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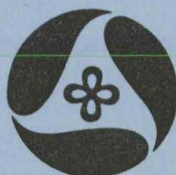
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**Iowa's Experience  
With  
Contract Maintenance**

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**Prepared By:  
Dwight M. Rorholm  
Maintenance Operations Engineer  
Office of Maintenance  
Highway Division**

**Telephone 515-239-1197**



**Iowa Department  
of Transportation**



## IOWA'S HIGHWAY SYSTEM

As of January 1, 1981, there were 112,000 miles of roads and streets in the state of Iowa. Despite being 25th in land area, Iowa has the 7th largest rural road system in the nation.

The jurisdictional responsibility for Iowa's 112,000 miles of roads is vested in the Iowa DOT, 99 counties and 956 municipalities. The Iowa DOT currently maintains about 10,000 miles, the counties 90,000 miles, and the municipalities 12,000 miles.

The condition of these systems is at a critical decision point. Many of the primary roads and bridges have outlived their design life and are severely limited in serving current volumes of automobile and truck traffic. Many pavement and bridge structures are nearing the point of complete failure and must be replaced in order to continue to provide for Iowa's minimum traffic service demands.

### The Physical Condition of the Primary Road System.

- 3,000 miles of pre-1940 pavement remains in service.
- Pavement replacement is only being accomplished at 1/4 of the recommended rate.
- The average pavement age is 36 years, compared to a design life of 20 years.
- 1/3 of the major non-Interstate miles are in need of rehabilitation.
- 125 bridges are embargoed.
- Over 1/4 of the 4,000 bridges are over 40 years old.
- Over 600 of the bridges will be 50 years old in 1990 at the current rate of replacement.
- Pavement preservation is the only feasible alternative under current funding.



## MAINTENANCE RESPONSIBILITIES AND RESOURCES

The Department is responsible for the maintenance of the entire primary road system and state parks and institutional roads, a total of 24,413 lane miles. An inventory of some of the more significant features included for maintenance is shown in Table 1. The budgeted resources available for fiscal year 1985 to accomplish the maintenance program are shown in Table 2.

TABLE 1

HIGHWAY FEATURE INVENTORY (March, 1984)	
Highways (centerline miles)	10,432
Pavement (lane miles)	24,413
Shoulders (miles)	22,757
Ditch (miles)	19,640
Signs (number)	396,710
Culverts (number)	96,365
Bridges (number)	3,666
Guardrail (lineal feet)	2,247,280
Luminaires (number)	8,923



TABLE 2  
RESOURCES

Fiscal Year 1985

Maintenance Actual Work Program Budget - \$65.0 Million

Labor - \$35.0 Million

Materials - \$17.9 Million

Equipment - \$11.2 Million

Personnel

Number of authorized employees - 1659

Number of actual supervisors and administrative - 271

Numbers of actual mechanics and helpers - 148

Number of actual equipment operators - 1217

Equipment - number of major items

Trucks - 1048

Motorgraders - 100

Wheel tractors - 435

Rotary snowplows - 19

Draglines - hydroscoops - 26

Total maintenance fleet of self propelled equipment - 2456

A maintenance management system was developed and has been in use since 1975 to provide field supervisors sufficient data to help manage operations. The system provides for budget preparation based on features maintained, planning and scheduling work for a short range and long range basis. We can also provide cost feedback information and accomplishment rates for monitoring purposes.

Department priorities for the allocation of manpower, equipment and funds are generally allocated based on service level priorities, A-D, (A being the highest priority level).



## CONTRACT MAINTENANCE

Contract maintenance includes all highway maintenance activities which a contractor or another public agency is paid to accomplish. This includes projects let through the bidding process to contractors as well as negotiated contracts with cities, counties and institutions for routine maintenance work on roads for which the state is responsible. Contract work has increased significantly over the past few years as priorities have shifted from highway construction to system preservation. Contract maintenance is divided into two categories: general contract maintenance and functional contract maintenance.

### GENERAL CONTRACT MAINTENANCE

Section 17 of Senate File 561, 69th General Assembly stated the "feasibility of contracting with road contractors for highway maintenance services" should be evaluated. The following summarizes the Iowa Department of Transportation's experience with general contract maintenance.

