216	302	316	109	75
Isparta-Burdur	123	174	225	95	67
Muğla - Aydın	183	253	273	110	80
İzmir-Manisa	248	314	339	110	80
Denizli-Uşak	117	200	216	80	60
Balıkesir	157	252	297	175	138
Bursa-Bilecik	326	462	311	170	121
Çanakkale-Tekirdağ	61	165	156	175	56
İstanbul-Kırklareli-Edirne	307	406	537	237	171
Sakarya-Kocaeli	515	171	387	147	102
Eskişehir-Kütahya-Afyon	134	161	299	167	122
Ankara-Kırşehir-Konya-Çankırı	178	255	611	405	284
Bolu	131	218	445	378	272
Kastamonu-Sinop	88	105	354	266	197
Zonguldak	159	180	562	250	175
Amasya-Samsun-Tokat-Sivas-Yozgaz-Çorum	217	352	378	100	770
Giresun-Ordu	47	88	171	50	36
Trabzon-Rize-Gümüşhane	115	248	277	100	73
Artvin	9	38	78	50	28
Erzurum-Erzincan-Ağrı-Kars	60	117	126	70	50
Elazığ-Bingöl-Malatya-Tunceli-Muş-Diyarbakır-Urfa-Mardin-Siirt-Bitlis-Van-Hakkâri	215	373	554	115	75
TOPLAM - TOTAL	4.010	5.904	7.891	3.587	2.378

11. ADOBE STABILISATION AND THE USE OF PLASTIC MATERIALS

11.1. USE OF PETROLEUM PRODUCTS FOR ADOBE STABILISATION

11.1.1. Introduction
11.1.2. Stabilising Adobe with Asphalt
11.1.3. Kind of Asphalt used according to Kind of Soil
11.1.4. Determination of the optimum amount of Asphalt for certain kinds of Soil
11.1.5. Conclusion

Appendix - Availability of Asphalts used for Adobe Stabilisation

11.2. UTILISATION OF PLASTIC MATERIALS IN DWELLINGS

11.2.1. Introduction
11.2.2. Planning aspects of Plastic Processing Industry
11.2.3. Plastic as Building Material

REFERENCES.

11.1. USE OF PETROLEUM PRODUCTS FOR ADOBE STABILISATION

11.1.1. Introduction:

Adobe is a very popular building material in Turkey. In rural housing, the share of adobe is 35% (Ref.1).

Especially in villages, when stone, timber and similar materials are difficult to obtain, adobe is almost always locally available. Workmanship is easy. Heat insulation is quite adequate and the strength is pretty enough for one-storey houses. Repairing is not difficult as the material is familiar.

The major disadvantage is the weakness against water. This deficiency is tried to be overcome by stabilising the adobe with some chemicals and petroleum products.

11.1.2. Stabilising Adobe with Asphalt:

Several attempts have been made in Turkey to provide stabilisation with asphalt. The following is the summary of findings of a study recently conducted by the General Directorate of Building Materials of the Ministry of Reconstruction and Resettlement.

A laboratory analysis of the adobe material is essential. This will help to decide what kind of asphalt be used and what the optimum amount is. The analysis should cover a sieve test (gradation) and a determination of silt and/or clay amount. Liquid limit and plastic limit should be determined to know the plasticity index (PI) of the soil (x). In general the soils, with a clay and/or silt ratio of more than 45% are not suitable for asphalt stabilisation as silt and clay tend to prevent pulverisation.

(x) PI: Plasticity Index LL - PL

11.1.3. Kind of Asphalt used according to Kind of Soil:

The kind of asphalt is determined by the kind of soil, as follows:

Cut-back asphalts of RC type and emulsion asphalts, are very suitable for sandy soils, with a small silt and/or clay content. The soils of PI 5 or less are of this kind. As nonplastic soils are cohesionless, the stability of the mixture is a function of the binding power of the asphalt used.

Cut-back asphalts of MC type provide a more homogenous mixture in case they are used with soils of PI 6-10. As the plasticity becomes higher, cohesion is higher. Consequently the stability of the mixture is determined by both the binding power of asphalt and the cohesion effect of clay. This kind of soil gives satisfactory results with emulsion asphalts.

Asphalts of SC type are good for clayey soils as they are highly penetrative. They can be used with soils of PI higher than 10, and silt and/or clay content higher than 30%. The stability of the mixture does not depend much on the binding property of the asphalt, as the soil itself is highly cohesive.

11.1.4. Determination of the Optimum Amount of Asphalt for a Certain kind of Soil:

The most realistic method was found to be mixing of the soil with various amounts of asphalt and conducting a series of "stability" and "water absorption" tests. In the laboratory, it was found by

experience that the soil should contain half of the optimum water content, for cut-back asphalts. In other words, the asphalt will substitute the remaining one half. In case emulsuin asphalts are used, the water content must be 10% or slightly more. This amount of water facilitates the mixing of asphalt.

The mixing and curing processes have been performed under certain conditons. Then pressure strength, capillarity and frost tests were conducted.

In the following, the average results of two sets of tests (one with 4% and the other with 7% asphalt ratio, with 85-100 penetration rate, in form of an emulsion containing 60% water) conducted on GM type soils:

	With 4% Asphalt	With 7% Asphalt
-Unit weight	1,879 Kg./dm3.	1,902 kg./dm3.
-Pressure Strength		
(a) Normal in dry air		
Average	8,647 kg./cm2	11,181 kg./cm2
Minimum	7,070 kg./cm2	10,419 kg./cm2
(b) Absorbed with water		
Average	-	8,759 kg./cm2
Minimum	-	7,145 kg./cm2
(c) After frost		Collapsed after the 15th repetition.
-Capillary water rise		
(a) cm/hour (23 hours)	7 cm	-
(b) gr/hour (27 hours)	160 gr.	19 gr.
-Water absorption	Collapsed.	3.64
-Cost per adobe block (29 x 14 x 9.5 cm.)	0.387 TL.	0.738 TL.

As the petroleum refineries produce various kinds of materials, and they are easily found on the market, it will not be difficult to obtain them for such a study. Still, the costs must be analysed for economy (See Appendix).

11.1.5. Conclusion:

The individual limited attempts to stabilise adobe with petroleum products have been done from time to time in Turkey. But this kind of work has not been handled in form of a large and continuous project. At present, the effect of stabilisation on a single block is known to some extent, but there is no experience on mortar, completed walls, plasters and whole structures.

A comprehensive study is believed to be very helpful in investigation of the ways of improvement of this inexpensive and popular building material.

(11.1) APPENDIX

AVAILABILITY OF ASPHALTS USED FOR ADOBE STABILISATION

(a) MC(Medium Cure) Cut-back Asphalt:

It is a mixture of asphalt cement (AC) and kerosene. Grades 0, 1, 2 of this kind of asphalt can be produced by Batman Refinery of T.P.A.O. It is only available if orders of major amounts are given, The price in Batman is about 750 TL. per ton. The cost rises to about 1200 TL. in Ankara, because of transportation expenses. Refineries in İzmit and Mersin usually do not produce this; but it should be considered that if big orders are given it will be feasible.

(b) RC (Rapid Cure) Cut-back Asphalt:

It is a mixture of asphalt cement (AC) and gasoline. Grades 0-5 of this kind of asphalt can be produced by Batman Refinery. It is only available if an order of more than 50 tons is given. Unit price is about the same as MC type. It is highly flammable and General Directorate of Highways prefer to produce it locally.

(c) SC (Slow Cure) Cut-back Asphalt:

It is a mixture of asphalt cement (AC) and light oils. Crude oil and fuel oil are of this kind. It is not produced, nor used in large amounts. Can be produced by Batman Refinery. Price in Batman is about 600 TL. per ton.

(11.1) APPENDIX (Cont'd.)

(d) Emulsion Asphalt:

It is produced by private insulation firms, in Ankara and Istanbul; standards are vaiable. Price is about 1.10 TL/kg. Water ratio can be changed very easily.

11.2. UTILISATION OF PLASTIC MATERIALS IN DWELLINGS

11.2.1. Introduction:

As a tradition, solid and durable materials are generally preferred for building construction in Turkey. However, recently numerous plastic materials emerged in the market, and some of them are used in the newly constructed modern buildings.

Replacement of the traditional materials used in the manufacture of various goods and articles by plastics has resulted in rapid development of the plastic industry in Turkey. This industry mostly depended on imports for raw and auxiliary materials, until the end of 1969. However, in recent years certain polymers and plasticisers began to be produced locally. Now the plastic industry is in process of improvement.

11.2.2. Planning Aspects of Plastic Processing Industry:

Plastic processing industry is covered by separate chapters in the First and Second Five-Year Development Plans (Ref. 1 and 2).

In 1969, the consumption of plastic materials was 1.5 kg. per capita. The estimated figure is 2.2 kg. per capita for 1972.

Imports provided by limited allocations, have shaped the present structure of this industry, which is composed of many small units and of a few large enterprises. Plastic technology in the world is in a process of rapid development. Existing installations have to be adapted to new varieties of plastic and technological advances. Since this could not be done properly, 40% of the existing capacity remained idle in Turkey during the First Five-Year Plan period (1962-1967). Artificial increases occurred in prices, obliging enterprises to operate with a large volume of raw material stock.

In spite of this, the demand has always existed in the market, even for the low quality materials. For economic production, the State Planning Organisation stipulates the use of at least 60% of the total capacity.

large petro-chemical industry, named PETKİM, has been established in Yarımca (Kocaeli), in the year 1969. It started to produce polyethylene and PVC in 1970. Since then, every year considerable progress is recorded.

The domestic demand, production, imports and exports for total plastic materials are shown in Table 1.

(11) TABLE 1.

(in million TL., 1968 rates)

Years	Demand	Production	Imports	Exports
1967	380	378	2	-
1968	450	447	3	-
1969	588	586	2	-
1970	706	700	6	-
1971	904	900	5	1
1972	1,000	1,000	5	5

The plastic processing capacity was 129,000 tons/year in 1967. It raised to 165,000 tons/year in 1969. The investments in plastics will be doubled during the Second Five-Year Planning period (1968-1972) and long-term technical training and technological improvement will be stressed and a drop in idle capacity ratio is expected in 1972.

The main plastic products, at present, are plastic shoes, artificial leather, vinyl-asbestos floor tiles and polyethylene film bags or sheets. Recently plastic pipes showed a rapid progress.

11.2.3. Plastics as Building Material:

Of the mentioned amount of plastic processing production (about 300,000 tons in 1972), only the following items are used in buildings:

(a) Vinyl-asbestos floor tiles:

Recently vinyl-asbestos floor tiles became popular in the cities and towns, and substituted cement, mosaic, etc., tiles. Production is growing rapidly and the rate of populatisation shows that this material may well be adopted in villages too, in near future. It takes an important percentage in total production and has a good potential for export, since it matches high standards.

(b) Clean and/or Waste Water Installation Pipes:

Plastic pipes are already used for irrigation and agricultural purposes, in great extent. It may well be largely adopted in rural dwellings, for it has such advantages as lightness, workability and durability.

(c) Kitchen and Bathroom Fixtures, Water Reservoirs, Wash-basins, Handrails, Plinthes and Lambris:

Use of plastic for such items is constantly increasing.

(d) Flat or Corrugated Plastic Sheets:

Although corrugated plastic sheets are widely used as roof covering material in temporary or urban structures (partly for decoration purposes), they are not accepted yet as a major material. Flat sheets are especially used in advertisement, decoration and lighting fixtures.

(e) Sheets or Bags of Polyethylene Films:

Recently, plastic sheets (films) are widely used on roofs (especially on earth roofs, which provide a good thermal insulation but are very weak against water) for waterproofing, or in hollow gables of roofs for windproofing. Plastic bags are used to hold glass-wool in place, for heat insulation. They are also used on tents or temporary structures as an upper cover (waterproofing).

(f) Plastic Foams for Heat and Acoustic Insulation:

Although several kinds of plastic insulation materials (foam, etc.) exist on the market, they are not used yet in dwellings, but are very popular in furniture and industrial use (seats, armchairs, refrigeration, industrial insulation, thermal and acoustic insulation of few modern buildings).

(g) Acryllic Wall and Plaster Covering:

This material has not been popularised yet, but seems to be in progress.

(h) Styrofoam Beads and Panels:

They are used to provide insulation and lightness in prefabricated houses.

Such materials as electric cables and plastic wall-papers are excluded here because they are considered non-structural.

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12. HOUSING INDUSTRY

12. HOUSING INDUSTRY

12.1. SITUATION OF THE HOUSING SECTOR

12.2. LIGHT-CONCRETE AND
PREFABRICATED CONSTRUCTION RESOURCES

12.2.1. Introduction - Historical Background
12.2.2. Production of Precasting Plants

12.3. FUTURE DEVELOPMENT
AND PROBLEMS OF PREFABRICATION IN TURKEY

12.1. SITUATION OF THE HOUSING SECTOR

The number of new dwellings is quite high in Turkey. But the "dwelling construction" is not considered as an important activity of the construction sector. Usually dwellings are not constructed by big structural firms,but instead by a large number of small contractors who do individual work. Hence, this, to a certain extent makes it impossible to get rationalised, standardised and industrialised.

Standardisation and a partial rationalisation can be observed only in public dwellings built by the General Directorate of Housing of the Ministry of Reconstruction and Resettlement.

But this is practiced in small living centres and therefore does not concern the Housing Sector at the country-side. In fact, for the housing sector at the country-side, one cannot even talk about the presence of small contracting firms. People, themselves build their own dwellings at the suburban quarters of large and small towns with primitive construction methods. To do this, they merely get help from one or two craftsmen. The very same situation is observed in the rural dwellings in villages.

Standardisation and rationalisation in the housing sector has recently started to be planned in the touristic dwellings at the Western and Southern Anatolian coasts.

However, there is still no sign of efforts being made to use the same technique in typical dwellings.

12.2. LIGHT - CONCRETE AND PREFABRICATED CONSTRUCTION RESOURCES

12.2.1. Introduction - Historical Background:

Since light weighted concrete is used in Turkey only in precasted structures, historical background of prefabrication technology will be studied only.

The first application of prefabrication in Turkey was in 1957 when a Turkish construction firm built a housing complex consisting of one, two and three-storey units, using Danish Larsen Nielsen procedure in Ereğli region.(*) Private sector contributed very little to the progress of this technology for 15 years. The second effort in this field was made by the State during the last few years, and is still alive.

Precasting is done in Turkey using different combinations of materials for frame units and wall units as follows:

(i) Steel skeleton and timber partition walls
(ii) Reinforced concrete panels
(iii) Light weighted, reinforced concrete panels
(iv) Plastered panels
(v) Steel frames and walls filled with light weighted concrete
(vi) Timber panels
(vii) Prestressed concrete units
(viii) Plastic dome elements

All systems used are based on the 'partial' and 'open' prefabrication concept.

In Table 1, a summary of the Turkish applications of the precasting technology for the last ten years is given.

(*) The firm had serious financial problems and giving a bad example of financial operation, influenced negatively the development of precasting technology by the private sector.

The efforts have increased widely since 1967. This is mainly due to the successive natural disasters occurring in Turkey since this date. Varto, Sakarya, Demirci, Gediz, etc. earthquakes, Mersin flood and several landslides all over the country required quick urban projects and prefabricated housing constructions to be realised. State passed first orders to private firms for construction of partially precast dwellings. Later the construction components began to be prepared in the workhouses of the MKE (State Mechanical and Chemical Industry' Institution) and in the plants of the Land Resettlement Directorate (Toprak İskân Genel Müdürlüğü).

In 1968, this effort was focused to the foundation of a new plant of half private character and later on, of two other plants depending on the General Directorate of Natural Disasters.

It can be noticed on the table that at the present time the precasting units for housing purposes are mainly prepared by only three plants. Two plants of the Ministry of Reconstruction in Ankara and the plant of YTONG firm in Istanbul. The emphasis will be then given, to the study of this three types of production.

12.2.2. Production of State Precasting Plants:

(a) The first timber precasting plant of the two State precasting plants was founded in 1968 at Lodumnu, in Ankara. This plant is exclusively reserved to the preparation of the timber housing components.

At the beginning, it produced 6 dwellings a day for the disaster regions of Kığı, Iğdır, Amasra and Bartın.

After Gediz earthquake in 1970, the production was nearly tripled and reached a capacity of 16 dwellings a day. At present, 7 dwellings are produced in normal time and 16 a day at emergency.

On a modular size of 1.20 m., several types of timber panels are prepared. They can be divided mainly into two groups: outside panels and inside panels. Outside panels are 10 cm. thick in total and are filled in portion of 5 cm. of thickness by insulating glass-wool.

They are covered by hard board of 19 mm. thickness on the outer face and by 8 mm. thick asbestos in the outer face (Fig. 1.a).

The units to be used inside of the dwellings are only 6.0 cm thick and are covered by thin hard board on two faces. (Fig.1.b.)

The units are prepared to constitute plain panels without window, or panels with window/door etc.

Details about connection of panels are sketched in Fig.2.

The panels are mostly used in construction of one storey, single dwelling units of 48 sq. m. clear surface for urban types and 43 sq. m. for rural types following some prototype architectural plans. One of the most typical architectural and construction arrangements is given in Fig.3.

The timber roof system is also precast in the plant and provided to the client as 7 completely prepared trusses.

Besides 37 different panels and 7 roof trusses, all other complementary items are delivered also by the plant.

The photograph (Fig. 4) may give an idea on the phase of erection of the dwellings in place.

A completely finished dwelling is seen in Fig. 5.

The mosques can be constructed too, with these timber precast components as seen in Fig. 6 where it can also be noted that a minaret is built by precast circular timber components.

