Attention has also been given to facilities for the workmen. Individual lockers are provided in two mezzanine locker rooms, one at each end of the building. In addition to toilet facilities, two 54-in. circular wash basins are provided in each locker room. The capacity of these locker rooms may be doubled by adding a second story to the mezzanines. Four drinking fountains on the main floor provide cool drinking water at all times.

Throughout all the construction flexibility has been emphasized. In so far as possible every attempt has been made to keep the building in step with production changes. The structure itself may be enlarged by the addition of a third 60-ft. bay alongside the present high bay in the space now occupied by the storage yard. Lighting intensities may be increased by about 25 per cent without additional wiring or excessive line drop. Service facilities are available for more portable equipment. The power load may be increased when additional stationary or portable machines are required. The transportation facilities are extremely flexible. The result is a building with pleasing design that may reasonably be expected to keep in step with production for some years to come—to continue to serve, rather than to confine, production.

Considerable credit is due to the several suppliers who aided by their advice and equipment; to the architect, J. J. Novy, Chicago; and to the contractors, Kaiser-Ducett Co., Chicago.

Concrete Rigid Frame Span of 146-ft. Features Park Bridge at Kenosha

By Hugo E. Bothe
Civil Engineer, Kenosha, Wis.

A RIGID FRAME span 146 ft. long from center to center of piers, believed to be the second longest in the United States at present, is a feature of a three-span concrete memorial bridge completed in August, 1936, in Lincoln Park, Kenosha, Wisconsin. While intended primarily for pedestrians to pass across a park lagoon, this bridge is designed to carry trucks and other park maintenance equipment equivalent to an H-10 loading. The roadway is 10 ft. wide between curbs.

The problem was to get an attractive structure which would have sufficient height above the level of the lagoon at the springing line and the lowest possible elevation of deck to permit safe boating and ice skating. An economical design solution proved to be a long rigid frame center span, with 43½ ft. end spans simply supported. The foundations rest on hard blue clay about 10 ft. below the bottom of the lagoon.

The deck slab of the rigid frame span is 6½ in. thick at the gutters and is crowned 1 in. It is supported on two ribs 9 ft. 4 in. apart, this arrangement giving a lighter and more economical design than the alternative of three ribs. The two ribs are 1 ft. 4 in. wide and vary in depth about 3 ft. 1 in. at the crown to 7 ft. 3 in. at the springing lines. Five transverse stiffening beams are provided. As a means of providing sufficient strength, a soffit slab is used, making the structure a hollow box girder for a distance of 11 ft. out from each center pier. From the 11-ft. point toward the center the soffit slab narrows down, ending at the nearest transverse stiffener as shown in the sectional plan view.

For appearance and structural reasons the piers were made 7 ft. wide. Tension reinforcement from the top of the deck span is carried down the outside face of the piers and into the footings, no attempt being made to secure hinge action at the top of the footing. Hinge action, however, was provided at the toe of the footing.

The end spans each consist of a deck slab supported on two girders arched to harmonize with the center span. Cork-filled expansion joints 1½ in. wide are provided at the piers and 1 in. cork-filled joints at the abutments. The springing line at the pier extends below the seat of the girders. The expansion joint below the seat is concealed to give the appearance of a continuous structure, by notching the girders into the piers. Bronze expansion plates are provided at the abutment ends.

