

# Planning for the Future

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•LONG BEFORE the Illinois Tollway was opened for traffic, plans were formulated for the organization of the Maintenance Division with its necessary personnel and equipment. It was organized so that it would be workable and could be efficiently operated at the lowest cost per unit of activity commensurate with established expressway maintenance standards. After 4½ yr of operation, this planning has proved to be basically sound. The planning for this operation started with a study of the maintenance operation of existing toll facilities and of the maintenance organizations of the surrounding States. From these observations, an organization that best suited operations under conditions in the area near Lake Michigan was planned.

The equipment and personnel for roadway maintenance were based on the winter requirements. For the first 2 yr of operation this type of planning proved adequate to carry out summer activities. After the second year of operation, temporary summer help had to be employed to maintain the trees and shrubs around the buildings and interchanges and to assist in the guardrail painting program. A list was also made of men available for call-out duty during a severe winter storm period. Other than these additions and minor changes, the initial organization has remained.

## Divisions and Sections

The Tollway, for maintenance purposes, was divided into three Divisions. The Divisions consist of various sections as follows: Division I, Sections 1, 2 and 8; Division II, Sections 3 and 4; and Division III, Sections 5, 6 and 7. Each Division was headed by a supervisor and each section by a foreman. The roster at each section building varies with the number of trucks assigned to that section and an additional number at the three division garages. The Maintenance Division includes personnel engaged in building maintenance, lighting, communications, toll collection equipment, and automotive and equipment maintenance.

## Personnel

Assigned to duties at each of the three Division Headquarters are one electrician for roadway lighting, one electrician for building lighting, one tradesman for building maintenance, and one grader operator for section grading. Each of the eight sections is assigned personnel depending on the amount of anticipated work. Number of personnel and the size of each section are given in Table 1. Additional personnel serving the entire facility for specialized duties are one water and sewage technician, one carpenter, one welder, one stand-by generator and heating specialist, and one gradall operator. Sign erection and their maintenance are under the direction of the Traffic Engineer. The personnel engaged in this activity consists of one foreman, one shop man and six men in the field.

Each of the eight maintenance sections has its own building located approximately midway in the section. This central location eliminates the need for auxiliary stockpiles of chemicals, abrasives and loading equipment located at a distance from the building. In most cases the section buildings and storage yards are located within an interchange which enables vehicle movement in either direction without crossing the median.

TABLE 1  
DESCRIPTION OF SECTIONS

Section	Length (mi)	Main Line Lane Mi	Lane Mi With Ramps	Service Area Restaurant	Personnel (no.)
1	23.28	93.12	102.93	No	13
2	21.80	114.50	126.00	Yes	16 <sup>a</sup>
3	25.52	120.75	132.98	No	16 <sup>a</sup>
4	20.90	95.16	102.53	Yes	15
5	20.36	81.46	86.55	Yes	12
6	30.67	122.68	130.93	No	14 <sup>a</sup>
7	22.44	89.76	93.82	Yes	12
8	22.85	91.40	98.90	No	11

<sup>a</sup>Three workers assigned to manning the building on a 24-hr basis.

## ACTIVITIES

A very close schedule of activities must be adhered to so as to accomplish all necessary seasonal work with available man power.

### Pavement

Probably of greatest importance in the preservation of the highway is the constant maintenance of the 7,250,000 sq yd of concrete pavement that make up the driving lanes, bridge decks and ramps.

This includes the mudjacking of depressed areas, filling of joints and cracks, and re-pairing scaled bridge decks. Mudjacking is the operation of drilling holes at predetermined locations in a depressed slab area and introducing a slurry of cement, limestone and fly ash under pressure to fill the void and raise the slab up to its original elevation. This operation is time consuming and, due to the erratic movement of the slab, it is sometimes necessary to pump the area at intervals of 1 or 2 wk until the desired result is obtained. Unfortunately, this jacking, especially at bridge approaches, has exceeded original planning by approximately 100 percent.

