Postwar Highway Rehabilitation in the Philippine Islands

Progress made on 33 projects in $10,000,000 1947 construction program, in spite of personnel and equipment shortages. Standardization of bridge projects, with concrete favored over steel, has helped reduce delays. Two typical projects are described herein, with photos courtesy Public Roads Administration

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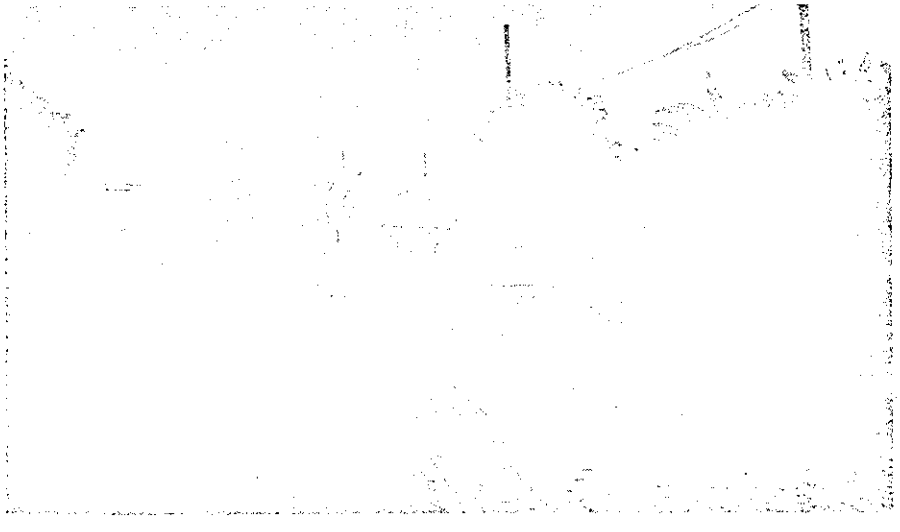
WAR in the Philippines wrought widespread havoc to the highway system. Scarcely any area escaped damage. Even where there was no large-scale fighting, there was guerilla warfare which resulted in wanton destruction of highway facilities.

In 1945 an inventory was made to assess the extent of the damage. This inventory disclosed that of 1,741 permanent bridges, 621 had been destroyed or badly damaged, and that nearly 3,000 of the 6,352 wooden bridges would have to be replaced, either because they had been destroyed or because of deterioration due to neglected maintenance. Equally serious, though not as spectacular as the bridge demolition, was the effect of military traffic on highway surfaces. Roads adequately designed for the slow-moving carabao carreton were called upon to carry army six-by-six trucks, often bumper-to-bumper, in an unending stream.

$60,000,000 Job

The task that faced the Philippine Bureau of Public Works was a Herculean one. Thirty-five per cent of the highway system was in urgent need of rehabilitation. Engineering and maintenance personnel had become scattered during the war, many were battle casualties, and many more were drawn away after the war by attractive salaries offered in private industry. Offices and records had been destroyed, valuable plans had been lost, and all equipment had been appropriated by the invaders. Revenues had fallen to a low level, since the number of civilian vehicles had been drastically reduced. Meanwhile, because of heavy military movements, the volume of traffic had become much greater than in prewar days. Major shifts in population also had developed needs for extensive improvements to the highway system.



☆ Spreading cover aggregate on a Philippine reconstruction project

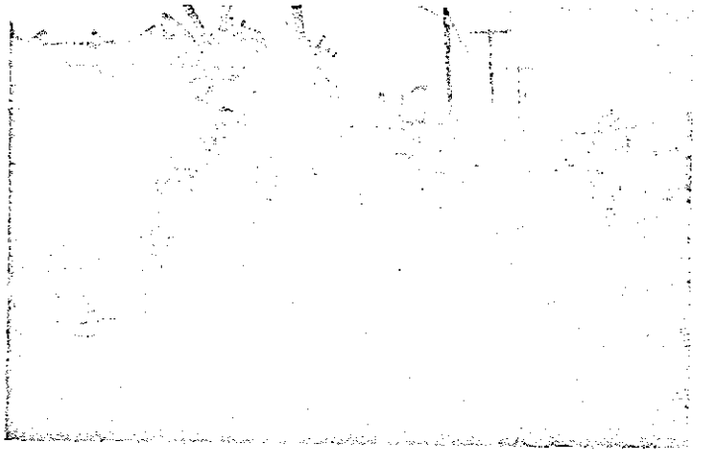
After the liberation of the Philippines, the American Army expended much effort in opening highways for traffic, and most of the important roads were passable by the end of 1945. Much of this work, however, was of a temporary nature. Permanent replacement at the earliest possible moment was imperative if highway transportation in the Islands, already strained, was not to break down entirely.