Architectural design

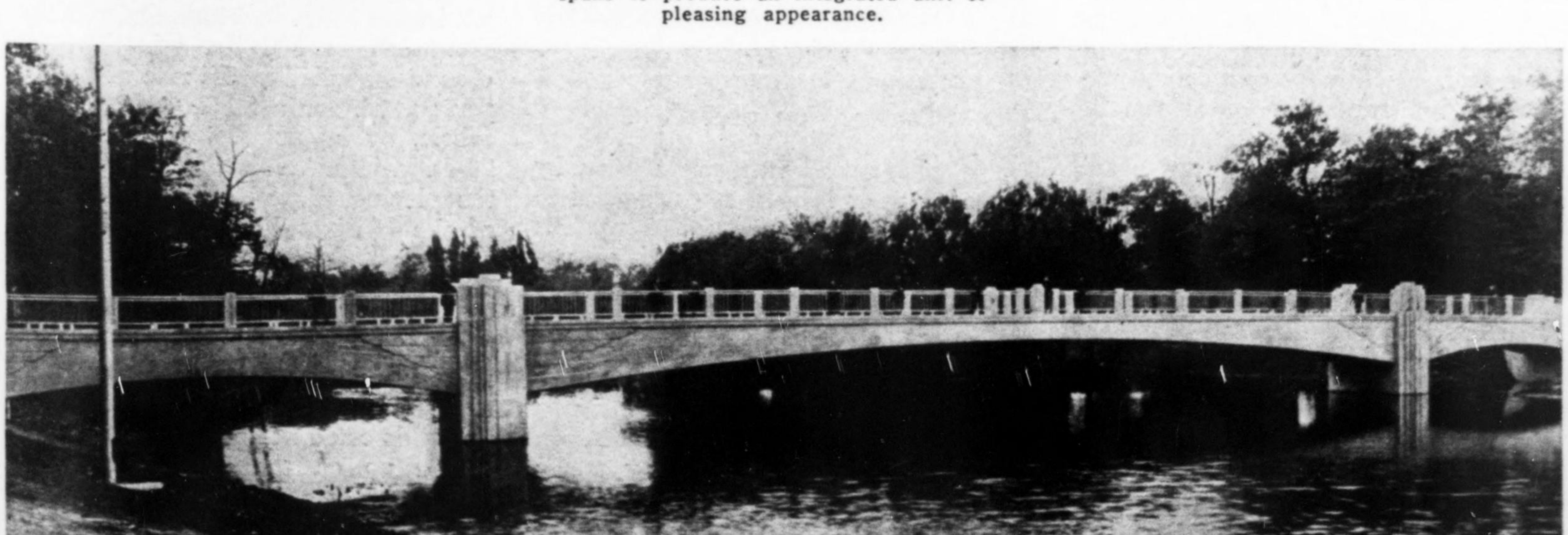
As indicated in the accompanying photograph, the finished bridge presents a striking appearance. The rigid frame design permitted a remarkable lightness of deck (the depth at center being only about 1/45 of the span) without sacrificing strength. The deck is cambered 18 in. in an over-all length of 245 ft.

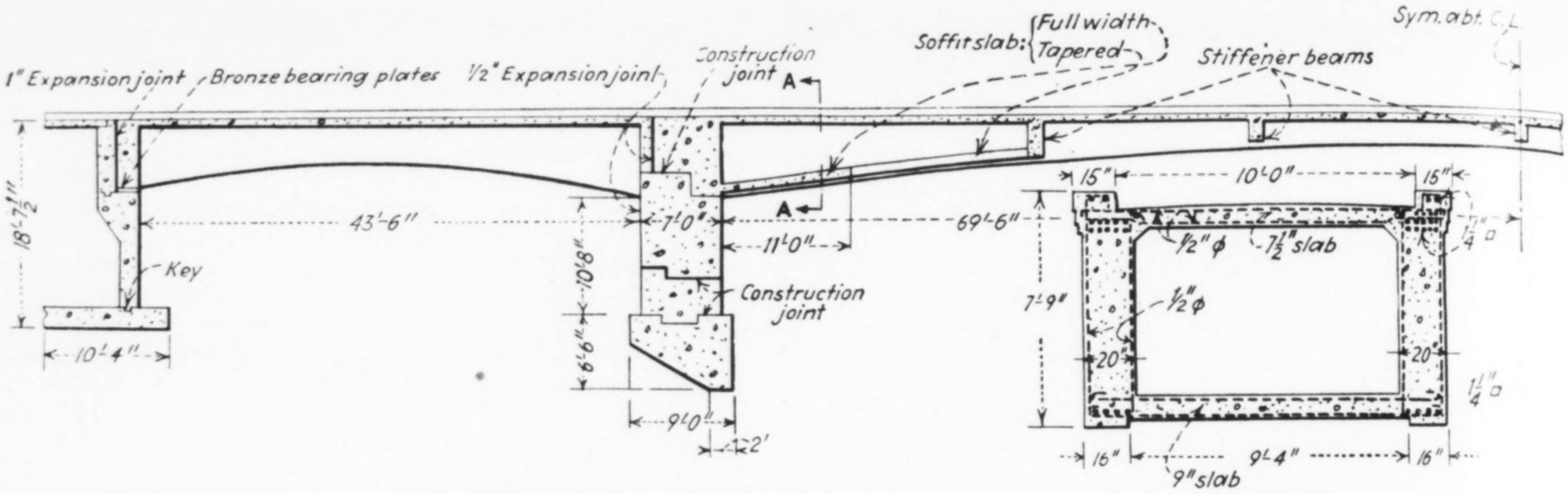
The hand railing consists of standard extruded heat treated aluminum members set in concrete posts. This open design adds to the effect of lightness. Perhaps the principal means of obtaining an appearance of strength is in the design of the pylons. Vertical reveals or offset lines of the pylons, together with the restrained wing motif, give the bridge a distinctive modern appearance. The wingwalls are of novel design, stepped, and given vertical offsets to harmonize with the piers.