Transverse and longitudinal joint filling consists of routing out the joint-filling material and applying, under pressure, a rubber-based asphalt sealer. This sealing material must withstand pavement contraction and expansion throughout the range of annual temperatures. The prevention of the infiltration of surface water, especially during the winter and spring months, is of prime importance to forestall the entrapment of water under the slab which may eventually cause very destructive slab pumping. The granular subbase under the pavement slab is designed to prevent this type of failure. Initially, it was anticipated that the joint-filling materials would need replacement after 3 yr. At least 95 percent is still in excellent condition after 5 yr. The longitudinal separation that has developed between the concrete slab and bituminous shoulder is due to heaving and settling of the shoulder during the first few seasons following construction. Several materials have been tested to fill this separation and hot poured asphalt containing a mineral filler is presently being used. This particular activity was not in the original planning.

The bituminous shoulders have stood up very well, except in some small areas where water was trapped in the subsurface. These areas have been drained with the installation of a short piece of 6-in. perforated corrugated metal pipe or with the placing of aggregate to act as a french drain. A shoulder-sealing program has been started chiefly to liven up the top surface.

### Bridge Structures

Bridge structure maintenance, other than sweeping, scupper drain cleaning and damage repair, was an activity that was thought would need very little attention for the first 5 yr. Repainting the structural steel members was to be done after 8 yr of weathering. This forecast was approximately 95 percent correct. Five percent of the bridge decks have developed scaling. Unfortunately, one that has required the most repairing is the "Mile Long Bridge," a twin structure 5,000 ft long. Patching and resurfacing has been done by use of epoxy resin for smaller areas, pneumatically placed concrete, and asphalt. Before resurfacing with the latter an epoxy resin coating is laid down to act as a moisture barrier between the old concrete and the overlay. Deck surfaces, in the future, will give more concern than originally contemplated. The repair of steel expansion devices has been necessary from the time the highway was opened.

### Guardrail

Painting the guardrail, approximately 700,000 lin ft, is a considerable task and expense. Original plans indicated a painting every 4 yr. This schedule has been cut

to every other year so that there would be a minimum amount of preparation. The longer period necessitates a full-scale cleaning to remove accumulated rust and corrosion. Much time was spent in experimenting with rust-inhibiting paint formulas to eliminate the time-consuming application of a prime coat.

Each of the three Divisions has a paint crew consisting of one permanent employee and two temporary summer employees. Each crew with a spray gun unit will average 1,500 lin ft of rail painting per 8-hr day for both sides and up to 2,500 lin ft for front side only.

A factory-coated galvanized beam has been placed at various locations to study its weathering capacity. Perhaps in the future it may prove economical to galvanize the present rail to eliminate the need for painting.

Experimental use of a custom-built guardrail maintainer which washes, scales, and paints the rail, has shown possibilities, especially for use on the front side.

During the past 2 yr, the approach ends on the installation have been buried to minimize fatalities and serious injuries when struck head-on at high speeds. To date, this has succeeded.

#### Erosion Control

From past experience, it was realized that it would take 3 to 5 yr after the project was completed to stabilize the cut and embankment slopes and to obtain a permanent turf cover. Marked progress has been made during the past four seasons in stabilizing the slopes, although there are a few critical spots that will require continued attention. Several methods have been used to correct the drainage situation, which in most cases is the basic requirement for eliminating erosion. The methods used have included the placing of a diversion ditch along the top of cut slopes, the installation of perforated metal pipe to pick up groundwater pockets, the placing of a stone blanket to act as a french drain, and the use of a curb along the edge of the shoulder to confine water to inlets from which pipes lead the water down the slopes.

A priority has been established to concentrate efforts on those eroded areas where the pavement foundation might be affected due to construction in the drainage ditches. The original target date for the stabilization of all slopes has been lengthened a couple of years due to more pressing projects.