U. S. Aid Given

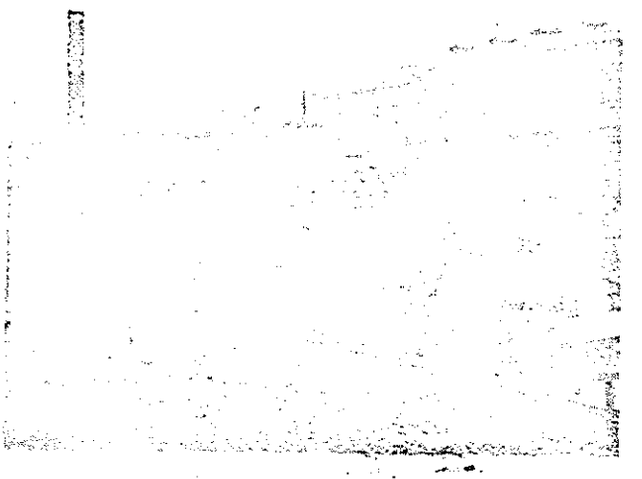
The United States, recognizing the inability of the Philippines to reconstruct their highway system without outside assistance, and realizing the desirability of establishing a stable economy as quickly as possible, proffered financial aid in the rehabilitation of Philippine highways under provisions of an act passed by Congress in April, 1946. This legislation authorized funds to assist in the restoration of highways and other war-damaged facilities and to construct new projects that would further the economic development of the country and which might be of primary importance to the national defense. The United States Public Roads Administration was designated as the agency to handle the highway features of the rehabilitation program.

A division office, staffed with experienced Public Roads Administration employees, was established in Manila to direct the work. An allocation of approximately $10,000,000 in the fiscal year 1947 was sufficient to allow the programming of 33 construction projects consisting of the repair or replacement of 27 bridges, the construction of approximately 31 kilometers of concrete pavement, 48 kilometers of intermediate type bituminous surfacing, and 47 kilometers of low-type bituminous surfacing intended as a temporary dust palliative on roads subjected to heavy military traffic.

A second allocation of $12,875,000 has been made for fiscal year 1948. One hundred and sixteen projects have been programmed and approved.



★ Hand-work on Santa Mesa Boulevard. The need for reconstruction was so great that the work could not be deferred until modern concrete paving machinery could be obtained



★ Pouring concrete curb-and-gutter on Quezon Boulevard. Job-made wooden forms were necessary since steel forms were not available

accounting for about 75% of that allocation. The projects aggregate 315 kilometers in length and include 93 bridges. Other projects will be added as rapidly as sufficient information can be assembled. Similar allocations are anticipated for the next two fiscal years.

The Philippine Bureau of Public Works is responsible for actual engineering location, design and construction control. Work is to be done under contracts awarded after competitive bidding. Public Roads Administration representatives exercise only general supervision and serve as consultants to local authorities. This procedure will develop a strong local highway department and assist in the rehabilitation of the contracting industry.

The rehabilitation program is planned to crowd into four years, work that would require normally about 15 years, at the risk of seriously overtaxing the facilities of contractors. It has been difficult to interest American contractors because of the volume of work offered in the United States.

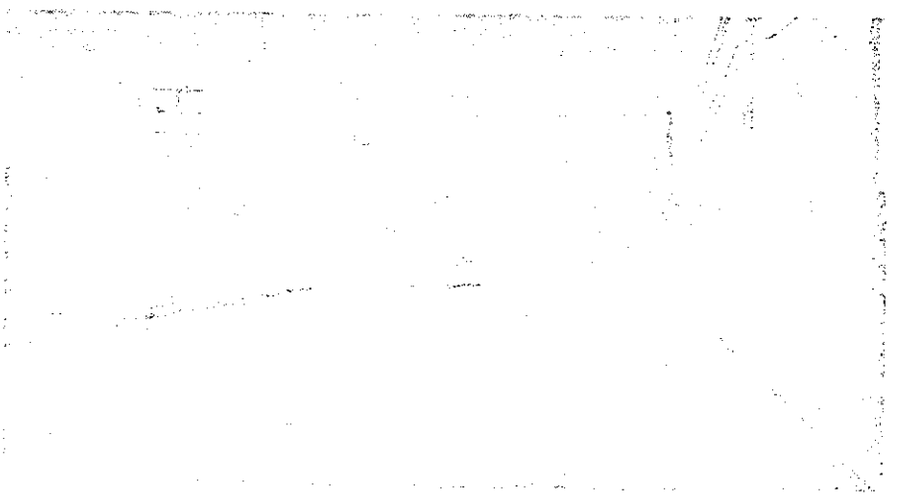
Lack Modern Equipment

There is a serious lack of modern construction equipment in the Islands. The necessity for immediate rehabilitation of 85% of the highway system makes hand-labor methods totally inadequate.