Insulation problems are somewhat solved in this system by use of 5 cm. thick glass-wool. It has been concluded after laboratory heat tests, that the external walls consisting of 10 cm. thick panels, would be equivalent to 60 cm. thick brick walls as far as heat insulation is concerned.

The earthquake resistance of these panels have not been tested in the laboratory, but it is assumed by engineering common sense that the earthquake hazard risk of these is less than a brick masonry dwelling of the same size.

As for the prices of those panel units, they vary between 140 and 167 TL. (1972 prices) for inside panels and between 194TL. and 233 TL. for outside panels.

The components and complementary items necessary for a dwelling are sold by the plant at a price of 13,000 TL. With foundation, erection, roofing on place and installation of sanitary and electrical equipment, the price would rise to 21,000 TL.

For a total construction area of 51.8 sq. m. (a clear surface of 48 sq. m.) this would correspond to a unit price of approximately 400 TL./sq. m., which is not expensive at all.

5.5 cu.m. of timber is used in the construction of such a dwelling.

(b) Light-Weight Concrete Precast Production:

The plant in Etlik, near Ankara, founded in 1970 is oriented for the prefabrication of light weighted concrete panels. This plant, which totally belongs to the private sector now took the place of Şimşek plant, half of the capital of which belonged to the State and which reached a total production of 4000 dwellings during the period 1968-1970. Şimşek now produces much less and only for the bungalow type construction at the touristic regions of the country and for small administrative buildings (Fig. 7).

The light-weighted concrete is made by using imported Styrofor, a product of the German BASF firm. Styrofor is going to be produced in Turkey, soon in the PETKIM (State Petro-chemical Industry) plants. Concrete obtained by using styrofor as light material has a compressive rupture cube strength no less than 40 kg/sq.cm.

The panel components are also based on a modular size 1.20 m. The most typical panels measure 1.20 m.x 2.40 m. Thickness of panels are 6 cm. for inside panels and 8 cm. for outside walls. The panels are covered by 1.5 cm. thick concrete at outer faces and by 0.2 cm. thick concrete at inner faces (Fig.8-a).

First type of concrete block with a cross section of 1.5 cm. x 0.2 cm has an average density of 940 kg/ cu.m., which is 2.5 times smaller than the density of usual concrete.

The panels are reinforced as seen in Fig. 8-b.

Panels are erected in the concrete strip foundations, as seen in Fig. 9.

The typical disaster region dwellings consisting of these precast panels have a prototype plan of 6.08 m x 7.28 m. as seen in Fig. 10.

Prices of panels vary from 156 TL. to 179 TL. for outside ones and from 133 TL. to 144 TL. for inside ones.

The typical dwelling seen in Fig. 13 is constructed by using 39 of those panels and 47 other detailing materials, including timber roofing elements. The price for total delivered items is 11,300 TL. With necessary expenses for erecting the total price of one dwelling amounts to 17,200 TL. The unit total cost is 400 TL./sq.m. This price is 2.5 times cheaper than the sale price of a similar dwelling made by private firms.

For roofing and door window details, 3.5 cu.m. timber is used in this type of construction, and 9 cu.m. of concrete without counting the concrete in the strip foundation.

The heat insulation characteristics of those panels are equivalent to the characteristics of a brick wall of 50 cm. thickness. The earthquake resistance which is not tested, nor computed, is only based on the common engineering sense.

The production of the two plants of the General Directorate of Natural Disasters is started to be used for the construction of school buildings , and of dormitory buildings used in the Army.

(c) Production of "Ytong" Firm:

Ytong Firm of Turkey which is founded in 1966, used to work with Swedish Ytong procedure. This procedure consists of using limestone instead of coarse aggregate and of using aluminum powder in addition to the portland cement.

Chemical reaction which takes place after the contact of this dry mixture with water makes the hydrogen go out freely. Within two hours after the chemical reaction, the material reaches already a sufficient degree of strength. Then it is cut out in block. The blocks are then sent to the autoclaves where a steam of 180°C circulates under 10 atmosphere pressure. This forced curing and drying process takes about 10-11 hours and finally the material is ready.

The material can be cut in the shape of brick, or panel wall unit, or panel slab unit or joist slab unit, etc., the units reinforced steel bars, which are to be used as load carrying elements have a density of 840 kg/cu. cm.

The Ytong products that can be used in the partial precasting can be listed as follows:

(i) Panel Slab Units: those are the rectangular prismatic balcks with standard width of 50 cm. Their length can vary from 1.0 m. to 6.0 m., increasing by 0.25 m. Their thickness vary from 7.5 cm. to 25 cm. , increasing by 2.5 cm. (Fig. 11-a)

The connection details of the blocks with the supporting girders are given in Fig. 11-b.

The slab panels are also used as precast concrete joists. In this case, the panels are located leaving empty places between them. These empty spaces are filled with reinforced concrete, which corresponds to the joist beams as seen in Fig. 12.

(ii) Panel Wall Units: Those are panels of 50 cm. width. Their length vary from 0.50 m. to 3.00 m., increasing by 25 cm. The thickness of the walls vary from 15 to 25 cm. The resistance to wind forces of 110 kg./sq.m. intensity directly effects the thickness of the wall.

Blocks and connection details are given in Fig. 13.

12.3. FUTURE DEVELOPMENT AND PROBLEMS OF PREFABRICATION IN TURKEY

Besides the emergency construction problems created by natural disasters, the tourism industry is going to require precast dwellings in Turkey, soon. The five enterprises working in this field, three mains which were studied in detail in Chapter 2., and two others (Şimşek of Ankara and the State plant of MKE) look like having a total production capacity of 7,000 dwellings a year. If Betontaş of Turgutlu and Fe-Ga of Ankara make an additional effort for production of housing units, the total amount will be 8,000 dwellings per year, at maximum. In comparison to the total housing requirement per annum in Turkey, this has no significance.

A State policy focusing on the prefabrication would create an atmosphere in which a total production capacity of 20,000 dwellings or more per year could be reached within ten years. But this would mean a transition from the very preliminary, partial, open, prefabrication of the present time to the total and heavy prefabrication. In this report, some

serious restrictions exist and without finding solution to them, the passage to the application of heavy prefabrication could create some problems.

12.3.1. In the case of heavy or total prefabrication, reinforcing steel and cement are not used in the most economic way. This would increase the shortage of reinforcing steel already existing in the country.

12.3.2. In order to minimise the transport expenses, several plants should be founded all over the country. The necessary mechanical equipment and the necessary new trucks would create a considerable amount of expenditure at the beginning. In the case of constructing two or more storey apartment houses, new cranes would be needed and since the country has no crane production industry, this would lead to new forced importation.

12.3.3. Earthquake resistance of the two or more storeyed precast apartments should be seriously studied, before going into production. This cannot be made very quickly.

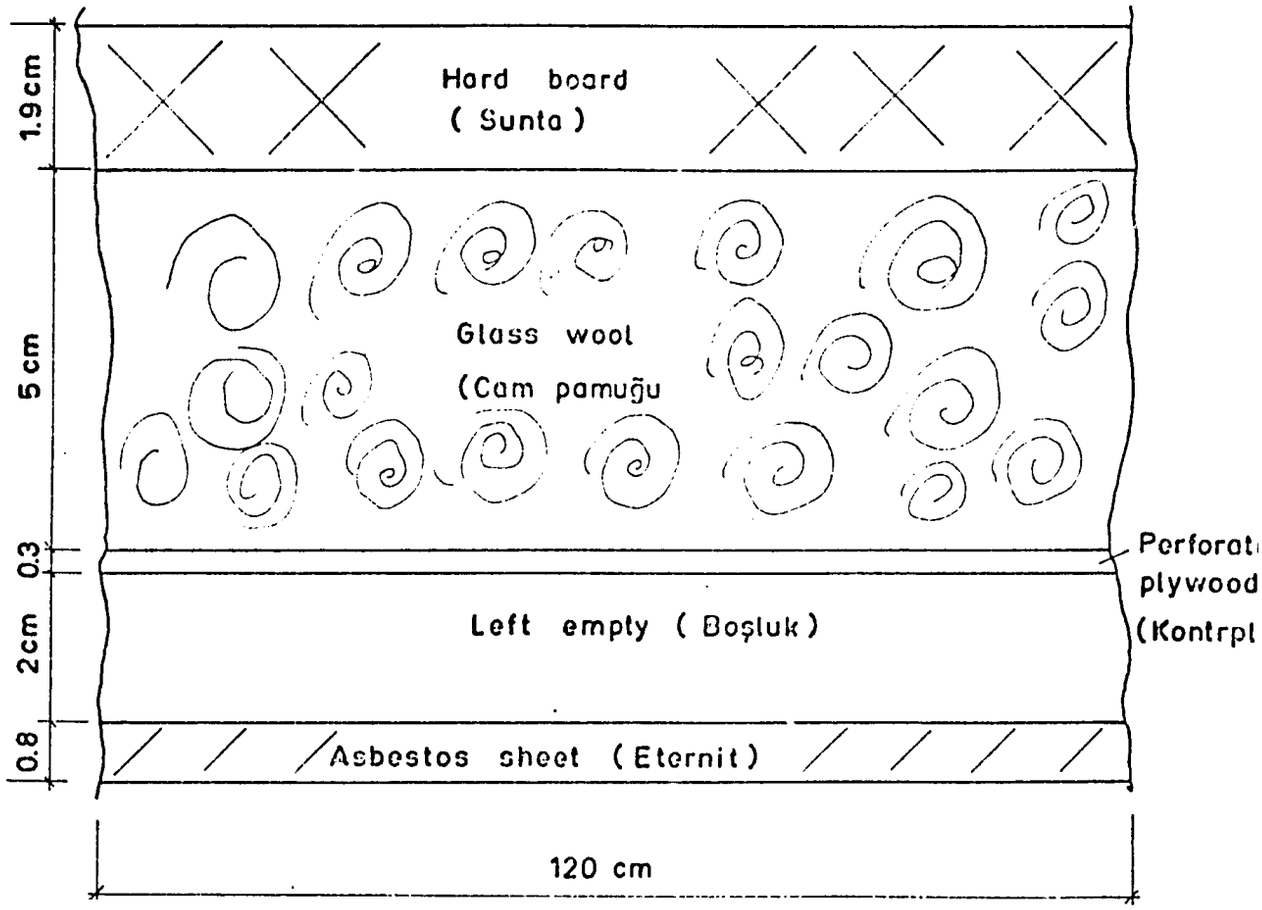
TABLE - 1

PRODUCTIONS OF MAIN PREFABRICATION FIRMS

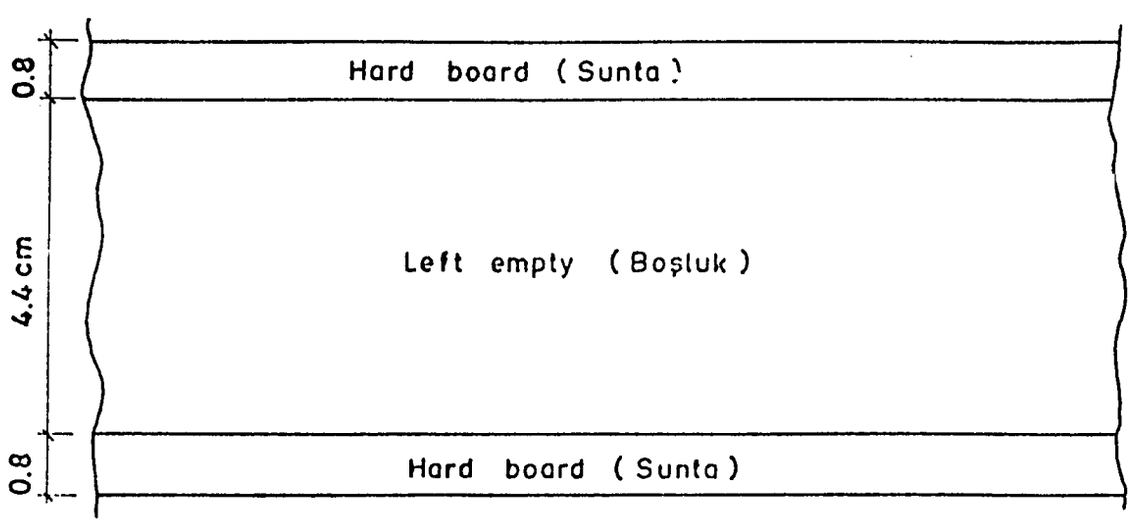
Item	Name Of Firm	Kind of Product	Material Used	Surf. Area	No. Of Dwel.	Place	Date
1	Prefa	Housing	Steel Skeleton And Timber Partition Wals	5780	61	Içel	1966
				2613	27	Adiyaman	1966
				1736	27	Elazig	1966
				1166	11	Tunceli	1966
				26268	1100	Varto	1966
				7362	116	Malatya	1967
				7285	35	Içel	1967
2	Ytong Pendik	Elements for Bldg. Constr.	Light W. Reinf Concrete		Nay. 120.000 m3 A year	All Regions	Since 1966
3	Ekmekçioglu	Housing Pref. Slabs Only	Reinf. Concrete	1600	1	Istanbul	1966
				120	1	Istanbul	1968
4	Simel	Piles	Reinf. Conc.				
5	D. Döncel	Housing	Concrete	110000	195	Ankara	1961
				1200	1	Ankara	1966
6	M. Daloglu	Housing Prefab. Partition	Plaster	400	4		1964
				4800	3		1965
				1700	2		1966
				2200	3		1967

Item	Name Of Firm	Kind of Product	Material used	Surf. Area	No. Of Dwel.	Place	Date
7	M. Daloğlu	Housing	Steel Frames		600	Varto	1966
8	German Red Cross	Housing	Timber		32	Varto Hınıs	1966
9	Sweden Red Cross	Housing	Timber		132	Hınıs	1966
10	Yugoslav Red Cross	Housing	Timber		24	Hınıs Muş	1966
11	Çimşek Semi Official	Housing	Timber		1000	Sakarya	1967 1968
		Housing	Light-W. Conc.		4070	Mersin Iğdır	1968 1969
12	Ministry Of Reconst Plants	Housing	Light - W. Conc.		1500 2000-4000 (A Year)	Demirci All Regions	1969 Since 1968
13	Betontaş (Turgutlu)	Pipe + High Voltage Piles	Reinf. Conc.		2000 1000	All Regions	1968 1969 1970

Item	Name Of Firm	Kind of Product	Material Used	Reinf. Area	No. Of Dwel.	Place	Date
14	Ye-Ga Ankara	Pipe High Voltage Piles Housing Units	Prestressed Conc. Prestressed Conc.		3000 3000 5 Storey Apart.	All Regions Different Regions	Since 1968 1971 1972
15	MKE Work Houses Ankara	Housing	Timber Light - W. Conc.		1000	Different Regions	1969
16	Ministry Of Reconst	Housing	Timber Light - W. Conc.		3100 (A year)	Different Regions	Since 1970
17	German Bayer	Housing	Plastic		15	Cediz	1970
18	Eston Eskişehir	Piles (Newly Housing Units)	Reinf. Conc.			Eskişehir	1972 for housin
19	Irekonsa Ankara	Housing	Reinforced Concrete			Ankara	Newly starte for Housin