General contract maintenance is defined for the purposes of this report as overall maintenance performed on a designated section(s) of highway for an extended period of time. General contract maintenance, therefore, includes a large variable workload with numerous types of material and work requirements.

In the past it was assumed contracting general maintenance to private contractors would be more difficult and costly than performing it "in house". This assumption was based in part on a lack of experience and on the premise general maintenance operations must be under the direct control of the agency in order to respond to emergencies such as snowstorms, accidents, pavement blowups, signing problems, etc. Moreover, experience gathered in other states indicated the administrative performance and response problems would offset any economic advantages. This experience also indicated general contract maintenance, although feasible under certain conditions was not cost effective.



Due to declining work available for highway contractors and suppliers, and the Department's need to continually evaluate its operations and performance, studies were initiated to examine the potential for general contract maintenance programs in Iowa. The first meeting with representatives of the construction industry regarding general contract maintenance was held July 14, 1981. At that time the total maintenance spectrum was reviewed and it was mutually agreed bids would be solicited for general contract maintenance of pavements, shoulders, roadsides, drainage facilities and bridges. It was also agreed the Department would retain the responsibility for performing traffic services, snow and ice control operations and emergency responses.

This division of responsibility was determined after contractors advised they would not be capable of acquiring necessary equipment and expertise in some specialized areas. Also, capital requirements, interest rates and performance risks precluded them from undertaking all of the general maintenance work items and responsibilities.

After receiving contractors' comments, the Department's staff developed specifications for six projects around the state. Bids were received and analyzed on the basis of records for similar type work accomplished by the department's maintenance forces. Since the contractors, in many cases, were unable to fully evaluate the costs associated with doing a specific type of maintenance work, the bids were analyzed on an overall basis. Factors considered in determining acceptable bids included direct cost data, department overhead, contractor overhead, interest rates and profit. Competitive bids on four of these six project were accepted for the routine contract maintenance study. All projects were scheduled to begin operations in early 1982 and to terminate at the end of the fiscal year 1983. The specifications, contractor performance, and economic advantages and disadvantages were evaluated throughout the course of the contract.

Due to the special nature of the work and the desire to encourage small contractors with limited resources to participate in bidding, the specifications included both descriptive direction and end result concepts. Provisions were also included for mobilization payments. These efforts were not successful since only large, well established contractors bid the work.



Small contractors may not have been interested due to the long duration of the contract periods and the relatively large dollar volumes of work. Both required significant commitments which were probably beyond the capability of very small contractors. By comparison, the functional contract maintenance program has effectively utilized and encouraged entry and development of small contracting firms.

The general maintenance contracts evaluated in this study included as many as 22 items of work. The quantity of work was estimated from maintenance work program records. In some cases this involved considerable effort by the contractor and in other cases only minimal effort was required in frequent intervals. Since this variability is inherent in maintenance operations, it is very difficult for contractors to bid on this type of work. The mileage and contract amount of each of the awarded contracts are:

<u>District</u>	<u>Mileage</u>	<u>Contract Amount</u>
3-Northwest Iowa	68.84	\$ 524,155
4-Southwest Iowa	81.14	247,911
5-Southeast Iowa	58.07	314,728
6-Eastern Iowa	99.76	664,160

#### EVALUATION OF GENERAL CONTRACT MAINTENANCE

Contractors cost of performing the general contract maintenance range from 151% to 186% of the cost for which the Iowa Department of Transportation could have performed identical tasks. For the program as a whole, the contractor cost was 167.01%.



CONTRACTOR COST VS. DOT COST

<u>District</u>	<u>Cost of Contract (B)</u>	<u>Cost if DOT had performed the work (C)</u>	<u>Contract Cost DOT Cost</u>
3	\$ 425,209.02	\$ 236,606.92	179.71%
4	168,521.51	90,447.94	186.32%
5	183,578.22	110,068.23	166.79%
6	<u>448,545.79</u>	<u>296,897.78</u>	<u>151.08%</u>
Total	225,854.50	734,020.87	167.01%

NOTES:

- (A) All of the functions were not included in the cost comparison due to a difference in quantity measurements. These figures are summations of those functions that could be compared.
- (B) Includes the DOT's cost of administration in addition to contractor payments.
- (C) The DOT estimated cost was determined by multiplying the quantity used by the unit cost of each function in each district.
- (D) The formulas used to calculate the total cost of the contractors and the DOT are as follows:
- (1) TOTAL COST CONTRACTOR = Actual amounts paid on each function + DOT administration cost + mobilization cost.
  - (2) TOTAL DOT COST = Actual quantity x DOT unit cost x traffic control cost for those items requiring traffic control x DOT overhead factor of 1.398.