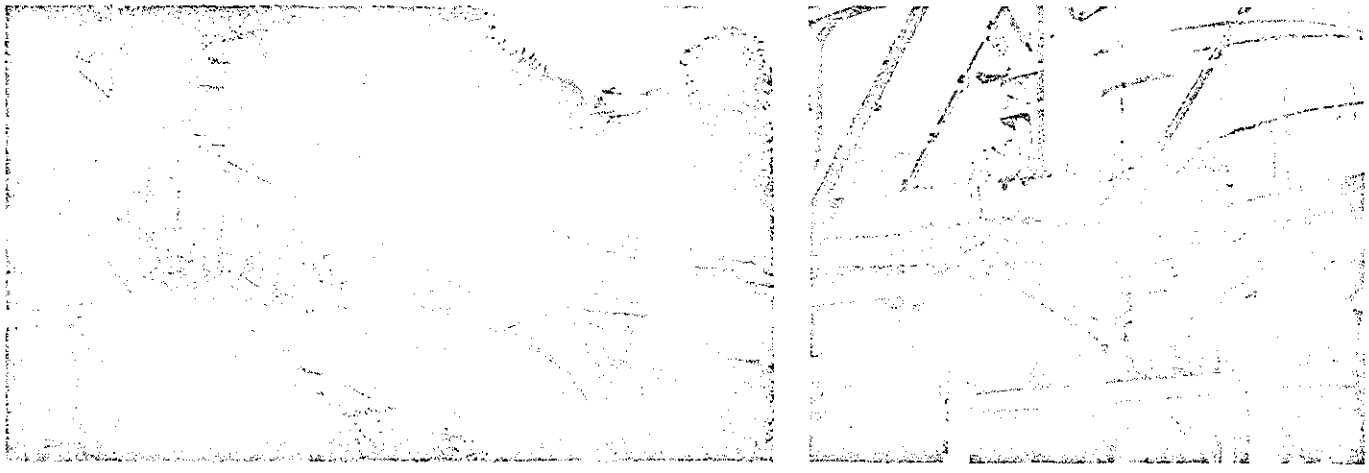
It was believed that ample equipment could be acquired from war-surplus stocks stored in large quantities in various depots throughout the Islands. Equipment obtained from that source has been useful in starting work, but the supply is not as large as had been expected. Much of the available equipment was specially designed for army use and not well adapted for peace-time use where economy of operation is a major factor. Too, much of the available equipment was not in operating condition, due to wear, deterioration and lack of proper protection and care. Repair parts have been hard to get, and many units have been discarded for lack of repairs.

In order to expedite the work, a pool of essential equipment has been established. This pool has been stocked

★ Completed six-lane concrete pavement. This pavement was placed using 14-S mixers and hand-batching and finishing in the absence of any concrete paving equipment



★ Santa Mesa Boulevard in Manila, showing one roadway of the divided roadway section completed and the fine-grading for the other side under way



★ (Left): Wrecked steel span over the Agus river at Dansalan, Mindanao Island. (Right): Temporary, makeshift repairs were resorted to in order to open the roads to traffic

with units obtained from surplus stock and with new machinery purchased in the United States. Contractors are allowed to draw upon this equipment pool, on a rental basis, to supplement their supply of road-building machinery.

While war has done much to bring new skills and new trades to workmen in the Islands, the changeover from hand labor to mechanized methods cannot be accomplished overnight. Operators have to be trained.