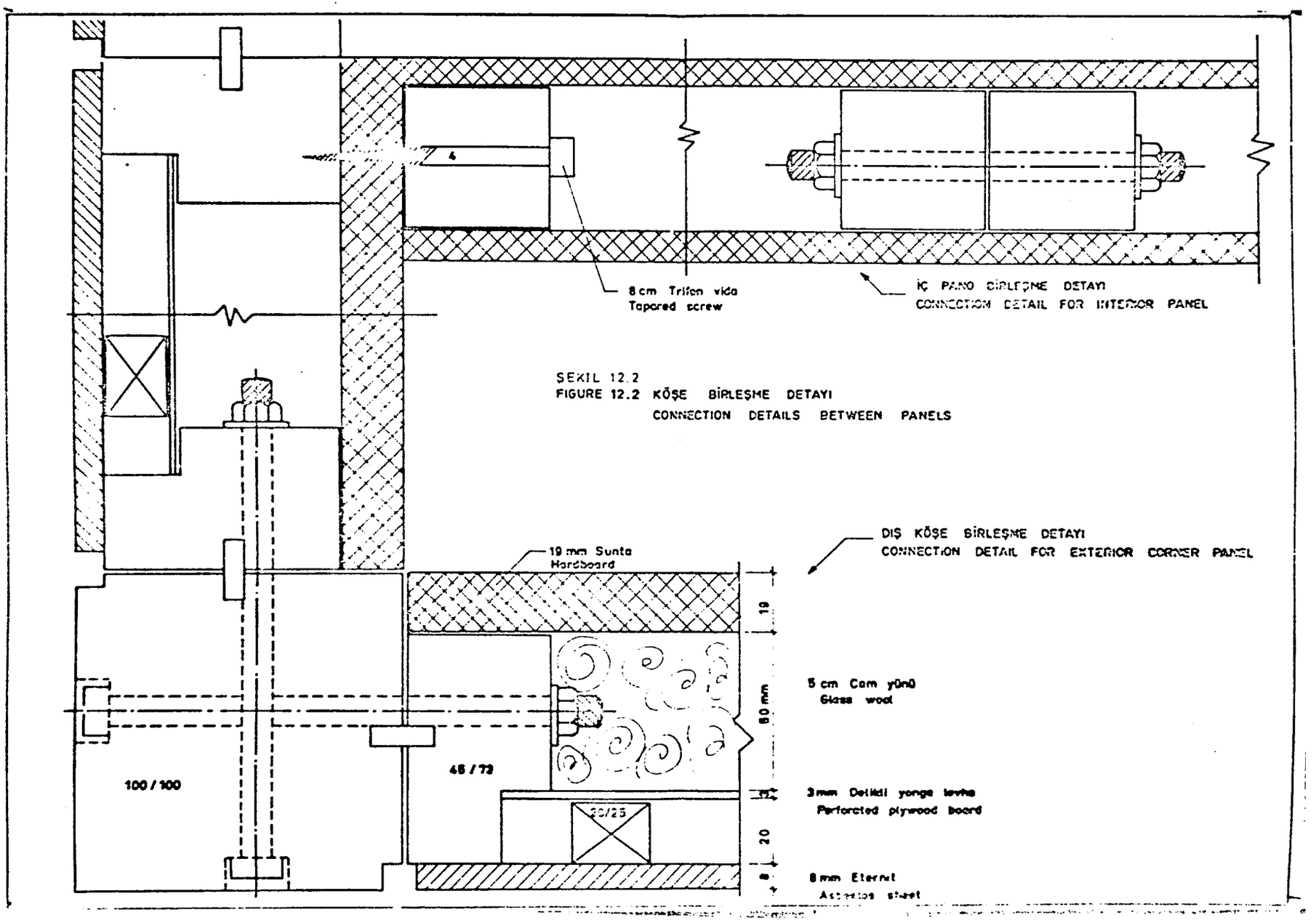


1. a



1. b

FIGURE 12.1



ŞEKİL 12.2
FIGURE 12.2 KÖŞE BİRLEŞME DETAYI
CONNECTION DETAILS BETWEEN PANELS

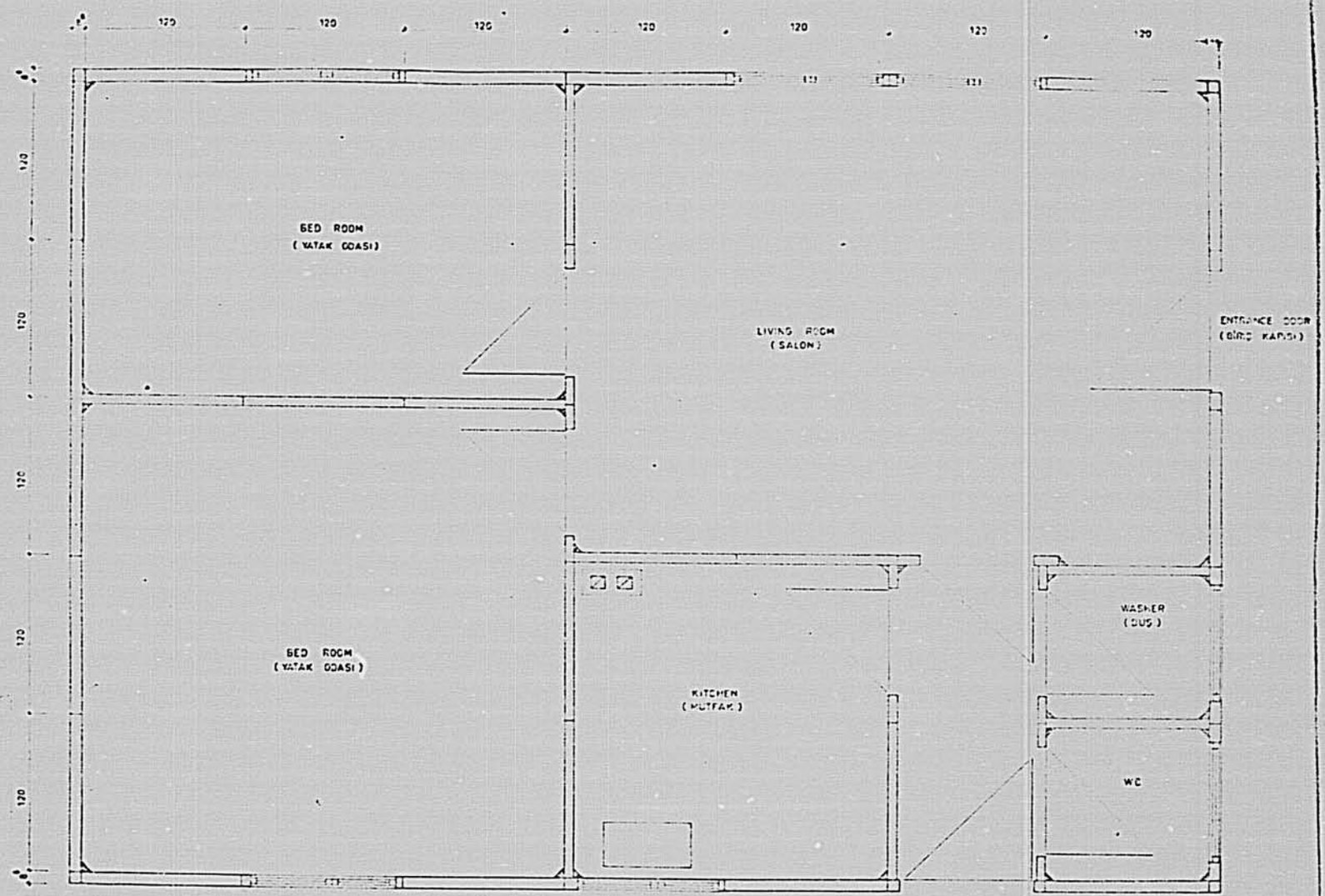
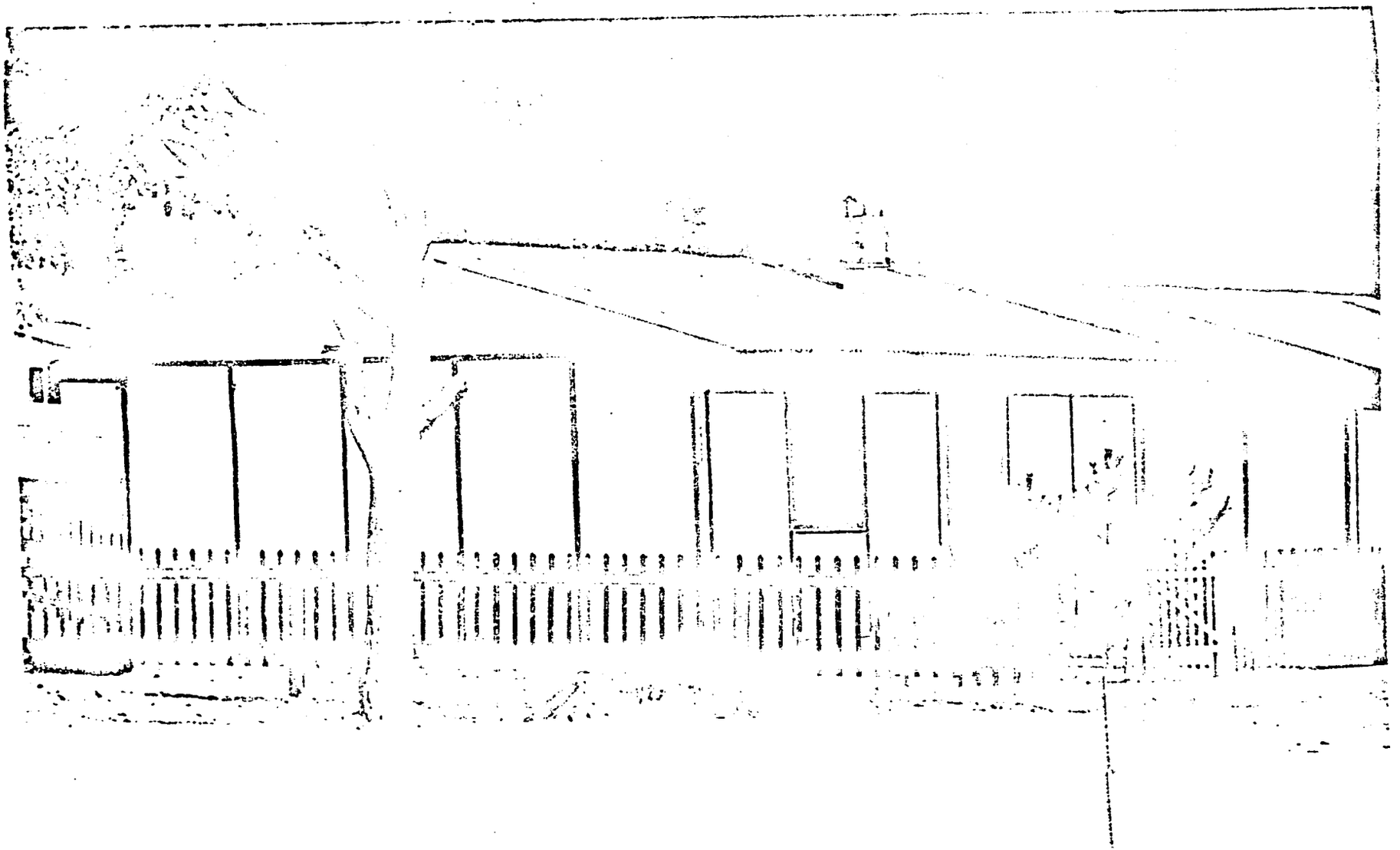


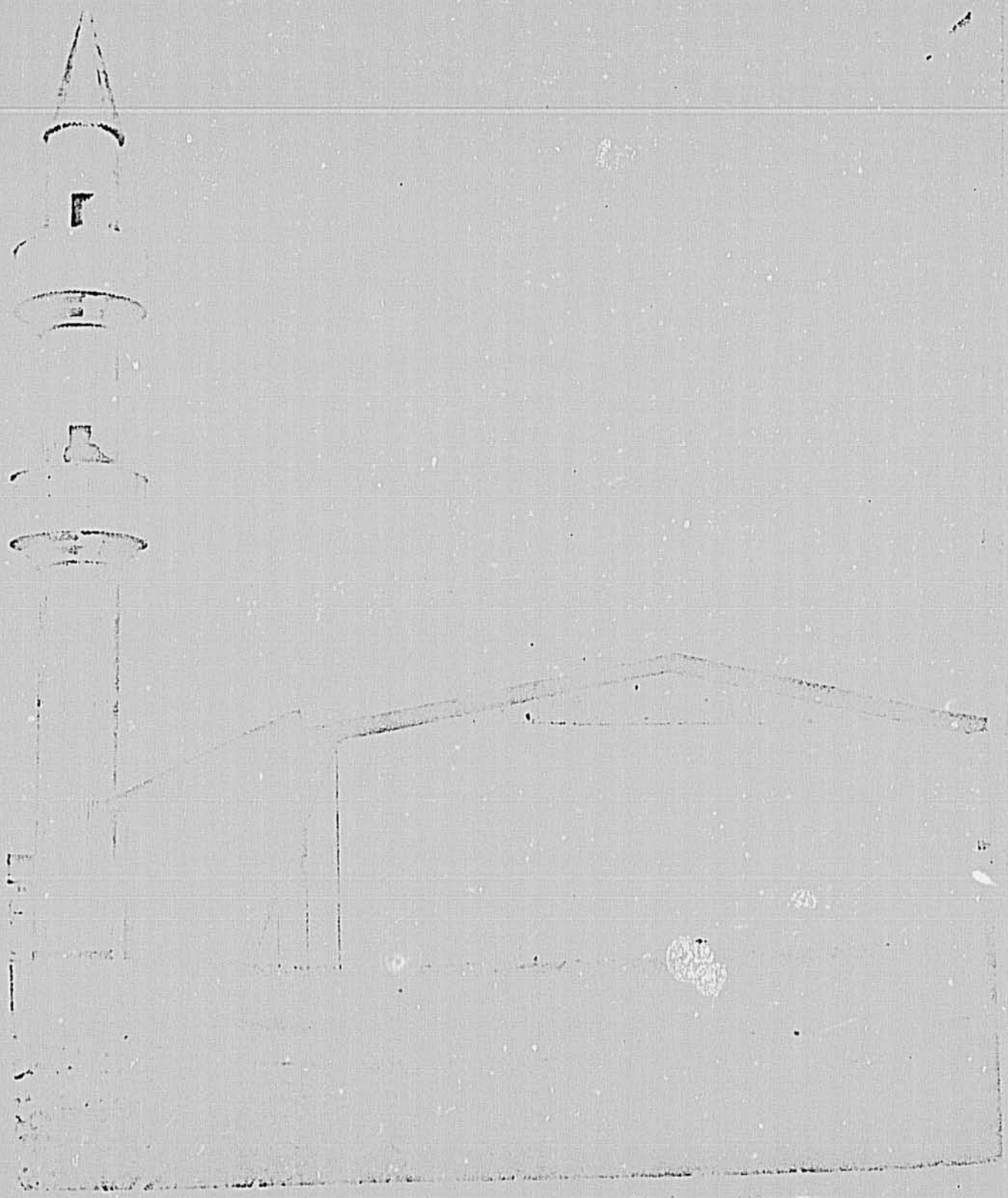
FIGURE 12.3

PLAN VIEW OF TYPICAL TIMBER PRECAST HOUSE (URBAN TYPE) — ŞEHİR TİPİ TİPİK PREFABRİKE KONUT PLÂNI (ŞEHİR TİPİ)

Şekil. 12.4 Ahşap Prefabrike Kırsal bir Konutun Montajı
Figure. 12.4 Erection of a Timber Prefabricated Rural Dwelling

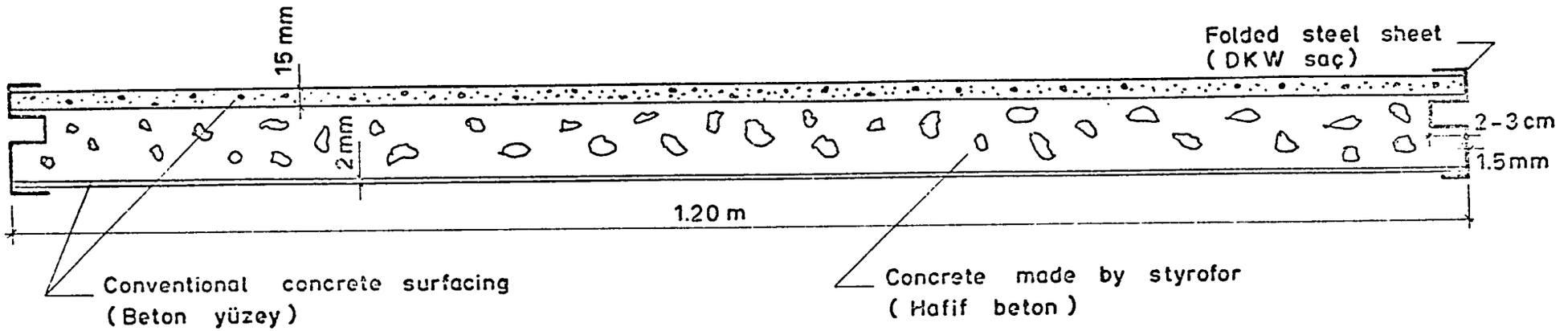


Şekil. 12.5 Bitmiş Ahşap Prefabrike Kırsal Bir Konut
Figure. 12.5 Completed Timber Prefabricated Rural Dwelling



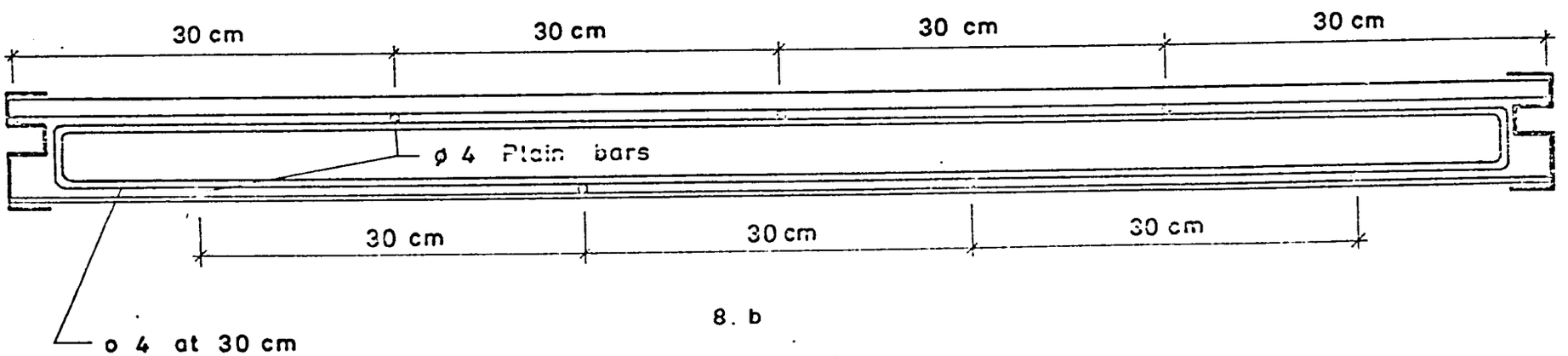
Şekil. 12.6 Ahşap Prefabrike Cami ve Minare

Figure. 12.6 Timber Prefabricated Mosquee With Minaret



Cross section of a typical light weighted concrete panel
(Tipik hafif beton pano kesiti)

