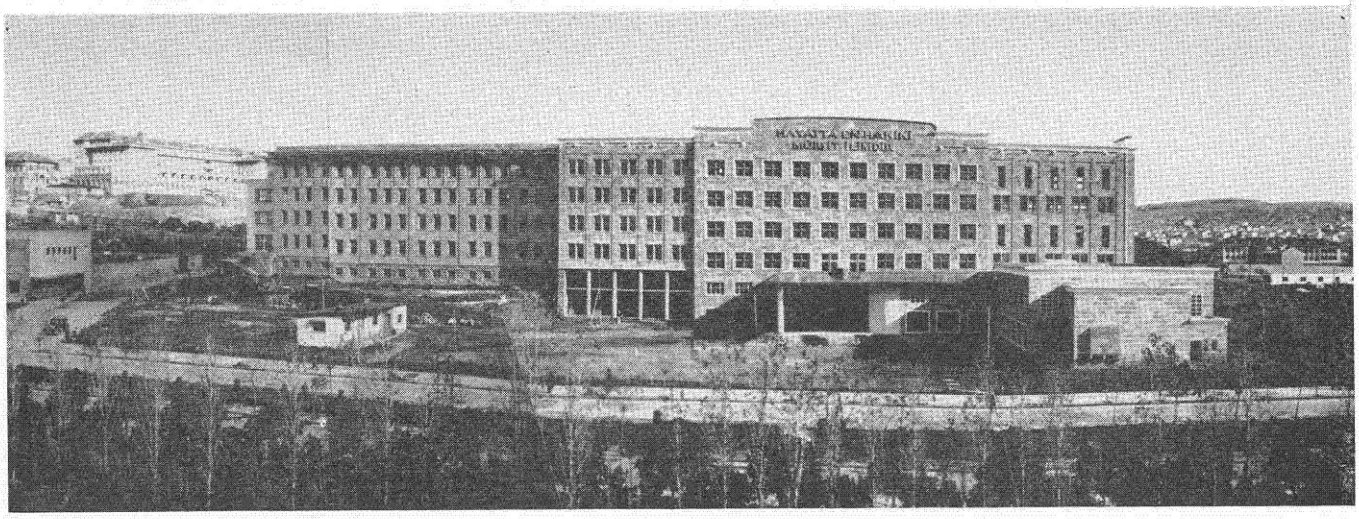

Front view of School of Language, History and Geography. The stone writing on top is a quotation from Kemal Ataturk, "The Truest Guide in Life is Knowledge." The architect was the late B. Taut.

Modern Building Construction in Turkey

BY ORHAN M. EMRE

". . . I saw [in Turkey] the most advanced type of building construction."—Wendell L. Willkie in "One World."

WHEN Turkey came out of the first World War she was faced with the problems of a country neglected in many ways. Among many shortcomings the lack of modern buildings was one of the most acute. There were still in existence many beautiful and well-built structures such as palaces, mosques and aqueducts which were priceless in historic value, but a country trying to keep up with the modern world could not afford to conduct governmental works, business, education, and recreation in obsolete, unsafe, ill-ventilated and out-of-date buildings. This lack of modern facilities was one of the most serious of all problems.

The postwar democratic government of Turkey did not hesitate to hire the best available city-planning experts; and a systematic plan for the remodeling of the cities was organized. According to this plan no buildings located on future public grounds were allowed to be remodeled or enlarged, so that after their useful life had expired the areas would be available for parks, playgrounds, community apartment units or whatever other programs were assigned for future development. Naturally the granting of new building permits on such areas was out of the question. This method worked very satisfactorily, and part by part the general plan was fitted together like a jig-saw puzzle.

WIDESPREAD USE OF CONCRETE

Most of the old buildings were either of wood-frame or brick and I-beam joist construction. The wood-frame buildings had a comparatively short life and were subject to heavy damage or destruction by fire. It was after World War I, and under the new governmental regime, that reinforced concrete became a very popular type of construction, and the new program made full use of it. Among the reasons for the wide use of concrete were that when properly designed it made a lasting fire- and earthquake-resistant structure, and also that the larger material constituents were cement and sand, which are found in good quality and abundance in the country. Until recent years Turkey imported her entire requirements of steel.