The higher costs are probably due to uncertainty of bidding on unfamiliar items of work and the fact that the unit bids included higher labor costs, profit and interest on borrowed capital. Mowing shoulders and medians, burn/plain surfaces, and brooming and sweeping show the most dramatic



differences. Functions such as spall patching, shoulder repair with aggregates, rebuilding shoulders with earth, and bridge painting are found to have nearly equal or lesser unit costs.

In addition to the extra monetary costs involved in this program, a large number of other factors were identified. The external factors and problems were documented in the resident maintenance engineers periodic reports. The problems experienced by the resident engineers tended to be much the same in each of the four districts and included:

- o Lack of necessary equipment when needed
- o The work descriptions and functions were not always clear to the contractor
- o Lack of experienced/qualified personnel to perform some of the functions
- o Poor quality of work
- o Contractors behind schedule
- o Bases of operations were far away from maintenance areas
- o Poor communication between the contractors and their workers
- o Workers not using safety equipment and proper traffic control
- o Loss of contact with property owners

The most significant comment which was made by the contractors involved with these projects indicated they preferred routine-type, "fill-in", high production functions. It was the small, varying tasks that caused them the most difficulty.

As a result of the information gathered and analyzed the Office of Maintenance of the Iowa Department of Transportation recommends the use of general contract maintenance not be pursued further at this time. Functional contract maintenance programs should be continued and expanded in those areas which are feasible for both the contractor to perform, and in those areas which provide cost savings to the Department.

A detailed report concerning this subject was presented to the Transportation Research Board, 1984 Annual Meeting, January 16-20, 1984, in Washington, D.C.  
IOWA'S EXPERIENCE WITH GENERAL CONTRACT MAINTENANCE.



## FUNCTIONAL CONTRACT MAINTENANCE

Over the years the Department has contracted for maintenance materials and services when these items could be clearly identified for bidding purposes, or when the Department did not have the capability, equipment and staff to enable it to economically or efficiently supply the materials or perform those work functions. This type of contract work is commonly referred to as functional contract maintenance. The term functional maintenance is applied to those types of operations which are limited to a few, and in some cases single, operations. Functional contract maintenance has proven to be a very efficient means of accomplishing necessary maintenance work that is beyond the capability of local crews. Since contracts are developed and awarded for specific items of work, contractors perform the work with specialized equipment and trained operators. This allows the local maintenance crews to concentrate on the wide variety of smaller, and more routine maintenance activities and respond to the emergency situations that are difficult to contract and/or schedule. The contracting industry has responded very well to this program by accomplishing the required work expeditiously and economically.

The selection and prioritization of candidate projects is initiated in the field offices. The "system preservation concept" emphasizes preserving capital investments, traffic services and safety, and maintenance cost/effort containment. The central office review of the program is coordinated by the Office of Maintenance which draws on the expertise contained in the Offices of Road Design, Bridge Design, Construction, Materials and Contracts. Contract administration and inspection are handled as set forth in The Code and DOT policies which govern all construction and maintenance project work.

Funding is provided through a special cost center that is established jointly by the Highway Division and Planning Division.



## PROJECT DEVELOPMENT

Candidate projects are field reviewed by the maintenance operations engineer to:

- o Define and document the concept in detail
- o Determine the need and timing of the proposed work
- o Rate the proposed improvement with respect to other project candidates throughout the state

When these reviews have been completed, the Office of Maintenance prioritizes all project candidates on a statewide basis with respect to need and fund allocations. This information is then provided to each district along with a request to gather necessary information needed for the development of project proposals.

## CURRENT PROGRAM

The current funding allocation for the contract maintenance program provides for \$11.4 million for the maintenance of pavements and shoulders and \$2 million for bridges (bridge painting and minor repair).