8 . a



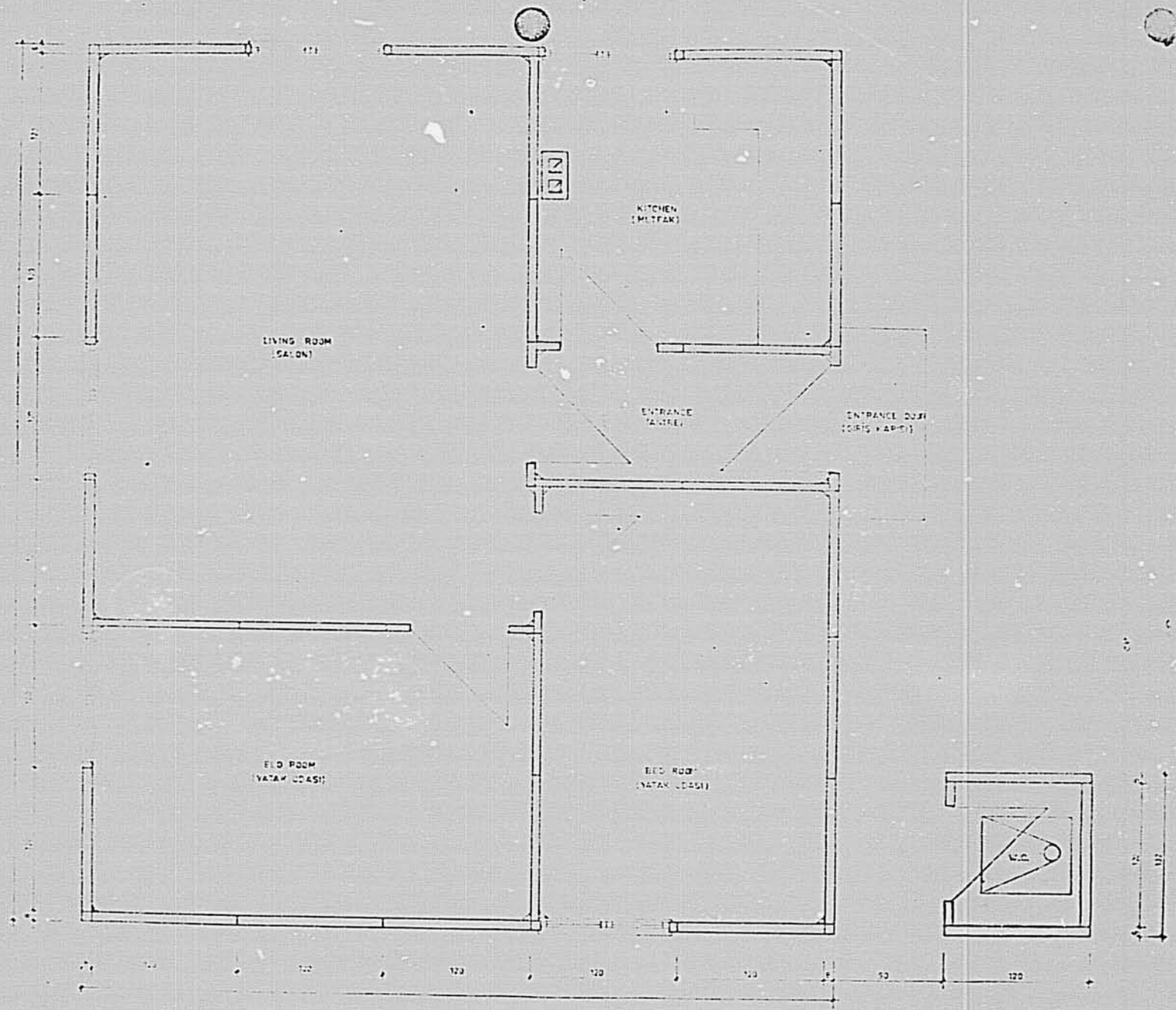
8. b

FIGURE 12.8

Reinforcing detail of panels
(Panoların donatı detayı)

Şekil. 12.9 Beton Temeller Üzerinde Hafif Betondan Prefabrike Bir Konutun Yapımı

Figure. 12.9 Erection of a Precast Light Weight Dwelling on the Coucrete Strip Foundation

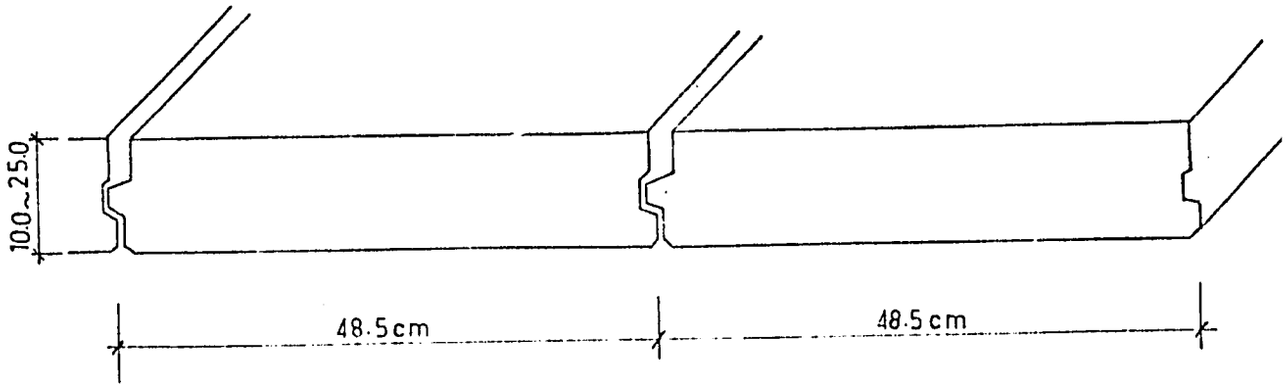


PLAN VIEW OF A TYPICAL LIGHT WEIGTED CONCRETE PRECAST HOUSE (RURAL TYPE) — TIPIK PREFABRIK HAFIF BETON KONUT PLÂNI (KIRSAL TIP)

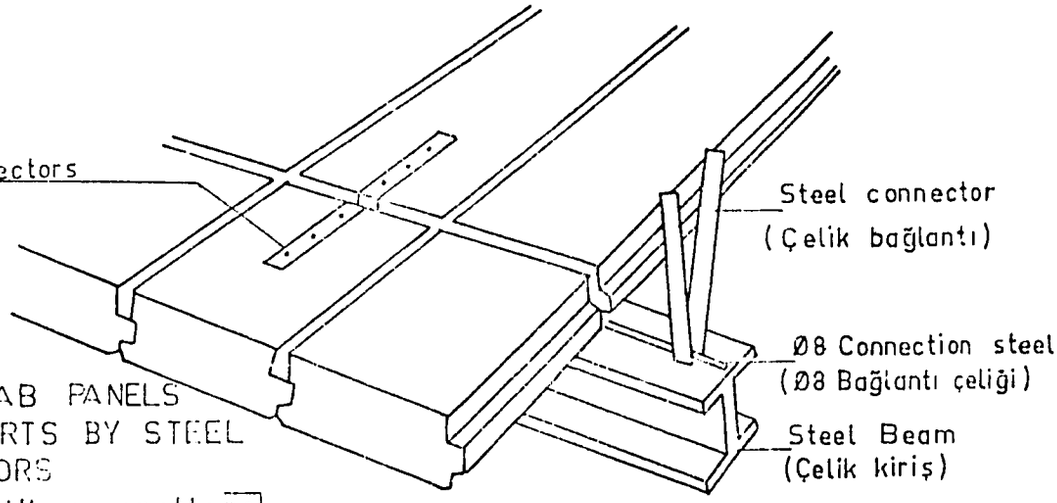
FIGURE 12.10

DETAIL OF TONGUE AND GROOVE IN ELEMENTS WITH THE WIDTH OF 10cm. OR MORE

(10 cm. ve-daha fazla genişlikte elemanlarda diş ve oyuk detayı)

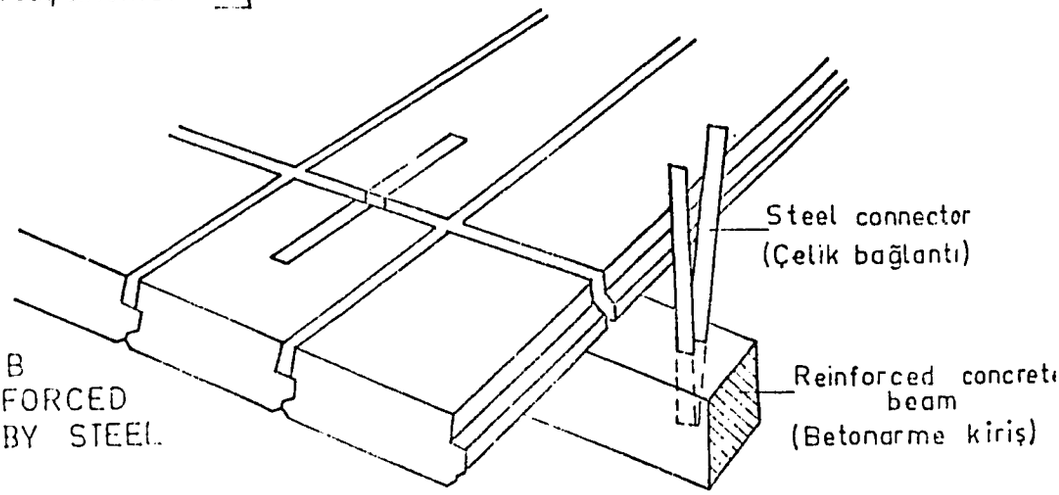


11-a



CONNECTIONS OF SLAB PANELS TO THE STEEL SUPPORTS BY STEEL CONNECTORS

Döşeme panolarının çelik mesnetlere çelik bağlantılarla birleştirilmesi



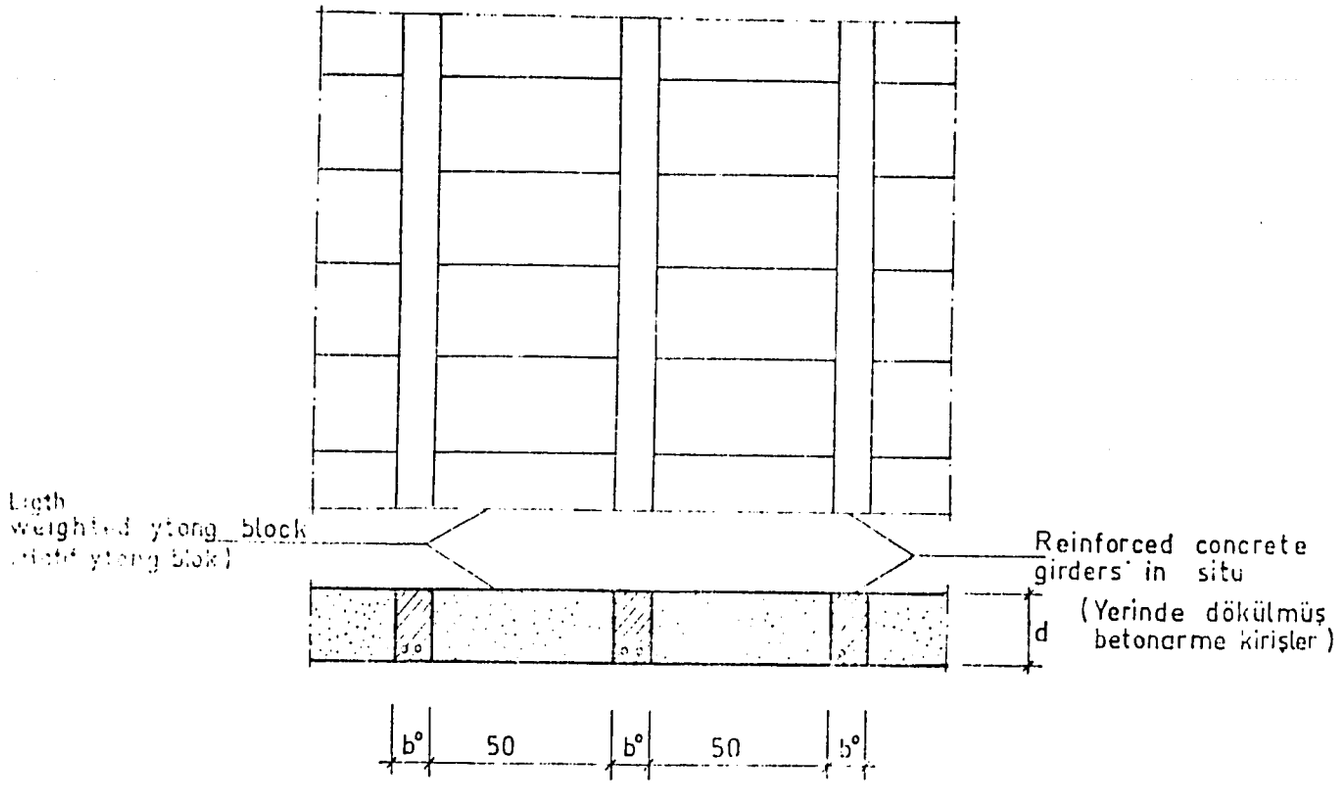
CONNECTIONS OF SLAB PANELS TO THE REINFORCED CONCRETE SUPPORTS BY STEEL CONNECTORS

Döşeme panolarının betonarme mesnetlere çelik bağlantılarla birleştirilmesi

11-b

FIGURE 12.11

ŞEKİL 12.11



DETAIL OF CONCRETE JOIST-SLAB ARRANGEMENT

(Beton dişli döşeme ayrıntıları)

FIGURE 12.12
ŞEKİL 12.12

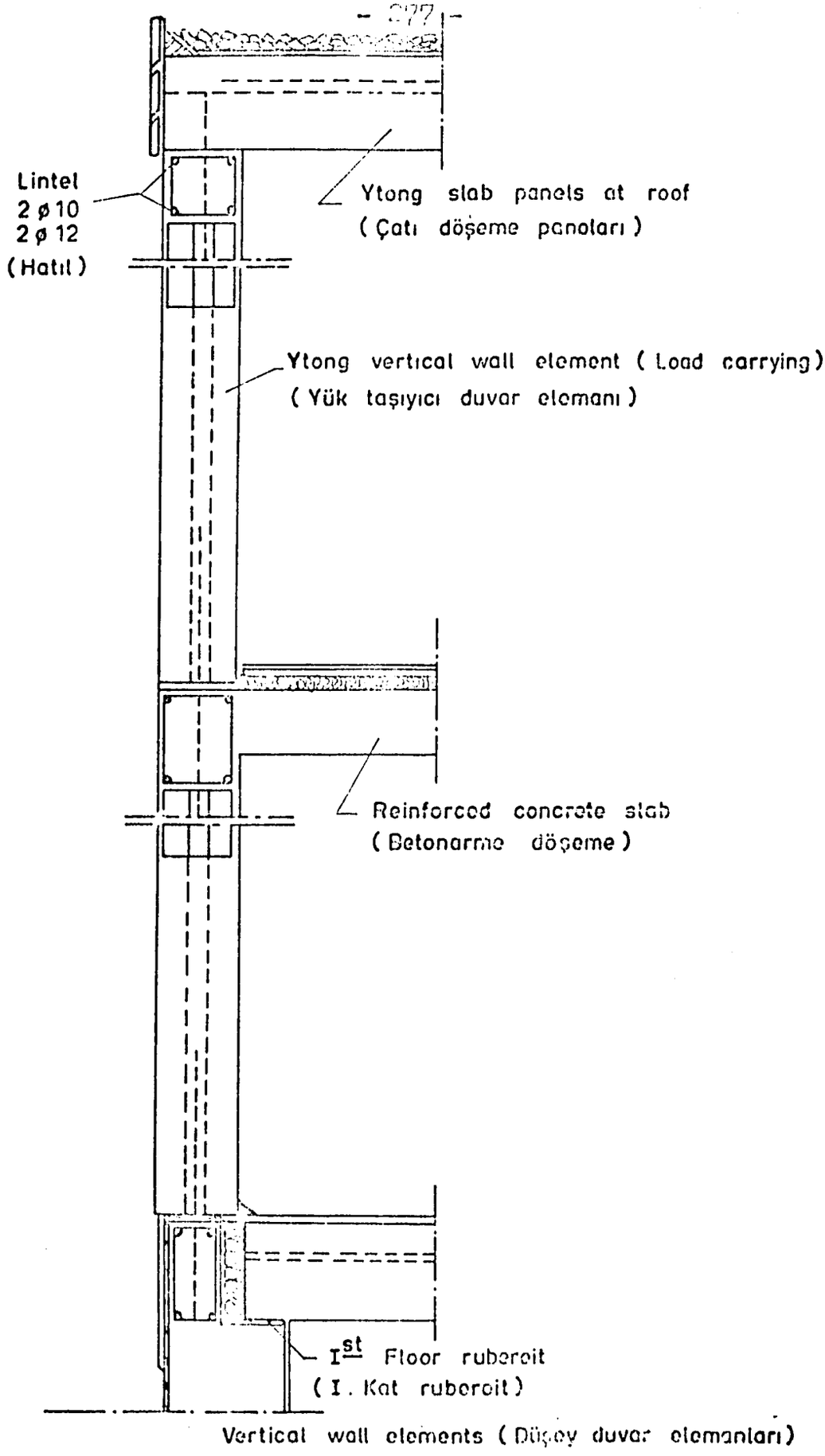


FIGURE 12.13.

TYPICAL CROSS SECTION (TİPİK KESİT)

ŞEKİL 12.13

13. MANPOWER PROBLEM

13.1. DESCRIPTION OF THE MANPOWER PROBLEM IN TURKEY

13.2. MANPOWER SITUATION IN CONSTRUCTION SECTOR. ESTIMATED DEMAND AND SUPPLY

13.3. LABOUR RATE TRENDS IN THE CONSTRUCTION SECTOR

13.1. DESCRIPTION OF THE MANPOWER PROBLEM IN TURKEY

Turkey has emerged from a traditional agricultural economy and is now becoming industrialised and undergoing rapid development. This requires significant structural and occupational changes in manpower.