Today the most widely used type of building construction is the reinforced concrete frame with brick or stone filler walls. The density of population in the cities does not as yet (and probably will not for some time in the future) call for a vertical expansion in building construction, so that few buildings are more than three or four stories high. A four-story reinforced concrete frame is, with due care and design, adequate for a seismic load of one-tenth gravity. Turkey is located in the seismic belt and earthquakes of major proportions are of frequent occurrence.

Wood-frame construction is not permitted in the cities because of the fire hazards of peace and war. Wood roof trusses may be used in residential buildings, but all large public buildings have to use a non-inflammable roof construction and a suitably large bomb shelter in the basement.

MOST MATERIALS IMPORTED

Most of the secondary items that enter into the makeup of a modern building are imported. With the installation of the steel manufacturing center in Karabuk, steel is now being provided locally; but goods like linoleum, heating and ventilating equipment, electrical apparatus

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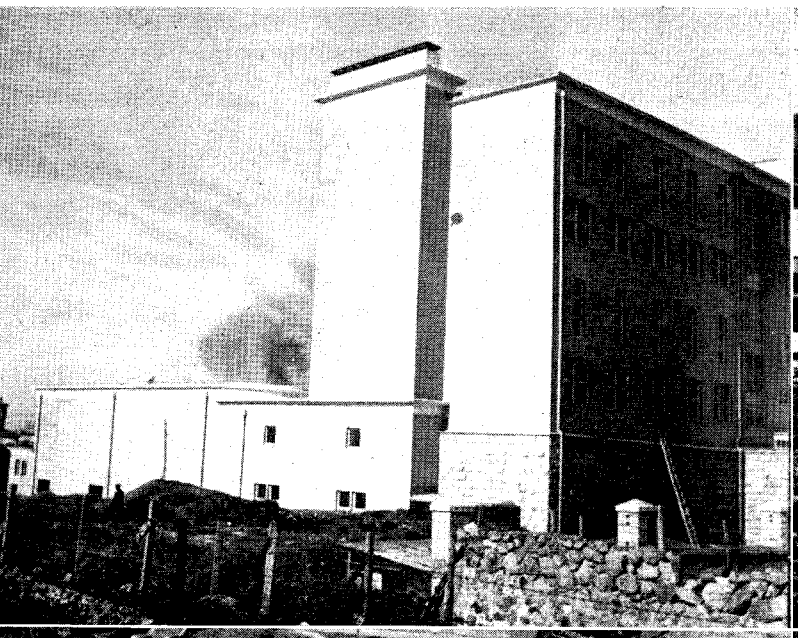
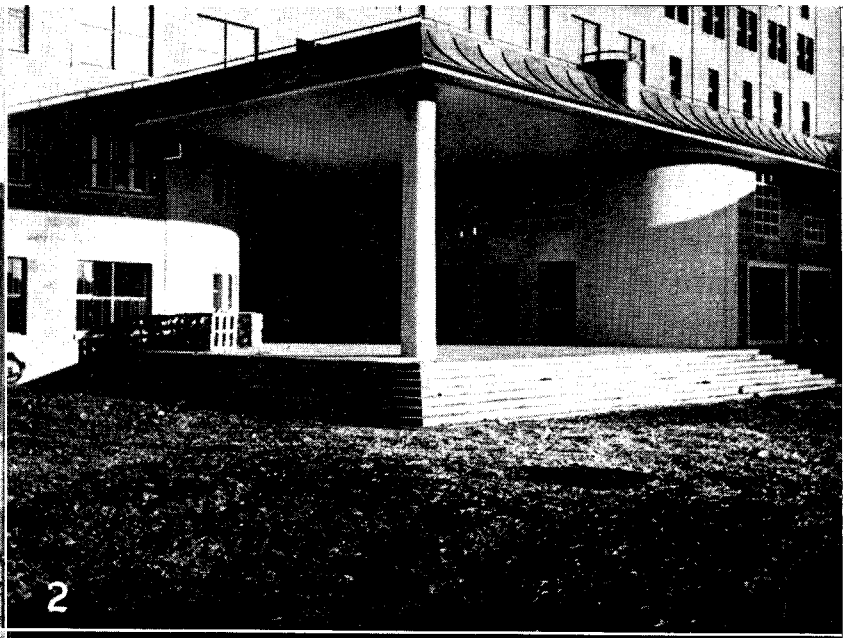
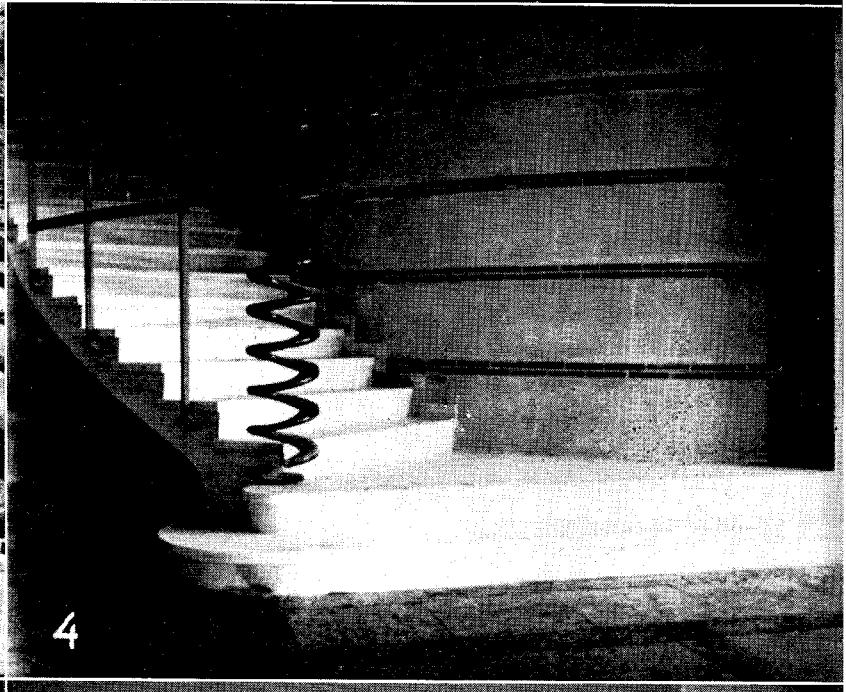
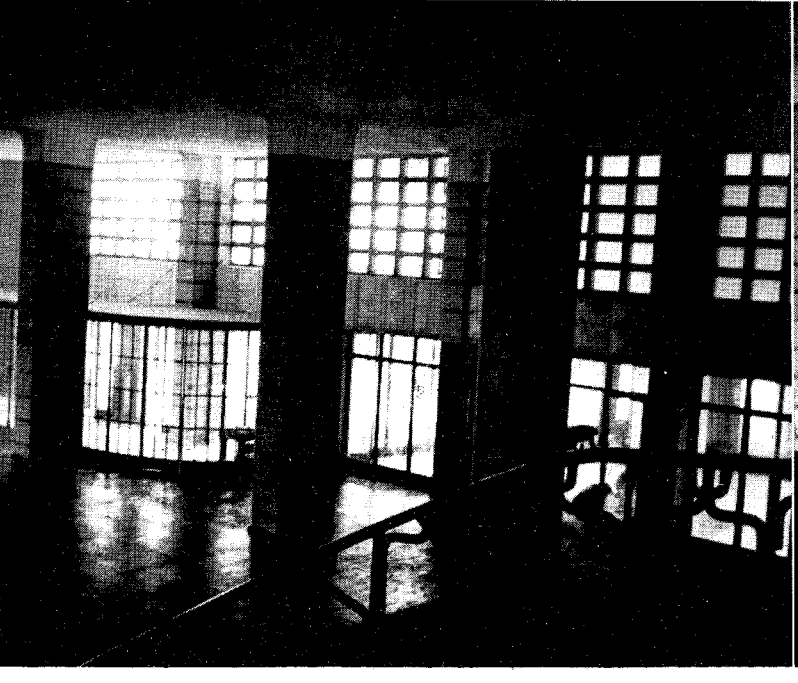
Illustrations on Facing Page