#### Mowing and Turf Cover

One of the problems in highway maintenance is to keep a good cover of attractive vegetation along the roadside without letting this vegetation interfere with sight distance or result in a prohibitive labor budget. Complete control of vegetation, therefore, means having the kind of growth desired where it is wanted and eliminating it elsewhere. The aim is to produce good turf cover along the Tollway and to keep out weeds that are unsightly or designated as "noxious" by State law.

It may be desirable to eliminate vegetation entirely in places where this can be done without risk of erosion, such as around sign posts, culvert headwalls, delineators and guardrail. Vegetation may shield or hide these objects, and it takes many man-hours to keep them clear throughout the growing season by hand cutting. Aluminum and rubber grass guards have been used around delineator posts to eliminate slow close-up mowing. Total grassed area is about 4,500 acres. On the average the median will be mowed 4 or 5 times annually and the remainder of the right-of-way from fence to fence once only.

At the present time, mowing equipment includes 16 large tractors equipped with hammerknife mowers that will mow a 12-ft swath; 5 large tractors mounted on high flotation tires to mow slopes; 32 self-propelled Gravely rotary mowers, 8 of which are equipped with sickle bar attachments (These mowers are used to mow under and behind guardrail, along the shoulder between delineator posts and those areas inaccessible to our tractor driven mowers.); and 16 hand-propelled 18-in. hammerknife mowers to mow around the delineator posts of which there are approximately 20,000. Five pull-type reel gang mower units are used to mow the median and interchange areas. This mower was not practical to use for the first year or two of operation due to surface irregularities that usually disappear after the vegetation becomes more dense.

One large tractor pulling a 7-gang unit reel-type mower will mow 6 to 8 mi of 40-ft median in 1 day. A Gravelly mower or small hammerknife mower on an average day will cut vegetation behind and under guardrail for a distance of approximately 1 mi and these units will mow around approximately 180 delineators in an 8-hr day.

Assuming that there are 26 delineators per mile on one edge yielding a total of 104 per mi for a divided dual-lane highway, the cost of mowing around delineators is estimated as follows:

1. Mowing with Gravelly mower—\$0.10 each or \$10.40 per mile for each separate mowing;
2. Spraying a soil sterilant—\$0.15 each or \$15.60 per mile;
3. Rubber matting "grass guard"—\$2.60 each with a life expectancy of 8 yr or total cost of \$33.80 yearly per mi; and
4. Aluminum "grass guard"—\$0.30 each with a life expectancy of 3 yr or total cost of \$10.40 yearly per mi.

The use of a soil sterilant eliminates vegetation but leaves a ragged pattern around each post. Spraying would have to be done annually. Mowing by machine leaves a neat appearance and the 30-in. strip adjacent to the shoulder is also cut which is not reflected in the preceding cost.

#### Automotive and Roadway Equipment Maintenance

There are 21 men engaged in automotive and roadway equipment maintenance. These include the master mechanic, clerk and automotive parts clerk, 15 skilled mechanics, car washer, lubrication man and a janitor. Each of the eight section buildings has the services of a skilled mechanic with the rest of the personnel stationed at the central shop under the jurisdiction of the master mechanic. A recent addition to this section has been a roadway equipment supervisor.

The maintenance and operation of the many different pieces of automotive and roadway equipment is under the jurisdiction of the Maintenance Division. Having this operation within the Maintenance Division eliminates much duplication, especially in the field, as the roadway section clerk also keeps the records for the automotive activity.

A rigorous inspection and preventive maintenance program is an essential element of equipment management. The equipment supervisor makes routine visits to each section to determine the progress of the preventive maintenance program and offers suggestions on solving mechanical problems. After these visits, the equipment supervisor reports back to the maintenance engineer with any suggestions that he may have to improve the operation. Check sheets have been prepared for the major pieces of equipment to control the program, which is supervised by the section foreman. The technical problems in the field are administered by the roadway equipment supervisor through the section foreman and the section mechanics. Minor repairs and routine inspection are done at each of the eight maintenance buildings. Major repairs are effected in the central shop, where they are supervised by the master mechanic.