The educational services for training manpower and changing the vocational structure are scarce in Turkey. On the other hand, training of qualified manpower to overcome the manpower shortage depends on long term programmes. The reason for this is that the results of measures taken now to meet the manpower demand will be obtained only by applying a long term education programme which is closely related to the manpower problem, along with the other social targets.

The demands for different types of qualified manpower increased considerably in the last 15 years. Though manpower supply increased as well, it still remains very limited compared to the demand.

Between 1955-1960, the number of engineers increased by 58%, while the number of technicians increased only by 21%. From 1960 to 1965 the rate was 33% for engineers and 43% for technicians.

13.2. MANPOWER SITUATION IN CONSTRUCTION SECTOR, ESTIMATED DEMAND AND SUPPLY

One of the main problems of economic development in Turkey is the insufficiency of technical manpower and its unbalanced distribution among the sectors.

There are only 1.6 technicians per each engineer. This makes the engineers responsible for the technical work also, and thus lowers the efficiency of engineers.

In the construction sector the problem is still worse, since for a total 11,000 civil engineers and architects, 600 of which work abroad, there are only 13,500 technicians. The education that the technicians have at present is provided by technical high schools and rarely by superior technical schools (kind of technical junior colleges). For the last 10 years, about 1,500 students per year attended these institutions. On the average two thirds of these students graduate per year and only one thirds work in the construction sector. So:

$$\frac{2}{3} \times 1500 \times \frac{1}{3} \times 10 \quad 3,300$$

people are really qualified construction technicians.

For the last twenty years, an average of 500 people graduated from the construction high schools of Turkey. On average, only half of these people remained in the construction sector. Then, totally,

$$500 \times \frac{1}{2} \times 20 \quad 5,000$$

people could be considered as sufficiently qualified construction technicians.

The remaining 5,000 people came either from the normal technical high schools or just have working experience, without any theoretical basis.

Experience has showed that these superior technicians' schools were not very successful. Then they are transformed into one year training classes, and are added to the present technical high schools.

In order to reach the growth rate foreseen by 1st, 2nd and 3rd Five-Year plans, the technical manpower demand should follow the trend summarised in Table 1.

For the present and future existing manpower is far from being satisfactory, because only one half of the demand is satisfied. In the coming years, the satisfaction factor will be even less than one half. The supply situation and the unavoidable shortage are given in Table 2.

On the other hand, a new education programme foreseen in the 2nd Five-Year Development Plan will increase the supply of engineers and technicians. Efficiency of the application of this programme remains unknown for the present. But if the programme can be applied just as planned, the shortage may disappear by 1978. This projection is summarised in Table 3.

Although the number of artisans working in the construction sector can be calculated accurately, the number of unqualified workers still remain quite approximate. This is mainly due to the large percentage of disguised unemployment existing in this sector. Indeed, the demand and supply for unqualified manpower vary by seasons in the construction sector. Most of the seasonal workers are not members of the trade unions, and this makes it difficult to evaluate their number as well as their working period during the year. In order to have an idea of the unemployment in the whole non-agricultural sector, one could refer to Table 1, which compares unemployment ratios during the last six years. It can be seen that unemployment ratios have shown decreases in recent years.

There are very few data available concerning the total number of people unemployed in construction sector until 1970 and the distribution of these people in subsectors. Using statistical information based on an approximate sampling, it can be considered that 412,000 people constitute the total manpower in the construction sector (*).

(*) This would correspond to 3.02% of the total working Turkish population aged 15 to 64.

But there are 132,000 people whose profession is not known. Some of them may probably be contributing to construction activity as seasonal workers.

Tables 5 and 6 may give an idea about the distribution of the active population to three different sectors.

Another statistical data concerning the variation of distribution of active population, during last 45 years and its projection to 1975 is provided in Table 7.

Although no exact statistical data exist on the distribution of artisans and non-qualified workers in the sub-activities of the construction sector, a recent research has brought, at least, a qualitative information avout the regional origins of the artisans. This information is given on Map 1.

In order to give an idea on the relationship between the meteorological conditions and the construction activity in Turkey, the 'identical production time' zones are also marked on this map.

13.3. LABOUR RATE TRENDS IN THE CONSTRUCTION SECTOR

Construction sector is known in Turkey as one of the most financially unstable sectors at present. This is due to the contractors who try to earn money in the shortest possible time with a minimum of capital. Then generally, the work is hard, and the salaries are medium.

The newly graduated architects and civil engineers start to work with salaries as given in Table 8. These rates are slightly higher than

the salaries of new graduates of human, social and administrative sciences and of pure science. They are slightly lower than salaries of medical doctors, and mechanical engineers.

Wages of technicians and surveyors are generally between one half and two thirds of what architects and engineers earn.

Salaries of architects, engineers and technicians employed by the State have been increase by 200% in the period 1950-1955. Therefore, the salaries in the private sector were increased too, and the members of the construction sector were among the best payed people, for years. But, the situation is now quite different and practically no difference exist among the labour wages of different sectors.

The salaries of artisans show a great variation between specialities (from 40 TL daily to net 100 TL.). Plasterers have the lowest salaries. The artisans of brick and stone masonry earn a little bit higher and carpenters still higher. The mechanical artisans get the highest salaries. Little difference in salaries of artisans exist between regions, rural areas and cities. No statistical data showing these differences is available.

For unqualified workers who constitute 70% of the people employed in the construction sector, the salary problem is a crucial one. The labour law of 1969 had fixed the minimum gross salaries for unqualified workers as changing between daily 15.50 TL. and 19.50 TL. The regional variation of minimum rates is given in Map 2.

Recently, the Government has started to look for possibilities of fixing higher minimum wages. The conflict between workers' trade

unions and contractor firms on this subject is not solved yet. But, approximately a rise of 30% for all regions is going to be applied starting 1972 summer.

The unqualified workers in the construction sector are paid at most 20 TL. per day on the basis of minimum rates in Eastern Anatolia (East of Samsun-Gaziantep line), while the Western region salaries are slightly higher and can reach 30 TL. in July and August.

(13) TABLO 1 - İNSANGÜCÜ İHTİYACI (x 1000 kişi)

(13) TABLE 1 - MANPOWER DEMAND (by 1000)

	1968	1970	1971	1972	1977	1982
MİMAR Architects İNŞAAT MÜHENDİSİ Civil Engineers	12.9 (100)	15.9 (123)	17.5 (136)	19.5 (151)	32.3 (250)	49.6 (384)
TEKNİSYEN, TEKNİK RESSAM, SÜRVEYAN Construction Technicians, Draftsmen and Surveyors	19.2 (100)	24.3 (126)	27.7 (144)	31.6 (164)	60.3 (314)	113.5 (590)
İNŞAAT USTALARI Artisans in Construction	186.1 (100)	240.6 (132)	263.6 (141)	295.9 (159)	509.8 (273)	797.3 (430)

(13) TABLO 2 - YAPI SEKTÖRÜNDE İNSANGÜCÜ MEVCUDU VE AÇIKLARI (x 1000 kisi)

(13) TABLE 2 - Supply and Shortage in Manpower in the Construction Sector (by 1000)

		1968	1970	1971	1972	1977	1982
MİMAR-MÜHENDİS Architect and Civil Eng.	Supp.	7.5	9.3	10.2	11.0	15.4	19.6
	Shor.	5.4	6.6	7.3	8.5	16.9	30.3
TEKNİSYEN, TEK. RESSAM, MÜRVEYAN Constr. Technicians, Draftsmen and Surveyors	Supp.	14.5	16.2	17.0	17.9	25.0	44.5
	Shor.	4.6	8.1	10.6	13.7	34.8	73.6
İNŞAAT USTALARI Artisans in Construction	Supp.	153	167	174	182	252	385
	Shor.	32	74	89	113	257	414

(13) TABLO 3 - 1968'DEN İTİBAREN YENİ EĞİTİM PROGRAMLARININ TATBİKİNDEN SONRA İNSANGÜCÜ AÇIĞI (x 1000)

(13) TABLE 3 - Evaluation of Manpower Shortage applying New Educational Programmes from 1968 (shortage by 1000)

	1970	1972	1974.	1976	1978	1980	1982
MİMAR, MÜHENDİS Arch., Civ. Eng.	6.66	8.32	10.07	11.86	10.38	7.70	1.54
TEKNİSYEN, RESSAM Technicians and Draftsmen	7.34	11.50	15.13	17.34	17.30	13.64	3.51

(13) TABLO 4 - TARIM DIŞI SEKTÖRLERDE MEVSİMLİK İNSANGÜCÜ İHTİYACI POTANSİYELİ VE İŞSİZLİK (x 1000 kişi)

(13) TABLE 4 - Maximum Seasonal Manpower Demand, Supply and Unemployment in the Non-Agricultural Sector (by 1000)

	1967	1968	1969	1970	1971	1972
MEVCUT Supply	4,198	4,449	4,730	5,037	5,369	5,729
MAKS. İHTİYAÇ Max. Demand	3,799	4,049	4,317	4,607	4,920	5,159
İŞSİZLİK Unemployment	399	400	413	439	448	470
İŞSİZLİK % %, Unemployment	9.5	9.0	8.7	8.5	8.3	8.2

TABLO - 5

Türkiye'de Toplam Nüfus, 15-64 yaşları arası toplam nüfus, ve 15-64 yaşları arası toplam çalışan nüfus.

(Total Population, Population aged from 15 to 64, and Active Population aged from 15 to 64 in Turkey).

	Erkek (Men)	Kadın (Women)	Toplam (Total)
Toplam Nüfus (Total Population)	18.060.957 (% 50.64)	17.605.592 (% 49.36)	35.666.549 (% 100)
15-64 yaş arası toplam nüfus (Total population aged from 15 to 64)	9.709.960 (% 50.3)	9.593.194 (% 49.7)	19.303.154 (% 100)
15-64 arası toplam çalışan nüfus (Active population aged from 15 to 64)	8.588.604	5.085.779	13.674.383
15-64 arası çalışan nüfusun toplam nüfusa oranı (Percentage of the active population bt 15-64 to total population)	% 24.0	% 14.2	% 38.2
15-64 arası çalışan nüfusun, 15-64 arası toplam nüfusa oranı (Percentage of the active population bt 15-64 to population bt 15-64)	% 44.4	% 26.2	% 70.6

TABLO - 6

15-64 yaş arası çalışan nüfusun meslek dallarına dağılışı

(Distribution of the active population bt. 15-64 ages in activity sectors)

	Erkek (Men)	Kadın (Women)	Toplam (Total)	15-64 yaş arası çalışan nüfus (Per. to the total active population bt. 15-64).
1. Tarım, av, ormancılık, balıkçılık Agriculture, Hunting, Forestry, Fishing	4.249.184	4.513.539	8.762.723	% 64.10
2. Maden Sanayii (Industry of Natural Resources)	101.684	2.041	103.725	% 0.76
3. İmalât Sanayii (Production Industry	1.004.596	259.028	1.263.624	% 9.25
4. Elektrik-Gaz-Su Temini (Electricity, Gasoline, WT Supply)	16.551	453	17.004	% 0.12
5. İnşaat Sanayii Construction Industry	409.796	2.267	412.063	% 3.02
6. Ticaret-Otelcilik-Lokantacılık (Merchantry, restaurants, Hotels)	706.346	30.720	737.066	% 5.38
7. Ulaşım (Transportation, Communication)	380.322	18.932	399.254	% 2.92
8. Sigorta İşleri (Insurance)	154.283	35.935	190.218	% 1.39
9. Kamu hizmetleri (Social Services (Social+Personeel)	1.448.514	207.448	1.655.962	% 12.09
10. Bilinmiyen (Unknown)	117.328	15.416	132.744	% 0.97

TABLO - 7

Ekonomik faaliyet dallarına göre nüfus %
(15 yaştan yukarı çalışan nüfus)

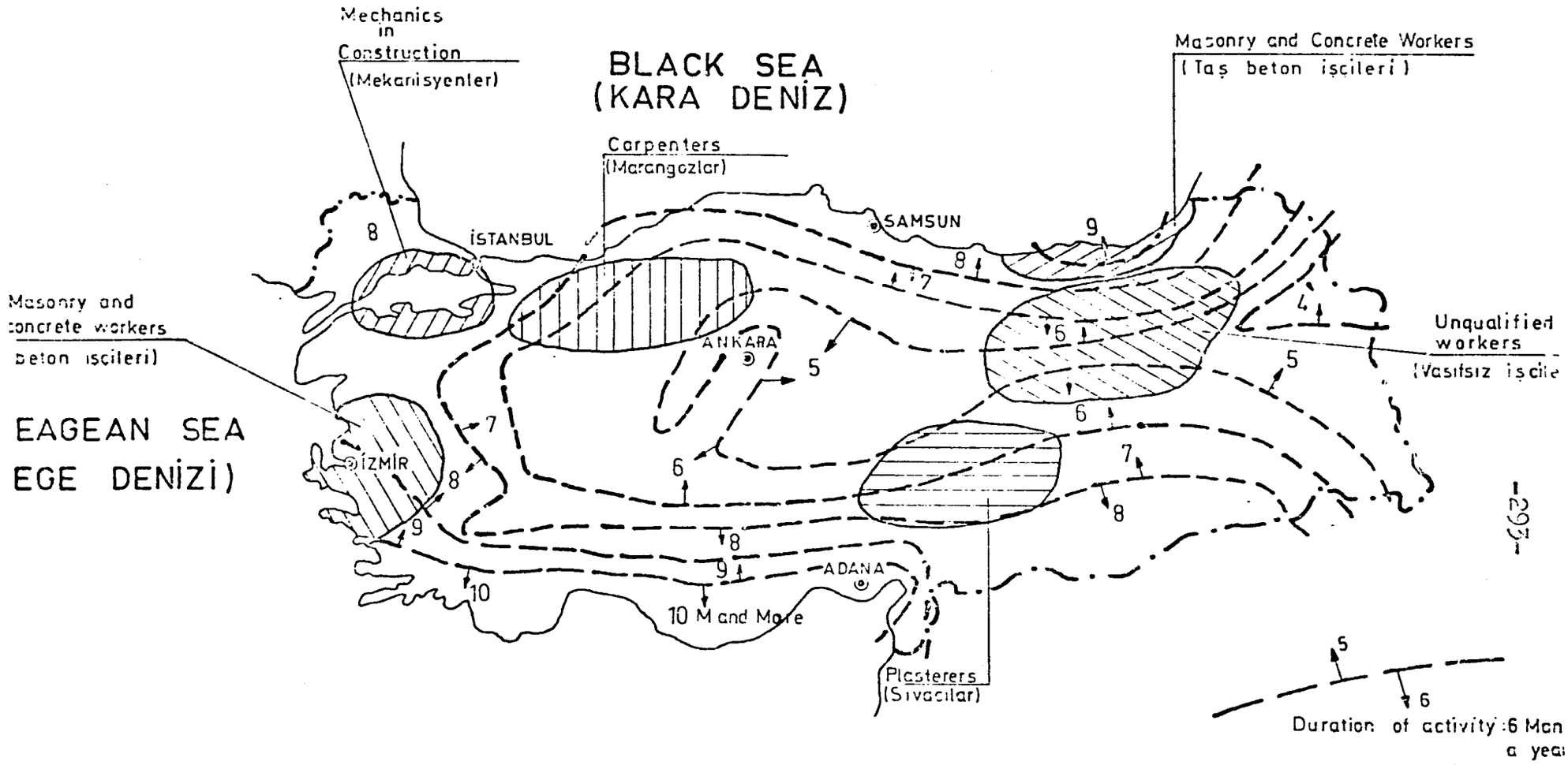
Population by economic activity %
(Active population 15 years old and over)

	1927	1935	1955	1960	1965	1970	1975
Tarım (Agriculture)	81.6	81.8	82.3	79.0	74.6	66	58
Endüstri (Industry)	5.6	7.3	6.9	7.8	9.5	10.2	12.5
İnşaat + Bina (Construction + Housing	-	1.0	1.7	2.3	2.9	3.02	3.20
Ticaret Bankacılık Sigortacılık vb. (Commerse, Banking, Insurance, Real Estale)	4.8	2.8	3.0	3.3	3.6	5.0	5.80
Ulaşım + PTT (Transportation Communication)	-	1.5	1.6	2.0	2.3	2.9	3.5
Diğerleri (Other Services)	7.0	5.6	4.5	5.6	7.1	12.88	17.0

(13) TABLO 8 - YENİ MEZUN MÜHENDİS-MİMARLARIN NET ORTALAMA AYLIK KAZANÇLARI

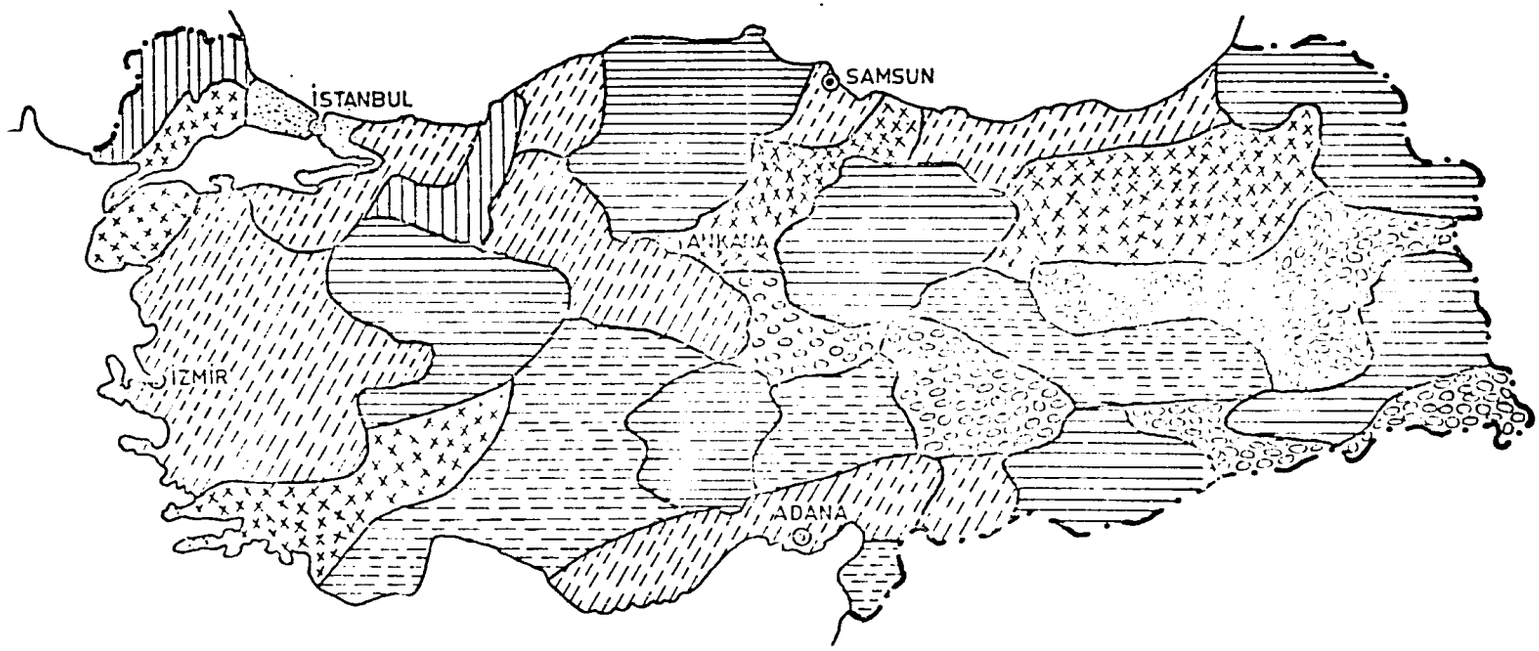
(13) TABLE 8 - Average Approximate Net Salaries for Newly Graduated Civil Engineers and Architects (Monthly TL.)