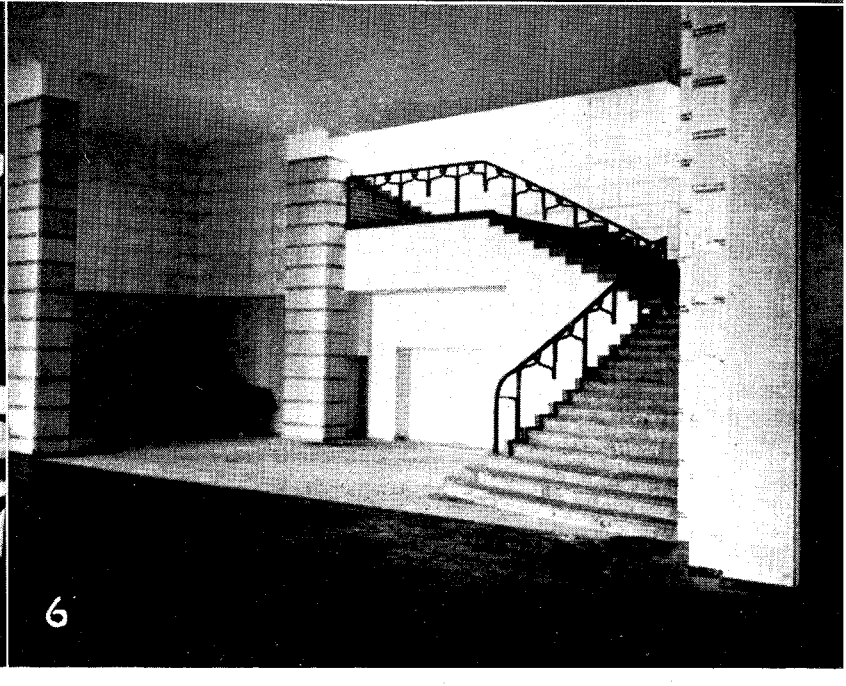
1. View of the school from northeast. Note the junction of face stone with plaster. The layers of stone alternate with layers of face brick bonded with white mortar. 2. Main entrance facing south. Note speaker's stand on copper rim of balcony. 3. Workman placing hollow concrete blocks for joist construction. Note hooks on column bars—due to building code regulation. 4. Reinforced concrete stair. Each story of the building has a different shade of color











on the walls. 5. Stair leading to the balcony of the main lecture hall. Steps are of white marble of high density. The wall is of Leski stone with bands of glazed ceramic of greenish-blue. 6. Main hall. Floor of Hereke stone, a beautiful conglomerate taking a high polish.

sponsibility and must apply a good share of its attention to the task, just as it does to any other undertaking of vital importance. Every kind of work that men do involves some degree of hazard, and every uncontrolled hazard, if given enough time, will produce its share of injuries. But proper attention to safety will result in the elimination of almost all the injuries that would otherwise occur, regardless of the industry, the type of operation, or the occupation in question. In management is vested all authority, the determination of policies and executive direction; from management must come the drive for safety. Management must want to eliminate injuries badly enough to make accident prevention a vital part of all activities. Prevention must be given continuous attention along with such matters as cost, quality, and production.

Perhaps in time of peace you may treat with accidents as you please, particularly if you are willing to pay the bill. But in time of war, it is your patriotic duty to conserve the only resource for which no substitute can be found—the number one raw material of war—MANPOWER.

Modern Construction in Turkey

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and supplies, asphaltic membranes and hardware (with the exception of nails) are imported from foreign countries.