Type of work currently addressed by the functional contract maintenance program consists of:

- o Rehabilitation of shoulders (granular and earth)
- o Installation of subdrains
- o Seal coat
- o Slurry seal
- o Slurry wedge (ACC shoulders)
- o Slurry crack leveling (ACC surface)
- o Other work, if found to be cost effective or beyond the capability of local crews and budgets
- o Fog Seal
- o Spot leveling
- o Crack filling with emulsion (ACC surfaces)
- o Crack and joint sealing (ACC & PCC pavements)
- o Pavement patching
- o Mowing



The Department also enters into agreements for maintenance work on segments of the primary road system within cities, on the grounds of state parks, institutions, state fairgrounds and area community colleges. The Department also enters into agreements with counties for selected sections of primary and other roads and with adjacent states for the maintenance of border bridges. These agreements cover a broad spectrum of activities ranging from snow plowing to blading of gravel roads. The agreements reflect local needs and conditions and may be adjusted each year. Supplemental agreements may be developed for special needs and unforeseen circumstances at any time. All agreements are drawn in accordance with a provision of chapter 28E and other relevant sections of the Iowa Code.

Program trends are shown in the following table:

<u>Item</u>	\$ <u>FY 1981</u>	\$ <u>FY 1982</u>	\$ <u>FY 1983</u>	\$ <u>FY 1984</u>	\$ <u>FY 1985</u>
Pavement repair & preventive maint.	5,300,000	6,800,000	7,064,000	9,187,000	8,549,000
Paved in stabilized shoulder maintenance		1,200,000	1,436,000	593,000	2,766,000
Bridge painting and repair	2,800	1,800,000	1,500,000	1,401,000	1,579,000
City maintenance agreements & misc.	262,000	502,000	500,000	567,000	614,000
<b>TOTAL</b>	<b>8,362,000</b>	<b>10,302,000</b>	<b>10,500,000</b>	<b>11,748,000</b>	<b>13,508,000</b>

The contract maintenance program is and will continue to be an important part of our maintenance program.



PRESENTATION



## **CONTRACT MAINTENANCE**

- **Two approaches**
  - **General maintenance**
  - **Functional maintenance**

## **PURPOSE**

- **Supplement efforts of local forces**
- **Preserve investment in roadway system**



**IOWA DEPARTMENT OF TRANSPORTATION  
HIGHWAY FEATURE INVENTORY**

<b>Centerline</b>	<b>Miles</b>	<b>10,432</b>
<b>Lane</b>	<b>Miles</b>	<b>24,413</b>
<b>Shoulder</b>	<b>Miles</b>	<b>22,757</b>
<b>Ditch</b>	<b>Miles</b>	<b>19,640</b>
<b>Signs</b>	<b>No.</b>	<b>396,710</b>
<b>Culverts</b>	<b>No.</b>	<b>96,365</b>
<b>Bridges</b>	<b>No.</b>	<b>3,666</b>
<b>Guardrail</b>	<b>Lin. Ft.</b>	<b>2,247,280</b>
<b>Luminaires</b>	<b>No.</b>	<b>8,923</b>

**March 1984**

**GENERAL  
CONTRACT MAINTENANCE**



## **GENERAL CONTRACT MAINTENANCE**

- **Why? 69th General Assembly identified as an interest area which should be evaluated**
- **Why? Assumed premise this would be costly and difficult may be incorrect.**

## **GENERAL CONTRACT MAINTENANCE**

- **Included**
  - **Pavement**
  - **Shoulders**
  - **Right of Way**
  - **Bridges**



- **Not Included**
  - **Traffic services**
  - **Snow and ice control**
  - **Emergency responses**

**Why?**

**Contractors advised:**

- **Lack of equipment and expertise**
- **Capitalization requirement**
- **High performance risk**

- **Six projects prepared**
- **Bid evaluation**
  - **Department direct cost**
  - **Department overhead**
  - **Contractor overhead**
  - **Interest rates and profit**
- **Four projects accepted**



<u>District</u>	<u>Mileage</u>	<u>Contract Amount</u>
3 - NW Iowa	68.8	\$524,155
4 - SW Iowa	81.1	\$247,911
5 - SE Iowa	58.1	\$314,728
6 - Eastern Iowa	99.8	\$664,160

## **RESULTS OF EVALUATION**



## CONTRACTOR COST VS. DOT COST

District	Cost of Contract*	Cost If DOT Had Performed Work	Contract/ DOT
3	\$425,209	\$236,606	180%
4	\$168,521	\$ 90,447	186%
5	\$183,578	\$110,068	167%
6	\$448,545	\$296,897	151%