		ISTANBUL, ANKARA, İZMİR	MARMARA, EGE Marmara and Aegean Regions	DİGER BÖLGELER Other Regions
DEVLET State Sector	BÜRO İŞİ Office Work	1,200	1,500	1,800
	ŞANTİYE Field Work	1,500	1,700-2,000	2,000-2,300
ÖZEL SEKTÖR Private Sector	PROJE BÜROSU Design Office Work	1,500	1,700	2,000
	ŞANTİYE Field Work	2,000-2,500	2,500-2,800	2,800-3,300



MAP OF ANNUAL DURATION OF CONSTRUCTION ACTIVITY
(Yıllık İnşaat Sürelerinin Dağılış Haritası)

13. MAP : 1
13. Harita : 1



Minimum labor rates at present (Bugünkü asgari ücretler)	①	②	③	④	⑤	⑥
	19,50	18,00	17,00	50	16,00	15,50

DISTRIBUTION OF MINIMUM SALARY OF UNQUALIFIED WORKERS

(Vasıfsız İşçi Asgari Ücret Dağılışı)

13. MAP: 2

13. Harita: 2

14. REACTION OF PEOPLE TO NEW CONSTRUCTION MATERIALS

14.1. INTRODUCTION

14.2. PEOPLE'S REACTION TO UTILISATION OF PLASTICS IN MAJOR COMPONENTS OF BUILDINGS

14.3. FUTURE OF PLASTICS IN BUILDING

14.4. REACTION OF PEOPLE TO 'YTONG'

14.5. THE CONDITION OF PUBLIC SECTOR AND THE INTRODUCTION OF GAS-CONCRETE TO CONSTRUCTION STANDARDS

14.6. SOME INFORMATION ABOUT THE IMPROVEMENT OF 'YTONG'

14.1. INTRODUCTION

In order to evaluate the reaction of people to utilisation of plastics and other new construction materials, information will be given about the spherical dwellings made of styrofoam and used after Gediz earthquake of 28 March 1970 and YTONG which is a light gas-concrete, and thus very convenient to use in earthquake regions.

Additional explanation will be given about the future of the recent building materials. The two materials mentioned above have been taken as examples.

14.2. PEOPLE'S REACTION TO UTILISATION OF PLASTICS IN MAJOR COMPONENTS OF BUILDINGS

As can be understood, plastics are not yet utilised in major structural components of buildings. In big cities there are a few examples of use of plastics, but they are very limited and of decorative character.

After the Gediz earthquake (March 28, 1970) the government of Germany donated a number of plastic domed structures to be used as temporary dwellings. Perhaps they are the first examples of dwellings in Turkey in which large amounts of plastics were used.

The production process actually took place in Turkey, in a portable field plant with a 13-man crew. It was brought to Turkey by air. The material used was styrofoam and it was sprayed on an inflated rotation balloon, which functioned as a form. So the styrofoam shells of five meters in diameter and about 10 cm. thick, were made on site.

The styrofoam was sprayed through a moving nozzle, which could take any position on a ninety degree arc. After reaching the proper thickness (about 10 cm.), the outer surface of the dome was covered with a harder and stronger material for waterproofing and mechanical strength. The balloon was then deflated, and the shell could be carried for siting, by six people. It could be painted if desired. Elliptic openings were provide as doorways, and circular portholes as windows (for light). Ventilation was provided through smaller holes, drilled around the top. A relatively thick plastic sheet covered the doorway. Transparent plastic sheets were used as windows.

The outer circumference of the dome base was filled and compressed with dirt.

The interior was quite different from the familiar cornered prismatic pattern. Also all members of the family had only one space for various living functions. The domes worked very well to protect the inhabitants and the property from rain; but the lightness and softness of the material caused a feeling of inconfidence, especially after a strong wind, that carried away most of the domes.

After a few months, only a few of them remained in use. Their appearance had been changed considerably. Stove pipes coming out of the dome, such annexes as chicken coops (posts and wire mesh) and animal keeping areas (concrete block walls, with timber and earth roofing) next to the domes were common scenes.

The side of the dome exposed to sun served for drying clothes. The interior was separated into rooms by furnitures and curtains.

Although the architectural aspect is more important in this case, it also reflects the necessity of rigid materials for the structural parts of the building.

14.3. FUTURE OF PLASTIC IN BUILDING

Since plastics are spreading very rapidly, any estimation about the production and degree of popularisation of them in Turkey may easily become obsolete.

It can be generally said that plastic materials may well be used in rural dwellings, provided that architectural design considers the local living conditions and the necessity for low-cost material.

14.4. REACTION OF PEOPLE TO YTONG

Gas-concrete is a profitable construction material that is successfully being used all over the world for the last 50 years. Production of gas-concrete requires a great extent of technical knowledge and at least 1.5 - 2 million dollars of investment. For this reason the material itself is more expensive than the other materials used for the same purpose. However, the technical qualities of the material are superior enough to economise in great extent in construction. Gas-concrete industry is easily improving in the technically, economically and culturally developed countries which have consciously done this comparison.

The Scandinavian countries where the gas-concrete was originated, have wiped the traditional materials out of the market and are applying gas-concrete in largest extent. Germany, England, Israel and Japan are the countries where this material is showing rapid improvement.

As a result of investigations done in our country, Istanbul and its surroundings have been found to have reached the level of developed countries in all aspects and the first gas-concrete plant has been

established in this city. The fact that 35,000 cu. m. of gas-concrete has been utilised during 1966, the first operating year of the plant, confirms our statement above. Furthermore, the quantity utilised increased to 100,000 cu.m. per year during a very short period of 5 years and proved that Turkish nation and technicians are very anxious about using every technically developed construction material provided that it is economically and technically feasible. We must admit that our workers living in foreign countries, especially in Germany have played a vital role in the transfer and acceptance of the gas-concrete in our country.

There has been no difficulty in erecting Ytong dwellings in the earthquake regions. In fact, the gas-concrete materials have been easily applied to construction with the help of our villagers who favoured the use of this material. Let us add the fact that, the number of people from other villages and the workers coming back from foreign countries who ask for Ytong houses have been constantly increasing.

14.5. THE CONTRIBUTION OF PUBLIC SECTOR AND THE INTRODUCTION OF GAS-CONCRETE TO CONSTRUCTION STANDARDS

Gas-concrete which was used only by the private sector at the beginning, is now being used in the construction of official buildinngs. This delay is due to the fact that private sector has to do what the economic conditions necessitate, in conformance with the minimum safety regulations. In official construction on the other hand, only the methods which are described in standards and regulations are applied.

The fear of responsibility is also an obstacle to the application of new methods. Especially more economical solutions that require a serious work are not looked for. For these reasons, gas-concrete prefabrication materials have not been used in the public sector for a long period of time. After the introduction of gas-concrete to standards and regulations, public sector became interested in this material and the positive results of earthquake experiments in Japan gave the necessary encouragement to build a village of 260 units in Gediz region. By holding this application of the material under control, information will be obtained about how these light concrete prefabrication material affect earthquake safety.

But, the standards and regulations prepared by the Ytong firm in a very short time, have to be revised over a period of time, and the corrected and completed new regulations should be published as soon as possible.

14.6. SOME INFORMATION ABOUT THE IMPROVEMENT OF YTONG

Ytong firm is working on programmes that will reduce the consumption of timber and increase the use of earthquake resistant gas-concrete prefabrication elements in construction in Turkey. Meanwhile the study on the standards and regulations is going on.

The experienced members of the "application service" of the firm are training the master workmen in the plant in the laboratories and in the buildings where ytong is being used. In the earthquake or underdeveloped regions of Turkey, sample dwellings have been built

in order to show the convenience of the use of gas-concrete and construction methods without plaster. The possibility of erecting a second plant somewhere in Anatolia (probably Afyon or Gaziantep) is being looked into. For this purpose the raw material investigations are being made and relations with the official sector are being established. The Ytong firm in Istanbul is ready to support the erection of a new plant which will be founded under the leadership of the Government.

On the other hand. the tuff obtained from the Iskenderun iron and steel plant can be used for the implementation of a gas-concrete industry, as done in Salzgitter, Germany. In this way all the region up to Elazığ-Veban will be provided with a modern construction material.

Economic analyses show that a gas-concrete industry with a capacity of 100,000 cu.m. per year will add about 1 million dollars to the Turkish economy, in comparison to a brick industry. For this reason the State Planning Organisation and the Government have supported the Ytong industry by providing tax reduction and by allowing the participation of foreign capital in investments at a ratio of 5%. But the experience and skill gained during the production period is sufficient and the participation of foreign capital is not necessary any more.

15. THE MOST FAVOURABLE TYPES OF CONSTRUCTION AND CONSTRUCTION MATERIALS

15.1. INTRODUCTION

15.2. SOCIO-ECONOMIC PROTOTYPE

5.3. CONSTRUCTION METHODS FOR RURAL DWELLINGS AND THEIR DISTRIBUTION TO DIFFERENT REGIONS

15.3.1. Structural System
15.3.2. Foundation Types
15.3.3. Wall Types and Materials
15.3.4. Roof Types and Roof Covering Materials
15.3.5. Interior and Exterior Plaster Materials

15.1. INTRODUCTION

In the answer given to Question 1, different construction methods for rural dwellings were classified according to their structural systems and figures explaining their different procedures were provided ((1.2) Fig.s 19 and 20). The distribution of different rural dwelling types in Turkey were also shown on a map ((1.2) Fig. 2).

In this section, first a prototype rural dwelling will be determined, satisfying social and economic conditions. Then, the percentage of different types of foundations, walls, roofs and plaster materials will be given, together with their distribution in different regions of Turkey. Finally, today's application of the construction procedures will be criticised and recommendations will be made.

15.2. SOCIO-ECONOMIC PROTOTYPE

Given:

(15) TABLE 1 - SURFACE AREA OF RURAL DWELLINGS

Up to 30 m^2	9%
30 - 50 m^2	18%
50 - 70 m^2	76%
80 - 119 m^2	22%
more than 120 m^2	25%
	100%

Weighted mean: 80 m^2

(15) TABLE 2 - NUMBER OF STOREYS IN A RURAL DWELLING

One storey	58%	
Two storeys	41%	
Three storeys	1%	
	100%	Weighted mean: 1 storey

(15) TABLE 3 - NUMBER OF ROOMS IN RURAL DWELLINGS

1 room	23%	
2 rooms	35%	
3 rooms	22%	
4 rooms	13%	
5 rooms	4%	
6 rooms	2%	
7 or more rooms	1%	
	100%	Weighted mean: 2,5 rooms

Then, Ideal Prototype should be a one-storey, 80 sq.m. dwelling with 2 large and 1 small rooms; hall, WC, kitchen and bathroom.

The family living in it should consist of 6 people (mother, father, a grandmother or grandfather, 3 children). In figure 1, this prototype is illustrated with its climate and socio-economic condition.

15.3. CONSTRUCTION METHODS FOR RURAL DWELLINGS AND THEIR DISTRIBUTION TO DIFFERENT REGIONS

The construction methods are discussed in the following order:

- Structural Systems
- Foundation Types
- Wall types and Materials
- Roof Types and Roof Covering Materials
- Interior Plaster Materials
- Exterior Plaster Materials

15.3.1. Structural System:

Structural systems in rural dwellings can be generally classified under three groups: block, framed, mixed (block framed). In Table 4, the application percent of these systems are given:

(15) TABLE 4.

Block	76%	(Timber block 4%) (Stone block 96%)
Framed	18%	(Timber framed 100%) (Reinforced concrete framed 0%)
Mixed	6%	
	100%	

So, block system is the most practiced structural system in Turkey.

15.3.2. Foundation Types:

The five foundation types observed in rural dwellings are classified in Table 5.

(15) TABLE 5.

	Type of Foundation	Application %	Mostly applied Region
A.	Adobe Foundation	5	Middle and South-East Anatolia
	Stone foundation (with lime mortar)	9	Near main rodes and cities
	Stone foundation (with mud mortar)	74	Nearly everywhere
	Stone foundation (without any mortar)	10	Nearly everywhere
	Reinforced concrete foundation	1	In big central villages
	Others	1	Northern Anatolia, Regions with forests.
		100%	

(A) type foundations are commonly used in adobe dwellings. (B) and (C) type of foundations are used in every type of rural dwellings. For (D) type foundations such a classification cannot be made. (E) type foundations are generally used in block structures with walls made of brick or Ytong. (F) type foundations are timber footings seen in timber framed dwellings.

In all these various types of foundations we recommend, of course, the reinforced concrete one. But as far as economical conditions are concerned, stone foundations with lime mortar can be the second choice, in block and timber framed structures. Other types of foundation should be abandoned

As far as earthquake resistance is concerned, the minimum depth of foundation should be 0.8 metre; connections should be carefully constructed and the ground below foundations should be covered with coarse grit (minimum thickness 20 cm.) when soil conditions necessitate it. In inclined fields special care should be taken.

15.3.3. Wall Types and Materials:

In Table 6 below, wall construction materials in block structures and in Table 7 in timber framed structures are given, together with their application percentages and regions.

(15) TABLE 6 - LOAD CARRYING WALL MATERIALS IN BLOCK STRUCTURES

Material	%	Mostly applied Regions
Stone	58	Nearly in every region. Mostly in Eastern, South-Eastern and Middle Anatolia and Aegean Regions.
Adobe	32	Mostly in Southern, Eastern and middle Anatolia; Northern Marmara and Middle Aegean regions.
Brick	7	In developed central villages.
Others (concrete blocks, Ytong, etc.)	3	In the surroundings of Istanbul, Ankara and İzmir.
	100%	

(15) TABLE 7 - WALL FİLLING MATERIALS IN TIMBER FRAMED STRUCTURES

Material	%	Mostly applied Regions
Mud	10	South-Eastern Anatolia.
Adobe	33	Northern, South-Eastern Anatolia, Aegean and West Mediterranean regions.
Stone	21	South-Eastern Anatolia,and Aegean regions
Brick	11	Northern Anatolia, surroundings of main highways
Timber pieces	4	North of Middle Anatolia..
Empty	4	Developed villages.

In block structures every kind of material can be used, provided that their quality is good enough. In the selection of the material to be used, economy should be the first factor to be taken into consideration. Our recommendations for different regions are as in Table 6. The recommendations stated in Section 17 must be taken

into account in design and application projects. When timber framed structures are concerned, we strongly recommend that the walls should either be empty or filled with timber pieces.

15.3.4. ROOF TYPES AND ROOF COVERING MATERIALS

Different roof types are summarised in Table 8.

(15) TABLE 8.

Roof Type	%	Region
Flat roof	52	Middle, South-Eastern, Eastern, South-Eastern Anatolia.
Gable roof	17	Northern Anatolia, Marmara Region
Hip roof	31	Northern Anatolia, Marmara Region
	100%	

Roof types are distributed in regions according to climatic, social and economic conditions. Our recommendations are as in Table 8.

Roofing materials mostly seen in rural dwellings are summarised in Table 9.