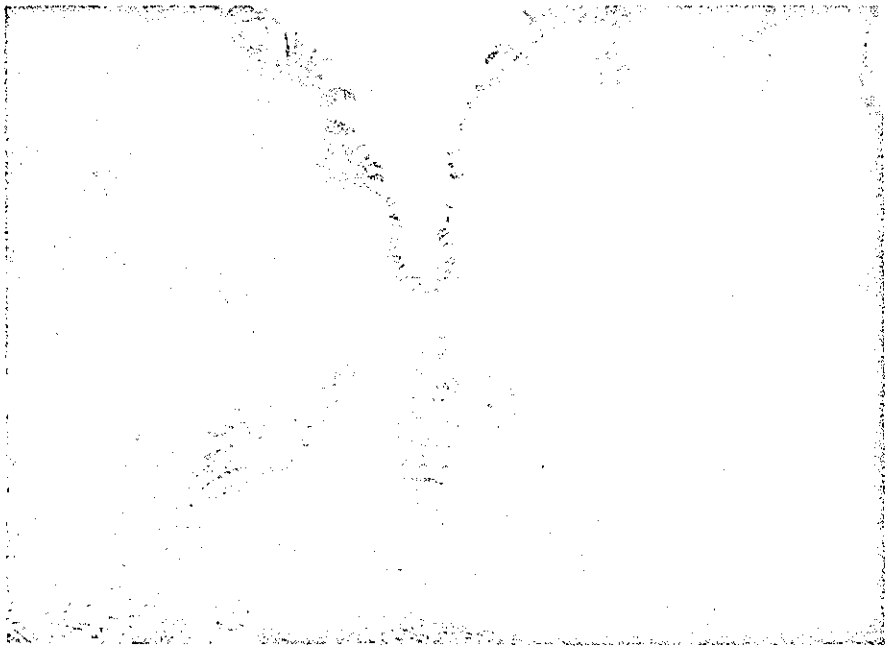
Bridge Projects Standardized

The scarcity of materials, particularly steel, has delayed the bridge reconstruction program. In the early stages of the program steel suppliers talked in terms of 12 to 18 months delivery, and then only at prices current at the time of actual delivery. Naturally contractors were hesitant about bidding under those conditions.

Three methods have been adopted to improve the situation: (1) Wherever possible, reinforced concrete design has been favored over structural steel, even though it may be more costly. (2) In order to simplify fabrication, a few standard span lengths and designs have been adopted. Every effort is made to use standard unit lengths wherever possible. (3) A supply of reinforcing steel has been obtained and stocked. This is distributed to contractors as needed, so that they will not be forced to negotiate for firm prices and definite delivery dates each time before submitting bids.

Gravel, sand and crushed stone are available but modern methods of producing them in adequate quantities are lacking in most localities. A gravel plant and a rock quarry have been obtained as complete operating units and are producing material for use in the Manila area. Local quarries are being opened up on a commercial basis, and the aggregate supply is rapidly increasing, but it will be necessary to obtain additional portable crushing and screening units for use in outlying provinces if highway construction is to progress as it should.

Despite all these handicaps a fair start has been made on the actual accomplishment of the rehabilitation work. By the end of 1947 almost all the projects included in the first year's program were either completed, under construction, or had been advertised for contract.



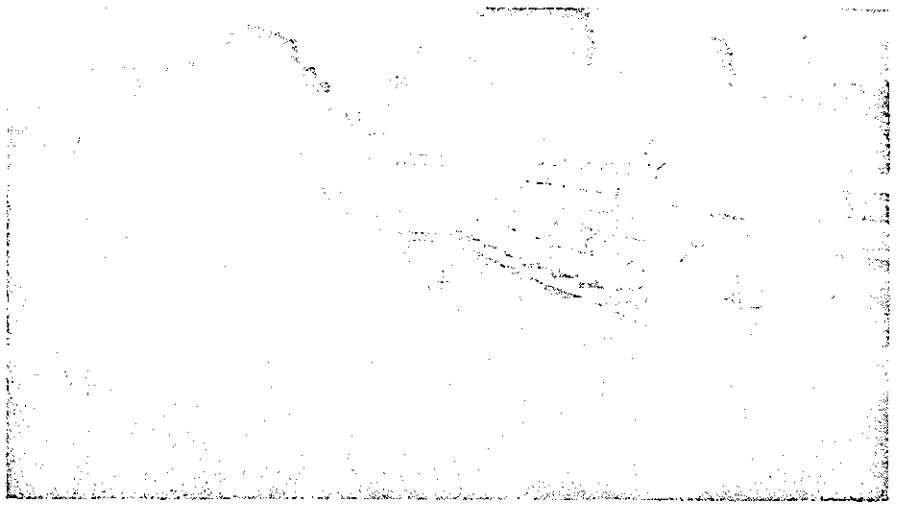
★ Provincial road in Mindanao showing the cumulative effect of neglected maintenance and heavy Army traffic on a lightly-graveled road

Two Typical Projects

Typical of the work accomplished are two projects which involved the reconstruction of portions of two main thoroughfares entering Manila from the northeast. These are Quezon Boulevard and Santa Mesa Boulevard. Both had been partially completed before the war. The proposed reconstruction followed practically the same design as had been used in the initial construction.

Plans for these projects were started early in 1947 by the city engineer's office, working in cooperation with a PRA representative. As the highway was to be of the latest modern design and of a somewhat different nature than had formerly been built in the Islands, a public roads engineer was detailed to work with the local designers and to lend technical assistance needed in preparing the plans and specifications.