Labor is cheap compared to material cost. Unskilled labor is abundant and the wages are low. A pick-and-shovel workman, for example, normally earns 60 to 90 cents for an eight-hour day. Of course, one should consider that it is possible for this type of a workman to feed himself for 40 cents a day, but even then his financial life is very modest. Skilled labor is somewhat better off; a carpenter earns from two to four dollars a day. The big jump comes in the earnings of the professional class, such as the engineers and architects. This is primarily due to the great need for such services, and the civil engineer or architect enjoys a distinct position in income and prestige. Strikes and labor disputes of major proportions are practically nonexistent in Turkey. Problems that arise between the workmen and the employer are referred to the "labor inspectors," who see to it that such problems are settled according to the laws and regulations of the republic.

As a result of low labor rates the cost of construction in Turkey is below what it is in the United States. Apartment houses cost from two to three dollars per square foot and the very modern public buildings that are being erected feverishly at the present time cost from four to eight dollars per square foot. The labor cost in the big items such as reinforced concrete, brick masonry, plaster, etc., is about 15 per cent of the material cost. The contractors are naturally very sensitive about any kind of material waste.

Bids for government construction follow a method which has proved successful in this period of intensified construction. The architectural plans are prepared by government offices and a rough material estimate of the future building is made. Then the job is let out for bids. Each bidder receives a set of design, material and workmanship specifications, along with the general architectural drawings. The designing offices of the participating contractors use their own judgment and skill in producing the structural design. The contractors each submit a bid which is based on unit prices. These unit prices when multiplied by the material quantities add up to the total price of the bid. The advantage of this method is that it stimulates the contractors to prepare a design that will be of minimum total cost. As a result of this system the contractors are very conscious of the value of a skillful structural engineer.

LESS LABOR-SAVING EQUIPMENT

Labor-saving mechanical equipment for construction is not used as much as in this country. Concrete mixers and material elevators are usually the only mechanical equipment used in the field. Vibrators, for example, are not used, because it is cheaper to tamp the fresh concrete by hand tools, and the forms are not built sturdily enough to withstand the vibration. Two-inch boards are used under beams and one-inch planks are used for slabs and for sides of beams. All attachment of forms is done by nails.

The building code for reinforced concrete calls for all bars to be provided with hooks. Since plain bars are used exclusively and earthquake forces are expected, this is an inexpensive security measure. As in most European codes the value of shear strength of concrete is neglected once the shear intensity exceeds 40 pounds per square inch. The allowable fiber stresses in concrete are about 25 per cent lower than the values generally used in the United States for ordinary construction. Up to recent years moment factors were used, or, for more exact analysis, the "three-moment equation"; however, the Hardy Cross method of determining moments is becoming more and more popular at the present.

Due to the great demand for technically trained men the government has adopted a very benevolent attitude in employing foreign engineers and architects, and most of these men have done splendid jobs. The foreign engineer, however, has a few problems to consider before making his luxurious salary. The tax rate starts at about 30 per cent withholding and increases as the income gets larger. When leaving the country a person is allowed to take out only one-third of the cash he has made. However, judging by the fact that there are a large number of foreign engineers in the country, these restrictions apparently are not too severe.

The photographs displayed with this article were taken in 1939, and show features of design and construction of the Graduate School of History, Language and Geography, located at Ankara. The author worked on the structural design of this project and was present during the entire period of construction.

Alkylation Plant

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review might be 45 feet long, eight feet high, with possibly three horizontal tiers of dials of various sizes and shapes. At any moment a glance will show what any unit of the equipment, provided with an instrument connection, is doing.

Electric power and light installations in an alkylation plant are extensive. Explosion-proof motors are used in all areas considered hazardous because of the possible presence of hydrocarbon vapors. They might vary in size from ¼ horsepower for driving an exhaust fan to 450 horsepower for furnishing the motive power for a large water pump, synchronous motors being preferred for such units. Electric current is usually brought in several