(15) TABLE 9.- ROOF COVERING MATERIALS

Material	%	Mostly applied Regions
Clay	10	Eastern, South-Western Anatolia
Soil	42	Nearly in all regions. Eastern, South Eastern, Middle Anatolia.
Tile	36	Northern Anatolia, Aegean and Marmara Regions
Metallic Materials	4	Eastern Black-Sea region, middle Anatolia.
Timber	3	Northern, Southern Anatolia
Rushes	1	Mediterranean coasts.
Eternite	1	Highly developed central villages
Others (Reinforced concrete, etc.)	3	

There are two main factors influencing the selection of roofing materials in Turkey:

(i) climate, (ii) social conditions.

Flat roof covered with soil and clay is selected mainly because of social conditions. Although this type of roofing is economic, it should be abandoned, because it is not technically feasible. In every region in Turkey, tile should be used. But in this case, social needs should be met by architectural design. For example, the social functions carried out by the flat roof can be transformed to some place in the garden. For Northern and Southern Anatolian regions, timber roofing is the most convenient one.

15.3.5. Interior and Exterior Plaster Materials

Interior and exterior plaster materials and their application percentage and regions are summariesed in the following tables:

(15) TABLE 10 - INTERIOR PLASTER MATERIALS

Material	%	Region
Without any plaster	16	Mostly Eastern Anatolia
Mud-plaster	71	Nearly in all regions.
Lime-plaster	11	Near developed central villages
Others	2	
	100%	

We recommend that stone walls should be plastered with normal plaster. For today's conditions stabilised mud (10% cement) may be an economic solution to the problem.

(15) TABLE 11 - EXTERIOR PLASTER MATERIALS

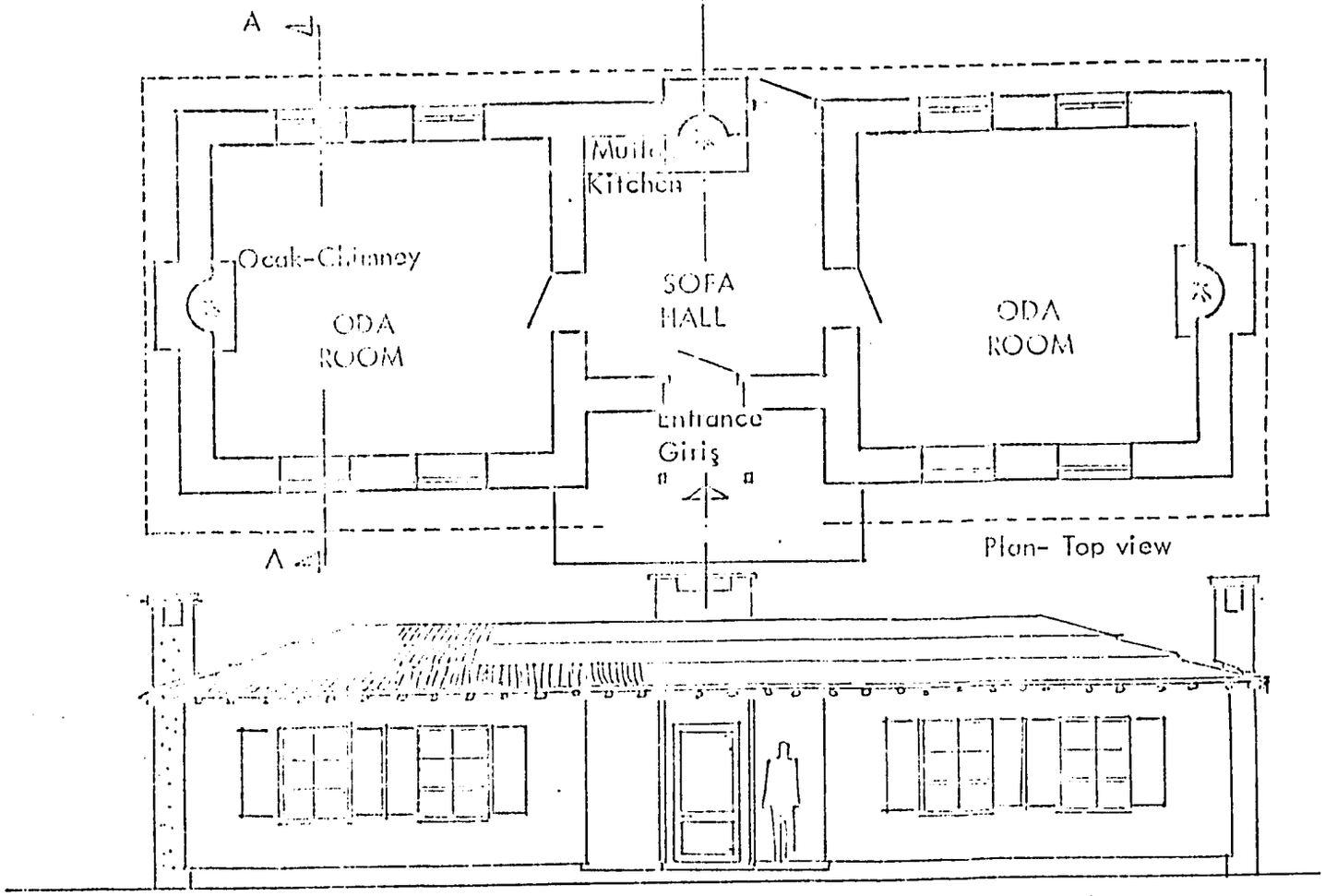
Material	%	Region
Without plaster	50	In all regions
Mud-paster	44	In all regions
Lime-plaster	5	Near developed central villages
Others	1	
	100%	

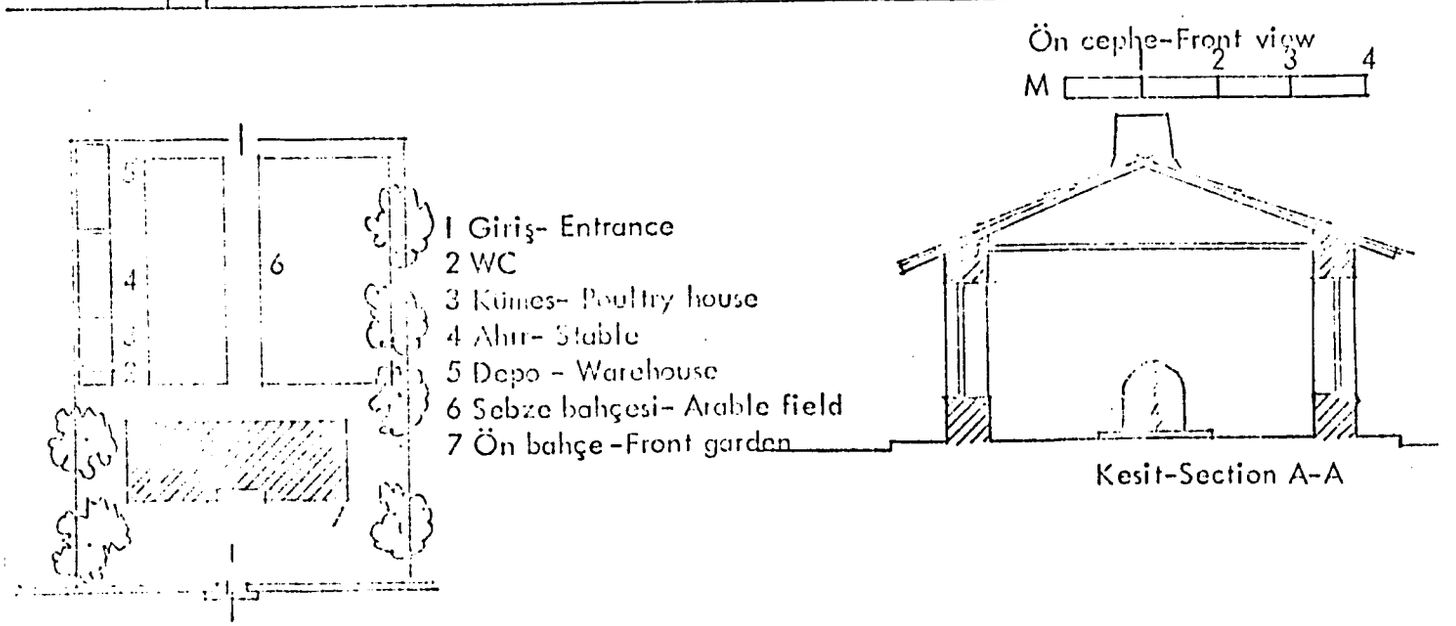
Stabilised mud (30% cement) may be used as an economic exterior plaster.

15/ Figure. 1

PROTOTIP KIRSAL KONUT 5,00 m²

PROTOTYPE OF A RURAL DWELLING





Vaziyet Planı-Layout Plan

16. GOVERNMENT CONTROL IN CONSTRUCTION

16.1. INTRODUCTION

16.2. TURKISH ASSOCIATION FOR BRIDGE AND STRUCTURAL ENGINEERING

16.3. FUNCTIONS OF THE MINISTRY OF PUBLIC WORKS

16.4. TURKISH STANDARDS INSTITUTE

16.5. FUNCTIONS OF THE MINISTRY OF RECONSTRUCTION AND SETTLEMENT

16.6. FUNCTIONS OF THE MUNICIPAL GOVERNMENTS

16. GOVERNMENT CONTROL IN CONSTRUCTION

16.1. INTRODUCTION

Government control can be exercised at different levels and for different purposes. Therefore it is necessary to classify the types of institutions and their role in the control of construction.

Before the Government started direct control of construction an unofficial professional organisation called the Turkish Association for Bridge and Structural Engineering (Türkiye Köprü ve İnşaat Cemiyeti) had prepared codes to design structures made of different types of material. However, these codes were merely recommendations.

Two ministries of the Government are directly related with the control of construction. The Ministry of Public Works (Bayındırlık Bakanlığı) has published the General Technical Regulations (Genel Teknik Şartname). These regulations include all the building materials that exist in Turkey as well as certain non-structural properties that parts of buildings should possess. The Ministry of Reconstruction and Settlement (İmar ve İskan Bakanlığı) has published the most important document as far as earthquake resistant structures are concerned. This is the Building Code for Regions of Hazard (Afet Bölgelerinde Yapılacak Yapılar hakkında Yönetmelik).

Aside from the two ministries above, the Institute of Turkish Standards (Türk Standardları Enstitüsü) is an active organ of the control system. All kinds of material and in particular, construction materials are standardized and classified with respect to their properties.

The above mentioned four documents will be discussed in greater detail below.

On a more local level, inspection of construction is carried out by the municipalities. Licenses are also issued on the municipal level. For official constructions the Provincial Construction Directorates (İl İmar Müdürlükleri) are responsible. These are connected to the Ministry of Reconstruction and Settlement. For design or construction that they find deficient, they can advise the municipality to take the necessary measures.

16.2. TURKISH ASSOCIATION FOR BRIDGE AND STRUCTURAL ENGINEERING

Turkish Association for Bridge and Structural Engineering (Türkiye Köprü ve İnşaat Cemiyeti - TKIC) is an unofficial professional organisation established in order to supply technical assistance for Turkish engineers working on the fields of bridge and structural engineering. One of the main tasks of this Association has been to publish recommendations for the design and construction methods for buildings,such as:

(i) Codes for design loads to be considered in the design of structural elements (Ref.1).

(ii) Codes for reinforced concrete (Ref. 2).

(iii) Codes for reinforced brick slabs (Ref. 3).

(iv) Codes for steel structures (Ref. 4).

Although these recommendations mainly consist of the direct translation of the corresponsing DIN norms of the years about 1930-1940, they have proved to be of great assistance to the Turkish engineers until early sixties, at the time when there existed no Turkish standards and codes published by an official member.

As modern specifications have already been published by the Ministry of Public Works and also the Turkish Standards have been prepared by Turkish Standards Institution on the design and construction methods for buildings, the recommendations published by TKIC are no longer assumed to be valid.

References:

1. Yapı Elemanlarının Boyutlandırılmasında gözönüne alınacak yükler hakkında Şartname - TKIC - Ankara, 1963.

2. Betonarme Şartnamesi - TKIC - Ankara, 1962.

3. Tuğlalı Döşemeler - TKIC - Ankara, 1964.

4. Çelik Yapılar Şartnamesi - TKIC - Ankara, 1963.

16.3. FUNCTIONS OF THE MINISTRY OF PUBLIC WORKS

The Ministry of Public Works has published the General Technical Regulations which were prepared by a committee made up of representatives from ministries and institutions. The regulations will be applied in the programmes of the construction sector investments and valid in their newest form as of December 29th, 1970.

The regulations are mainly specifications for materials and techniques for construction and transportation. It is stated in the regulations that when the Institute of Turkish Standards publish a certain specification for a material mentioned in the regulations, then the published standard should be applied.

The regulations consist of twenty-four parts but only the relevant ones are briefly mentioned below.

General Technical Regulations (Ref. 5)

(1) General Technical Regulations for Cement:

Cement to be used in construction will conform to the Turkish Standards TS-19. If it is found necessary by the responsible office of the contractor or the administration, samples will be taken and analysed in the laboratory.

(2) General Technical Regulations for Lime.

(3) General Technical Regulations for Plaster:

Properties of plaster will conform to the Turkish Standards TS-370.

(4) General Technical Regulations for Aggregates, Stones, Mortar and Masonry:

In this section, required properties of sand and pebble stone are given. Also eleven types of stones are specified for

different uses in masonry construction as well as different construction techniques. Specifications for types of mortar, such as cement and lime mortars are also included.

(5) General Technical Regulations for Concrete:

Dosage and compressive strength of plain and reinforced concrete are specified. Regulations for mixing, transportation, pouring, pouring in water, pouring in cold weather, joint made out of concrete and formwork are also specified.

(6) General Technical Regulations for Lightweight Concrete:

Three types of lightweight concrete are specified, (i) containing lightweight aggregate, (ii) containing aluminum dust, (iii) containing bubbles.

(7) General Technical Regulations for Brick, Tile and Concrete Brick Properties such as dimensions and weight are specified for the above materials.

(8) General Technical Regulations for Wood:

Wood used in construction includes formwork for concrete, wooden frames, wooden roofs, ceilings and floors. Regulations for these are given.

(9) General Technical Regulations for Roofs:

Different combinations of structural and isolation elements and their regulations are given.

16.4. TURKISH STANDARDS INSTITUTE

The Turkish Standards Institute (TSE), established in 1954, is an official member of the International Organisation for Standardisation (ISO) and of the International Electrotechnical Commission (IEC).

TSE has published 1016 Turkish Standards (TS) up to 30th April, 1971. In principle, these standards are optional. If their mandatory application is considered to be beneficial to Turkish economy, TSE applies to the Cabinet of Ministers who, if considers it appropriate, issues a decree making the standard obligatory. Among the published 1016 standards, 174 are mandatory.

Below, the standards published by TSE in relation with building construction are classified and listed with the TS number and title. The mandatory standards are also indicated by (M) following the TS number.

Reference: Türk Standardları Kataloğu, 1971.

(16.4) TURKISH STANDARDS

1. Construction Materials:

1.1. Natural Stones and Soil Materials:

TS-537	Cement treated Adobe Bricks
TS-699	Natural Building Stones, Method of Testing

1.2. Binders and Concrete Products:

TS-19 (M)	Portland Cement
TS-20 (M)	Blast Furnace Slag Cement
TS-21 (M)	White Portland Cement
TS-22 (M)	Masonry Cement
TS-25 (M)	Trass
TS-26 (M)	Trass Cement
TS-30 (M)	Types of Lime used in Construction
TS-33 (M)	Sand
TS-213	Concrete Flooring Tiles
TS-370	Building Gypsum
TS-406(M)	Precast Concrete Blocks for Walls
TS-407	Lightweight Concrete Hallow Blocks and Plates for Ribbed Floors
TS-453	Gas Concrete Material and Structural Parts
TS-639	Fly Ashes for use with Portland Cement Clinker and Portland Concrete
TS-640	Fly Ash Cement
TS-706	Concrete Aggregates
TS-802	Design of Concrete Mixes
TS-807	Asbestos Cement Flat Sheets
TS-808	Sand-lime Bricks
TS-809	Sulphated Slag Cement

1.3. Ceramic Products and Bricks:

TS-562	Clay Roofing Tiles
TS-704(M)	Clay Bricks (hand made)
TS-705(M)	Clay Bricks (factory made)

1.4. Timber Products and Boards made from Wood or other Ligno-Cellulosic Fibrous Materials;

TS-46 (M)	Plywood
TS-51	Timber for Building Construction
TS-52	Roundwood (Basic Rules for Utilisation)
TS-64 (M)	Fibreboard
TS-130(M)	Particle Board

(16.4) Turkish Standards (Cont'd.)

TS-305	Wood Wool Building Slabs
TS-344	Wood Preservation for Superstructure
TS-697	Hardwood Timber (Term, Definitions and Method of Measurement)
TS-801	Beech Timber
TS-820	Oak Timber

1.5. Asphalt and Bituminous Materials:

TS-103(M)	Primer Materials for use with Asphalt in Built-up Roof Coverings and Waterproofing
TS-104(M)	Creosafe Primer for use with Coal-Tar in Built-up Roof Coverings and Waterproofing
TS-105(M)	Asphalt for use in Built-up Roof Covering
TS-106(M)	Coal-Tar for use in Built-up Roof Coverings and Waterproofing
TS-107(M)	Woven Burlap Fabric saturated with Bituminous substances for use in Roofing and Waterproofing
TS-108(M)	Woven Cotton Fabrics for use in Roofing and Waterproofing
TS-109(M)	Woven Cotton Fabrics saturated with Bituminous substances
TS-110(M)	Felt, Asphalt-saturated, for use in Built-up Roof Coverings and Waterproofing
TS-111(M)	Felt, Coal-Tar saturated, for use in Built-up Roof Coverings and Waterproofing
TS-112(M)	Asphalt Mastic for Roofing
TS-113(M)	Emulsions for use as Protective Coatings for Built-up Roofs
TS-114(M)	Cardboard Asphalt saturated for use in Constructing Built-up Roof Coverings
TS-306	Asphalt for use in Waterproofing and Moisture-Proofing of Foundations and Vertical Surfaces
TS-307	Bituminous Grout for use in Waterproofing above and below Ground Level

1.6. Steel:

TS-708	Steel Bars for Concrete Reinforcement
TS-822	Galvanized Plain and Corrugated Steel Sheets (Hot-dip galvanized)
TS-908	Hot-rolled, round edge steel angles with equal sides
TS-909	Hot-rolled, round edge steel angles with unequal sides
TS-910	Hot-rolled I-Bars
TS-911	Hot-rolled T-Bars with round edges

(16.4) Turkish Standards (Cont'd.)