Construction

Forms for placement of the deck were supported by two lines of 8x8 in. posts 14 ft. apart, and intermediate posts, resting on long 6 by 10 in. mud sills all

A CENTER SPAN of rigid frame type combined with simply-supported side spans to produce an integrated unit of pleasing appearance.





Section on Center Line of Bridge

Section A-A
Scale 1/4" = 1'-0"

STRUCTURAL DETAILS of a two-rib 146-ft. span, concrete rigid frame bridge designed for one lane of H-10 loading.

thoroughly braced. Sheathing was bent to the shape of the intrados. By temporarily draining the lagoon more satisfactory bearing conditions were obtained for the falsework and construction was expedited. Much of the form work was fabricated in an adjoining building and brought to the job in sections. The architectural detail called for unusually careful forming and much of the success in getting a fine looking job was due to the careful supervision of the WPA force assigned to form fabrication and erection.

Concrete was placed in accordance with rigid specifications which provided for careful control of water content and frequent change of the mixture to obtain a maximum workability with materials of varying gradation and moisture content. Careful attention to workability and careful spading enabled the development of high quality concrete free from honeycombing. In addition to spading, all of the concrete was vibrated. Field cylinders were tested to as high as 4240 lb. per sq.in. ultimate strength for abutment and wing-wall concrete and 7490 lb. for concrete in the deck.

Acknowledgments

This bridge, a WPA project, was built by the department of parks and city planning, Kenosha, Wis., Floyd A. Carlson, director. The writer was the designing engineer; Charles H. Whitney, consulting engineer; Frank Vilen, surveyor; L. J. Gallager, superintendent of construction; and Floyd H. Pedley, assistant superintendent.

Construction Costs of Cotton-Reinforced Asphalt

Methods and cost of constructing a cotton fabric reinforced armor coat bituminous road surface

By Leon Corder

Project Engineer, Missouri State Highway Department, Van Buren, Mo.

THE USE OF COTTON FABRIC in bituminous road construction has the advantage, it is claimed, of giving a long-sought reinforcement to that type of surface which will reduce the amount of raveling and the formation of chuck holes in the driving surface, and of cementing the surface with a seal which more completely prevents the infiltration of water and its resultant winter damage. While it is rather early in the life of most roads of this type to reach definite conclusions, preliminary observations indicate that the above claims have some basis in fact. Experiments with this type of road as carried on by several of the highway departments in this country, as well as in England (with jute) would seem further to indicate the above benefits.

The cotton fabric used on Route 60, Shannon County, Missouri, was of three grades: Grade A-1, having 12 picks and ends per in., and weighing 5½ oz. per sq. yd.; Grade B-1, having 9 picks and ends per in., weighing 4¼ oz. per sq. yd.; and Grade C-1, having 6 picks and ends per in., weighing 3¼ oz. per sq. yd. The figures for picks and ends, and for weights, are close approximations. These three grades were placed on three test sections, arranged so as to permit future observations, and, for the most part, constructed in exactly the same manner.

Construction procedure

The entire road was swept clean by a rotary power broom, supplemented to some slight extent by hand brooms. As the existing surface consisted of ordinary surfacing river gravel which had been plowed into the roadway in an effort at base stabilization, there was a good firm foundation, but the weather preceding this construction had been so dry that some of the larger rocks in the subgrade were exposed by traffic that had fanned out the finer aggregate around them. This latter condition existed mainly within the central 8 ft. of the driving surface.

The roadway was then primed with a TC-2 tar primer (specific gravity of 1.1634 to 1.1647) at the rate of 0.3 gal. per sq. yd. The temperature of application averaged 160 deg. F. This prime coat was put on for a 22-ft. width, and allowed to cure for about 5 days. Rain on two days of the curing period delayed the start of the next phase of the work, and was a factor in lengthening the time of curing, although the entire project was primed before any effort was made to start the fabric course.

A light tack coat of 200-250 penetration asphalt (at 330 deg. F.) was applied then, and the fabric placed directly upon it. The rolls of fabric as used were 7½ ft. in width, and contained from 150 to 330 lin. yd. The tack coat was applied at the rate of 0.05 gal. per sq. yd. for a 20-ft. width, and the fabric, by lapping 15 in., also gave a 20-ft. width. Immediately following the placing of the fabric, in the case of the Class A-1 and Class B-1 (fine and medium) sections, an application of 0.25 gal. per sq. yd. of the same type of asphalt was distributed, with the distributor running directly over the freshly placed fabric. However, in the case of the Class C-1 (coarse) section, this could not be done as the fabric picked up on the distributor wheels. Consequently a very thin spray of pea gravel was placed on the fabric, after