#### **EQUIPMENT**

The winter roadway equipment requisites, based on that number of trucks sufficient to spread chemicals and/or abrasives on all the mainline and ramps within 1 hr, served as the pattern. The basic equipment for each section includes two 4-wheel drive trucks of 32,000 GVW capacity equipped with a 7-cu yd hopper, under body blade, and right-hand discharge plow, with one equipped also with a right-hand wing. The other two basic units are trucks with 26,000 GVW capacity equipped with a power reversible plow and a 7-cu yd hopper body. These hopper bodies are interchangeable with a dump box for summer use. The number of 22,000 GVW trucks placed in each section was predicated on the number of interchanges within that section and total 37 for the eight sections. This type of truck has a dump box with a hydraulically operated tailgate spinner-type spreader and reversible snow plow. It is a minor task to remove the spreader, install the conventional tailgate, and have this truck available to do other

maintenance hauling jobs. Other equipment includes pickup and utility trucks, front end loaders, belt conveyors and compressors.

Originally it was thought that the small pickup trucks would be replaced after 4 yr use. This has been changed to 3-yr use, principally because of the rust and corrosion of the bodies. A newer method of undercoating is now being used which it is hoped will lengthen the usable life of these trucks. The larger trucks apparently will be useful for a longer period than anticipated because of a comprehensive preventative maintenance schedule adhered to from the date of purchase. The schedule of truck replacement is now as follows: pickup trucks, 4 yr; 21,000 GVW trucks, 6 yr; 26,000 GVW trucks, 8 yr; and 32,000 GVW trucks, 10 yr.

Police patrol vehicle purchases have gone through a transition from light- to medium- to heavyweight. The light- and mediumweight vehicles were being traded in after 60,000 to 70,000 mi. During the past 18 mo, purchases have been in the heavier field (122-in. wheel base). These cars have been driven over 100,000 mi each. The cost of operation per mile, taking into consideration the depreciation and trade-in value, will be no greater than for the light vehicles.

#### BUILDING AND EXTERIOR LIGHTING

There are 40 buildings on the Illinois Tollway: 8 maintenance buildings, 15 plaza control buildings, 15 service areas, an administration building and a central shop. In addition to the complex electronic equipment of the communications and toll collection systems housed in many of these buildings, there is a large investment in standard mechanical and electrical equipment, including power supply, heating, air conditioning, and emergency generators. The emphasis in the maintenance of such equipment is to preserve good-operating condition rather than to wait until trouble develops. A checklist of preventive measures has been prepared for the use of the building maintenance personnel.

The ten service station buildings and the five restaurant buildings located in the five service areas are maintained under agreement with the Standard Oil Company by resident maintenance men and by contract maintenance. Standard Oil furnishes the supervision. The Commission shares the cost of the resident personnel and bears the entire expense of contract maintenance and replacement parts. Presently a study is being made by the Commission to determine the feasibility of maintaining these buildings with Commission personnel.

All of the Commission buildings and roadway lighting before 1963 were under the direct supervision of the building maintenance engineer. He had, under his direction, a complement of 12 skilled men. After April 1, 1963 the over-all supervision of the buildings and the 3,900 roadway light standards remained with the building maintenance engineer, but the direct supervision of the personnel engaged in their maintenance was given to the roadway section foremen to obtain closer supervision. The number of persons engaged in this function has remained the same. During the original planning stages for the operation of the roadway, it was estimated that at least twice as many persons would be required to effect this maintenance, exclusive of the service areas.

Although the number of personnel and the amount of equipment have remained relatively constant since the first full year of operation, the amount spent for maintenance has risen appreciably. The Engineering Department budget for the past 5 yr is as follows:

1959	\$1,944,000
1960	2,202,000
1961	2,550,000
1962	2,625,000
1963	2,624,000

The figures for 1962 and 1963 seem to indicate that the commitments for the maintenance of the facility will be leveling off. This is not true because within the next year or two additional funds will be required for equipment replacement, structure painting, concrete surface repairs and other commitments that have not been necessary in the early years of operation.