TS-912	Hot-rolled Channels with round edges
TS-913	Hot-rolled Z-Bars with round edges
TS-924	Steel Strips (Cold-rolled)

1.7. Sampling and Testing Methods for Construction Materials:

There exist Turkish Standards for sampling and testing methods for each of the above mentioned construction materials. (Shall not be given here.)

2. Design and Construction Methods for Buildings:

TS-498	Design Loads for Buildings
TS-499	Codes for the use of Ribbed Steel Bars in Reinforced Concrete Construction
TS-500	Building Code Requirements for Reinforced Concrete
TS-543	Design and Construction Methods for Reinforced Brick Slabs
TS-647	Building Code for Timber Work
TS-648	Building Code for Riveted or Bolted Steelwork
TS-825	Thermal Insulation in Building Construction

3. General:

TS-734	Classification of building and space elements and Definitions concerned with their dimensioning
TS-735	Modular Coordination in the Building Industry

16.5. FUNCTIONS OF THE MINISTRY OF RECONSTRUCTION AND SETTLEMENT

Probably the most important official document pertaining to earthquake resistant construction is published by the Ministry of Reconstruction and Settlement. This is the Building Code for Regions of Hazard. The two sections which particularly apply to earthquake resistant design will be summarised later. This code is mandatory for all regions of hazard. A seismic zone map shows the areas which are affected by earthquakes.

Provincial Construction Directorates which are attached to the Ministry of Reconstruction and Settlement play a supervisory role in construction of official buildings.

(16.5) - BUILDING CODE FOR REGIONS OF HAZARD (Ref. 6)

This code is composed of nine sections. Of these, two sections are about earthquake resistant design. Below, first a general summary of all the sections is given, then the two sections concerning earthquake resistant design is discussed in greater detail.

Summary:

Section I - Scope of the Code:

The following structures are not within the scope of this code and their design conditions will be determined by the Government Ministry concerned with the structure in question: dams, bridges, minarets, mosques, high chimneys, transmission towers and the like.

Section II- Lands on which Structures cannot be built.

Section III-Protection against Floods.

Section IV- Protection against Fire.

Section V - General Regulations for Material and Workmanship.

Section VI- Protection against Earthquakes.

(This section will be discussed in greater detail below.)

Section VII- Repairing.

(Under this section it is required that the structures which are damaged by an earthquake will be repaired in such a manner that they will resist to a future earthquake. Also some regulations concerning size and location of chimneys are specified.)

Section VIII - Earthquake Resistant Design for Building Structures. (This section will be discussed in greater detail below.)

Section IX - This code is valid after its date of publication.(1968)

An appendix is added to these sections which illustrates some important construction details graphically.

Outline of Section VI - Protection against Earthquakes.

In this section five different types of construction are considered. These are reinforced concrete, masonry, semi-masonry, wooden frame and adobe.

(a) Reinforced Concrete Building Structures:

Some specific requirements are given for the design of structural elements of reinforced concrete buildings; such as foundations, foundation connections, columns, beams, slabs, shear walls and walls. Aside from these it is recommended that the centre of regidity and centre of gravity be made as close to each other as possible. For reinforced concrete frames over 44 metres, special dynamic analysis is required.

(b) Masonry:

The maximum number of storeys (excluding basement) that masonry buildings can have is three in seismic Zone I, and four in Zones II and III. Regulations for foundations and footings are given according to the seismic zones. Minimum wall thicknesses are also given according to seismic zones, number of storeys and type of

material. Three types of material are specified for walls; these are stone or concrete, brick and solid concrete brick.

(c) Semi-masonry:

These structures can have a maximum of two storeys excluding the basement. Foundation design is the same as for masonry. Different minimum thicknesses are given depending on the number of storeys and the material.

(d) Wooden Frames:

The code requires that wooden frame structures can have a maximum of two storeys excluding the basement and each storey can have a maximum height of three metres. Foundations are to be designed using the regulations for masonry structures.

(e) Adobes:

For foundation and basement, uncut stones (moloz taşı)(*) will be used. Load carrying walls will be made from clay soil. Organic soil cannot be used for walls. In seismic Zone I, the building should not have a flat soil roof.

(*) Defined in the General Technical Code (Genel Teknik Şartname).

Outline of Section VIII - Earthquake Resistant Design for Building Structures

(a) Lateral forces calculated from the following recommendations give the minimum values for earthquake resistance of the structure.

(b) The more critical of the wind or earthquake forces will govern the lateral design.

(c) Total lateral earthquake force is given by a formula where this force is proportional to the weight of the structure. The proportionality constant 'C' depends on four factors.

$$C = C_o a B \gamma$$

Here,

C_o: Seismic zone coefficient

a : Soil conditions coefficient

B : Building importance coefficient

γ : Dynamic coefficient

There are three seismic zones in Turkey and 'C' is adjusted according to these zones. 'a' can assume three values: lowest for solid rock and highest for loose soil containing water. 'B' can have two values: higher one for emergency buildings after a disaster (e.g., hospitals, post offices, etc.), buildings containing property of national value (e.g. museums) and public buildings (e.g., theatres, stadiums), lower one for others. The dynamic coefficient 'γ' depends on the fundamental period of the structure.

$$\gamma = 1 \quad \text{for} \quad T \leq 0.5 \text{ sec.}$$

$$\gamma = \frac{0.5}{T} \quad \text{for} \quad T > 0.5 \text{ sec.} \quad \text{and } \gamma \geq 0.3$$

where $T = \frac{0.09H}{\sqrt{D}}$ sec.

If it is not calculated by a reliable theoretical or experiemental technique.

H : height of the building in metres

D : depth of the building in the direction of the considered force in metres

In calculating the weight of each storey 100% of the live load is added for buildings such as schools, theatres, stadiums and warehouses. For other types of buildings this factor is 50%.

The distribution of the total load to each storey is triangular.

Allowable stresses can be increased by 50% in earthquake resistant design for both steel and concrete.

Appendages to buildings such as extruding façade decorations, handrails, balconies and chimneys are to be designed using a seismic coefficient 'C' which is equal to three times the seismic coefficient of the building as a whole.

Torsional analysis is to be made when the eccentricity between the centres of rigidity and gravity is greater than 5% of the maximum plan dimension of the building.

Discussion:

C_o, the seismic zone coefficient exhibits some peculiarities (see the seismicity map of Turkey), because adjacent regions are accepted to be of very different seismicity. In fact, there are several cases where Zone III is adjacent to a zone of no seismicity. However,

a new seismicity map is being prepared by using (1) earthquake catalogues, (2) epicentre maps, (3) maximum intensity felt maps, (4) seismo-tectonic zone maps. (Teknik Bülten, İ.M.O., No. 2)

The dynamic coefficient should theoretically represent the result of a response spectrum analysis. However, 'γ' is dependen on T only in the range $0.5 < T < 1.67$. Using the formula to compute T, given in the code, this corresponds roughly to buildings of 10-20 storeys. Although it is not explicitly stated, the code is intended for short and medium period buildings. This is substantiated by three observations:

1. 'γ' assumes a constant value of 0.3 for $T \geqslant 1.67$ sec., and this is a gross oversimplification for obviously high and probably important buildings.

2. The formula for 'T' is similar to the formula recommended by the Uniform Building Code (Ref. 7) of the USA for buildings which are not designed to carry 100% of the lateral force by a moment resisting space frame. This formula is further restricted to buildings for which the ratio of stiffness to mass is a constant.

3. In the distribution of the total lateral load to each storey, it is assumed that only the first mode of oscillations will govern - which is not a valid assumption for high buildings.

Allowable stresses can be increased by as much as 50% for both steel and concrete, if there is sound quality control of the properties of the material at hand. But increasing the allowable stress in some cases would lead to wrong results in a design which considers ductility requirements.

Appendages on buildings are designed conservatively because they cannot develop any ductility due to their statically determinate nature. Ductility or energy absorption capacity is not mentioned elsewhere in the code.

Torsional forces are not taken into consideration in an effective way. Appreciable eccentricities may be present because of statical errors. So each building should also be designed against torsional moment effects.

Damping of the structure and the effects of vertical earthquake accelerations have not been considered in the code.

16.6. FUNCTIONS OF THE MUNICIPAL GOVERNMENTS

The control of construction of private buildings in the cities and towns is governed by the Municipal Construction Offices.

The architectural design and construction project of each private building are examined in accordance with the master city plan and also with the current building codes and if the projects are found to be adequate, a construction license is issued by the Municipal Construction Office.

During the construction period and after the completion of the building, Municipal engineers examine the building to see whether it has been constructed according to the approved projec or not, and if the building is found to be adequate, a license for inhabitance is issued.

Although the above mentioned system for controlling private constructions seems to be appropriate, it is not always possible to say that this control system is working efficiently in practice, because of the shortcomings existing in the current Municipal Regulation. A new and more strict Municipal Regulation for controlling private construction is being prepared by the Government.

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17. CONCLUSIONS AND RECOMMENDATIONS

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17. CONCLUSIONS AND RECOMMENDATIONS

17.1. EARTHQUAKE RISK

Turkey has a population of about thirty-six million (1970) and lies astride the very active portion of the Alpine earthquake belt. 57.7% of its land is susceptible to frequently occurring damaging earthquakes. 66.7% of the population live in earthquake hazard zones in which 96% of the total national capital is invested. Housing standards in rural areas are very low and most of them suffer heavy damage even during relatively mild local shocks.

17.2.. LOCATIONS OF DWELLINGS

From the view point of cost, quality and location, residential buildings in Turkey may be summarised in three major groups as follows:

(i) Rural Dwellings:

These dwellings are in villages or in isolated farming or fishing settlements with population less than 10 thousand. There are 65,277 settlements (1970) of this nature in Turkey. Approximately, 61.2% of the population lives in rural dwellings, which is estimated to be in the order of 3.9 million units (1970).

(ii) Urban Dwellings:

These are houses built in relatively larger towns and cities with population more than 10 thousand. 37% of the total population in Turkey live in these houses which are estimated to be about 2 million units.

(iii) Night-Villages (Gece-Kondu)*:

These locations contain mostly one or two-storey, poorly built houses in the peripherical regions of the three large cities of Istanbul, Ankara and İzmir. The term "Gece Kondu" literally means "finished in an overnight" and implies the fact that these houses are actually built illegally without a city permit on a Government, public or private property. There has been a constant flow of people, coming from villages into cities in the past twenty years as a result of industrialisation and for other socio-economic reasons. Authorities have been unable to prevent neither the formation nor the expansion of these "night-villages". Presently (1970), there are about a total of 600 thousand dwellings in and around the three major cities of Turkey.

17.3. DEMAND FOR LOW-COST HOUSING

There is statistical evidence about the severe housing shortage in Turkey. Moreover, 30% of the rural dwellings require immediate structural repair and strengthening, while some 17% others are in very poor condition beyond any practical repair. The demand for low-cost housing is steadily increasing as a result of (1) increase in population in the order of 2.7% yearly, (2) plans for preventing night-villages, (3) damages caused by natural disasters, (4) necessity to replace the old houses.

Considering the current trend of population increase and also assuming that the average number of persons living in one family is 5.97

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* Squatter houses.

in rural and 5.00 in urban dwellings, it is estimated (1970) that about 120 thousand rural and 204 thousand urban dwellings are needed to be constructed yearly in Turkey. In fact, it is envisaged in the Second Five-Year Plan (1968-72) that about 0.6 million rural and 1.2 million urban dwelling units will be constructed. The total investment of housing corresponding to this period of construction is estimated to be in the order of 1.2 billion TL. ($ 86 million) for rural and 24.3 billion TL ($ 1.7 billion) for urban dwellings. These figures constitute about 18% of the total national capital investment. If, the population increase ratio is extrapolated and also the probable cost of construction is estimated, the portfolio of housing construction in Turkey for the next ten years (1972-82) may be calculated to be in the order of 3.6 billion TL ($ 0.26 billion) for rural and 72.6 billion TL ($ 5.2 billion) for urban dwellings.

When such a huge housing investment possibility is considered, it becomes evident that developments of new methods of construction and design for low-cost housing in Turkey is most desirable.

17.4. GENERAL CHARACTERS OF DWELLINGS

Of all rural dwellings in Turkey, 48% are stone and brick masonry, 28% are adobe construction, 13% are timber frame structures and 11% are mixed or other types (1970). Rural dwellings are built mostly at heights of one (58%) and two-storey (41%) occupying a plan area of less than 100 sq. meter.

The total cost of construction of rural dwellings varies significantly from region to region and it is especially difficult to make any realistic assessment in any region, since the rural dwellings are built mostly by their owners. Generally, only the local material is used and the knowledge of construction is very conventional because it is transferred with little or no change over the years from father to son.

Ranges of construction costs for urban dwellings, however, are available statistically. The average cost for a 98 sq. metre brick masonry house is about 27,362 TL ($ 2,000), which means a unit cost of about 276 TL. for one sq. metre ($ 2 per sq. ft.) area. Infrastructural expenditures, such as those for roads, sewage, water supply, electricity, etc., are not included in these figures. As a matter of fact, of all villages in Turkey, 80% do not possess adequate roads, 60% have no drinking water supply and 98% have no electricity.

17.5. FINANCING

Fovernment of Turkey, within the context of national budget, does not directly finance the individual housing projects. Except, long-term and low-interest construction credits are made available through "Sosyal Sigortalar Kurumu" Social Security Service and "Emlâk Kredi Bankası" Real Estate and Credit Bank of Turkey. These credits are issued on a very selective and restrictive bases and are not readily available. Nevertheless, the combined amount of credits issued by these two agencies for low-cost housing is 118 million TL. ($8.5 million) in the year 1970.

This constitutes, however, only the 3% of all the housing construction investment. In fact, the private sector in Turkey supplies almost 94% of all the housing investment.

17.6. POSSIBILITY OF PROGRESS

Since the housing construction in Turkey is basically financed either by owners and individuals or mostly by small businessmen, there is not much prospect for a rapid progress in the methods of construction and in the use of material for low-cost rural dwellings. With the prevailing conditions of financing and building regulations, the rural dwellings will be constructed using the same old conventional methods utilising whatever cheaply available local material.

Unless an efficient and reasonably priced pre-fabrication is established across the country, nothing will prevent 80% of the future houses to be built out of stone, brick or adobe masonry, which in most cases possess little or no lateral load carrying capacity. In a very few regions where timber is locally available, the prosperous builder may construct timber frame structures.

17.7. POINTS OF INTEREST AND RECOMMENDATIONS

Based on the experience of low-cost housing construction in Turkey as well as the field observations of damaged structures in recent earthquakes, several points of interest and areas of possible development regarding the earthquake resistant design and construction may be summarised as follows:

1. A realistic approach to the problem of improving the present methods of rural dwelling construction in Turkey, would be to study the earthquake response of stone, brick and adobe masonry structures. New rigid requirements of strength and ductility should be imposed in order to make these structures capable of resisting strong earthquakes without total collapse. It is very difficult to determine analytically the earthquake response of a masonry or timber frame rural dwelling. Therefore, experimental research on real or model structures is highly desirable. In these experiments, alternative methods of constructing the foundations, walls, lintels, bond beams, corners, ceilings, etc., should be investigated in great detail.

2. Geological and sub-soil conditions should be taken into account in selecting a site and also in designing a house. The predominant period of vibration, especially of soft soils should be determined. Depending on the availability of funds, analytical studies combined with laboratory tests and field measurements of shear wave velocity may be used for this purpose.

3. Coincidence of soil-structure periods should best be avoided by following the principle of building rigid structures on soft soils and flexible structures on hard soil.

4. Care should be given not to use unnecessarily heavy partition or in-fill walls, especially of the kind which do not contribute to the strength of the structure.

5. One and two-storey houses should be designed and constructed to withstand a minimum static lateral load of 0.10 g in the first degree earthquake zones.

6. Symmetry in all possible planes as well as uniformity throughout the structure should be maintained. Uniformity in the arrangement of rigidity, weight, geometry, materials, etc., is most essential for a safe earthquake-proof design.

7. Strength of adobe masonry structures should be increased by adding stabilising materials into the mixture, without raising the cost of construction significantly.

8. Infrastructural facilities like roads, sewage systems, water supply, electricity, telephone, etc., should be included in the overall design and planning of rural dwellings.

9. Architectural planning of rural dwellings should take into account the socio-economic needs of the people living in different regions.

It is hoped that, with the help of statistical data and other pertinent information contained in this report, one may establish some familiarity with the socio-economic aspects of the housing construction in Turkey and may also recognise the immense need for the development of new techniques of construction and material for low-cost housing. Any analytical and experimental research conducted in any part of the world and concerned with the promotion of better and safer living conditions in rural areas should be regarded as service to mankind.