\* Includes DOT administration cost

## HIGH COSTS DUE TO

- Uncertainty of bidding on unfamiliar work items
- Higher labor cost
- Profit



## **ADMINISTRATIVE PROBLEMS**

- **Lack of necessary equipment**
- **Work descriptions not clear**
- **Lack of qualified personnel**
- **Poor quality work**
- **Behind schedule**

## **Administrative Problems** (Con't)

- **Remote base of operation**
- **Communication problems between contractor and his employees**
- **Workers not using safety equipment and proper traffic control**
- **Loss of contact with property owners**



## **CONCLUSIONS**

- **General contract maintenance not cost effective**
- **Administrative problems - in-house and in contractors' operation**
- **The Department does not plan to continue this program**

## **BENEFITS**

**Discovered individual work items which would be cost-effective when let to contract**



## **FUNCTIONAL CONTRACT MAINTENANCE**

### **CONTRACT MAINTENANCE PROGRAM**

- **Functional contract work**
- **Expanded in 1980**
- **Current allocation**
  - \$11.4 million - Pavements/Shoulders**
  - 2.0 million - Bridges**
  - 0.6 million - City Agreements**



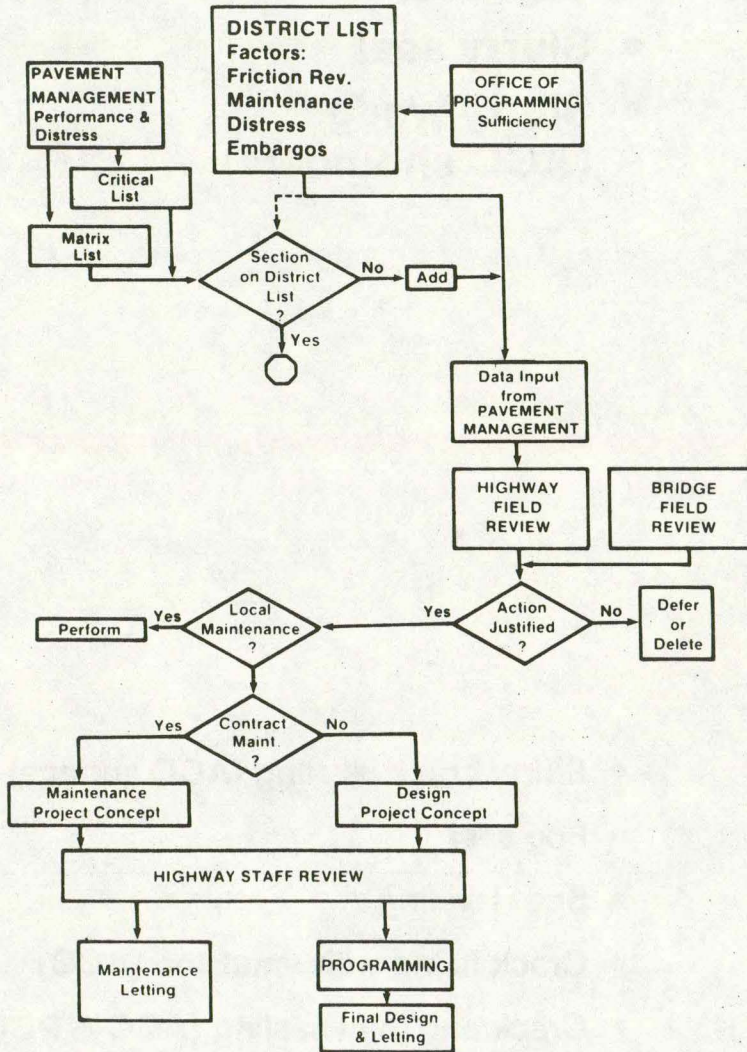
**NUMBER OF CONTRACTS LET  
IN TYPICAL YEAR**

**135 - Pavement/shoulders**

**72 - Bridges**



## System Preservation Flowchart









- **Pavement patching**
- **Mowing**
- **Other work if found to be cost-effective or beyond the capability of local crews and budgets**

- **Group related items**
- **Keep completion date at end of construction season when possible**
  - **Allows contractors to use as fill-in work**



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