Contracts were awarded in 1947 to two local contractors. The Quezon Boulevard improvement is 1.4 miles in length and the Santa Mesa project is 0.5 mile long. The plans of construction and design for the two projects were practically the same. In order to preserve the existing base



★ River crossing on the road north of Manila, showing the wrecked concrete abutment of the original structure and an Army-built Bailey span which provides temporary traffic service

and gravel surfacing as a foundation for the new concrete pavement, grades were laid to conform to the old surface.

The design called for a 6-lane divided concrete highway with curb and gutter and bituminous sidewalks on each side of the roadway. The concrete surface in each lane is 39 ft. wide between curbs, and the roadway is divided by an earth-filled median strip 8 ft. wide. The concrete surface is 7 in. thick and unreinforced. Three-quarter-inch expansion joints were specified at 200 ft., and weakened plane or "dummy joints" were introduced at 66-ft. spacing. The 36-ft. width is divided into two 11.5-ft. and one 13-ft. strips by longitudinal construction joints. Half-inch round tie bars were placed at one-meter intervals across the longitudinal joints; ¾-in. load transfer bars were used at expansion joints.

Future municipal plans contemplate the placing of gas, water and telephone lines underground outside the roadway limits and within the sidewalk area. For this reason bituminous sidewalks were specified on each side of the roadway to serve until the utilities are installed. Permanent concrete walks, 6.5 ft. wide, will then be constructed.

Pavement Design

Unit prices in the preliminary estimate were based on prevailing labor rates and costs of materials used by the city engineer's office on repair work under way in Manila. Since there had been no contract work before this in the postwar period from which to derive construction costs, and since material costs and labor rates were decidedly higher than in prewar years, the preliminary estimate of cost was largely a matter of guesswork.

The Santa Mesa project was the first let to contract. The low bid was $370,098. This was considered reasonable and was accepted. Unit quantities and bid prices of major items were as follows:

Item	Quantities	Estimated Unit Price	Contract Bid Price
Preparation of base	77,030 sq. yd.	$0.40	$0.213
Curb and gutter	29,207 lin. ft.	3.25	4.08
Asphalt paving	20,690 sq. yd.	1.55	1.75
Concrete pavement	55,064 sq. yd.	4.00	3.49

Bid prices obtained on the Quezon Boulevard project were comparable to these.

The projects were laid out and supervised by engineers from the Highway Division of the Philippine Bureau of Public Works, with technical assistance from the Public Roads Administration. Specifications for the work followed those in effect on similar work in the United States, using AASHO and Public Roads FP-41 standards as guides.

At the time work was started, paving forms, curb and gutter forms, and similar items for the specified design were not available, and had to be made on the project from local materials. Modern batching plants, pavers and finishing machines were lacking. Consequently, a large portion of the work had to be done by hand labor. A few motor graders, rollers and scrapers were used in the grading and preparation of the base. Aggregate production, batching, mixing and finishing were practically all done without the benefit of modern equipment.

A screening plant had been procured from the U. S. Army and was utilized to the limit of its capacity in the production of concrete aggregate. This supply had to be supplemented by material obtained from river deposits, which were shoveled, screened, washed and loaded by hand. Several 14-S concrete mixers were used for mixing the concrete. These were charged by hand by means of wheelbarrows loaded from stock piles of aggregate placed along the grade. All placing, striking off, and finishing of the concrete were hand operations, and tools used for this work were made on the project.

Because of the lack of modern plants and experience in this type of construction, problems of control were always arising. It was difficult to obtain uniform aggregate gradation, the operators and finishers consistently urged wetter mixes to facilitate placing, and the finishing had to be checked continually to avoid irregularities in the surface.

Since these projects were completed, a central batching plant, concrete paver, and finishing machines have been obtained by the Public Roads Administration and placed in the equipment pool to be available for use on other projects. At least two complete plants have been ordered by local contractors, and difficulties encountered on these first projects will be avoided on subsequent work.

These projects were the first major postwar highway construction in the Philippines, and were undertaken under difficult conditions. They demonstrate the transition that is occurring in highway construction methods in this part of the world. They have shown that modern equipment and efficient processing plants are essential in speeding up the program of reconstruction and thereby hastening the economic recovery of the Philippines.

By bringing their skill and their experience in modern construction methods to aid in the rehabilitation program, American contractors could be of great service to a grateful and friendly nation. Their participation is needed and would be welcomed by both the Philippine Bureau of Public Works and the Public Roads Administration.

A measure authorizing building of a toll road in Kentucky as one link in an ambitious Chicago-Miami toll road network has died in adjournment of the Kentucky Legislature.