AN INVENTORY OF HIGHWAYS

IN IOWA

USING THE PHOTO/FILE SYSTEM

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An Inventory of Highways in Iowa Using the Photo/File System

The development of the Photo/File system provided an additional low cost method for gathering comprehensive road information. This system was designed to assist highway administrators, planners and engineers in evaluating numerous physical features of the highway. The Photo/File data recording system provides a complete, photographic record of the roadway as seen from the driver's point of view.

A pilot study of the Photo/File system consisting of 200 miles of primary highways was undertaken in 1961. The purpose of this study was to appraise this new technique as to the potential benefits to the Iowa State Highway Commission. The results of the test study were most favorable. Many uses of this type of information were found to be a definite asset to our organization. The Federal Highway Administration participated in the original study and approved an additional Photo/File program for the remainder of the 11,000 mile primary road system. A Photo/File Library now exists which includes photographic records of Iowa's rural primary road system and its extensions. A re-inventory of this system is scheduled to provide our staff with updated photographic information. In addition, these film strips have been a valuable tool at Commission Meetings to familiarize commissioners and administrators with specific highway problems.

The amount of time and money saved as a result of using the Photo/File data recording system cannot be accurately determined since the data is of a permanent nature and used by a number of operating departments for a variety of purposes. The use of this system has eliminated numerous field examinations. It has been used many times to verify and substantiate existing information and provides a permanent comprehensive record of each roadway.

Photo/File Equipment

The Photo/File data recording system employs a truck mounted camera to provide a series of film positives at each 1/100th of a mile interval, showing the roadway and its appurtenances. The camera is mounted near the right front of the vehicle approximately 48 inches above the road surface. Each road section is driven in both directions to obtain all needed data. The recording mechanism is a power driven 16mm Bell and Howell Model 240 Camera with electronic exposure controls, and sequential timing and mileage indexing equipment. The camera shutter is actuated by use of a special electro-mechanical drive linkage unit from the transmission of the vehicle. The vehicle is operated at varying speeds up to 50 miles per hour, depending on road and traffic conditions. The camera is mounted to permit, through an intricate prism system, the inclusion of a data board shown in the lower center area of each frame of film.

The data board contains the following information:

1. Route number
2. County number
3. Date: Month - Day - Year
4. Odometer reading to 1/100 mile
5. Time of day

Each 100 foot roll of 16mm film contains a photographic record of approximately thirty-five miles of highway in one direction of travel. Approximately ten cubic feet of storage space is needed to store the 22,000 miles of highway information. The Photo/File film is catalogued by county and route for quick reference to any specific section of highway.

Black and white or color film may be viewed, projected, or reproduced in various ways. A projector such as the Kodak Analyst, which is capable of varying projection speeds, may be used to project a single frame or a continuous series of frames for viewing. Photographic enlargements have been made directly from the Photo/File Film.

A perspective grid has been designed for determining longitudinal and lateral measurements from the projected film. This grid measures 28½ inches by 21 3/4 inches and is used as a projection screen. The projector is positioned in such a manner that the projected frame corresponds in size with the perspective grid. A series of lateral lines are used to indicate measurements in ten foot intervals in front of the camera station. Another series of lines converge to a distant point and intersect

the lateral lines at two foot intervals for measurements of widths.

The perspective grid has been checked against known surface widths and bridge lengths. Measurements involving surface widths are accurate to approximately six inches provided the measurements are taken within thirty feet from the camera station. Longitudinal distances along the road are accurate to about two feet. Measurements taken from this perspective grid are most accurate when the projected road surface ahead is relatively level with no horizontal curvature. A typical perspective grid is illustrated on page 14.

Photo/File Costs

The Photo/File vehicle, a 1962 Ford Econoline van light duty truck, is owned and operated by the Iowa State Highway Commission. The current rate charged against this vehicle for operation, maintenance and depreciation is six cents per mile of travel.

An average of 100 miles per day is realistic for gathering good daylight Photo/File films in Iowa. This figure accounts for time lost due to poor weather conditions. The current cost of a 100 foot roll of 16mm Kodachrome II film is $6.95. The development cost amounts to $3.45 per 100 foot roll of color film. The following table illustrates our individual cost items concerned with the Photo/File system.

	Item	Estimated Cost
1.	Ford Econoline Van Truck	0.06
2.	Driver-Operator-(Salary)	0.25
3.	Driver-Operator-(Subsistence)	0.13
4.	Deadheading (30% of 1 thru 3)	0.13
5.	Cameras and Associated Equipment	0.08
6.	Color Film and Processing	0.30
7.	Edit, Catalogue, and Store	0.08
8.	Administrative Overhead (10% of 1 thru 7)	0.10
	Total per mile - One direction of travel	$ 1.13

Photo/File Data Uses

There are many important uses for Photo/File information to the progressive Highway Engineer and Administrator. Some of these uses are listed as follows:

USAGE OF PHOTO/FILE DATA

1. Public Hearings

Photo/File data has been shown at public hearings to point out the need for reconstruction or relocation of routes using specific illustrations. The film may be edited or shown in its entirety to illustrate conditions along the present route such as cracking and rutting, side friction created at points of access and egress, signs and signals, narrow bridges, parking conditions, safety hazards, etc. The film is also used in the preliminary planning of public hearings to familiarize the staff with problem areas.

2. Project Planning Reports

Photo/File data is used extensively in the preparation of project planning reports and project concept statements. The film is used to make a general review of an area prior to making a field trip to establish land use, to determine existing access provisions, no-passing zones, and passing restrictions, signing, side friction, pavement condition, and general driving conditions. A preview of the film gives a good indication of what will be found on the field inspection and how much time will be required to obtain the specific information that is needed. The film is used following a field trip to verify data collected in the field.

3. Sufficiency Rating Studies

Photo/File data may be used to identify pavement type, shoulder type, regulatory, warning, and guide signs; type, location, and condition of various traffic control signals, parking conditions, access, sight distance, pavement condition, and various safety hazards. It has been used to verify road section lengths and to some extent in verification of details for the five-year construction program.

Photo/File data generally cannot be used for location and evaluation of all drainage features since they are frequently located out of camera range.

It should be noted that Photo/File data is used for the supplemental verification of data used in needs studies and does not replace present methods of data collection.

4. Location of interview stations for Origin-Destination studies

Locations being considered as possible sites for interview stations for origin-destination traffic surveys can be reviewed prior to actual selection in the field. Photo/File data will show the type and extent of development existing in the area to be studied. Appropriate safety considerations can often be determined prior to actual field inspection. Like aerial photographs, the Photo/File inventory provides often-needed historical information to compare present development and existing culture with that found at the time the road section was initially photographed.

5. Road user analysis studies

Photo/File data is used regularly in road user analysis studies in conjunction with other sources of data. It has proven to be an excellent source of information pertaining to the general driving conditions found in a given area.

6. Supplemental data for official highway route log

Photo/File data has been used to verify section lengths when other sources of data were unavailable or incomplete.

7. Inventory of advertising signs along the highway network

The application of Photo/File data for use in connection with advertising sign inventory is dependent upon the availability of current film. If extensive information were desired for a specific route, it would be possible to treat that route as a special assignment and obtain current film as required.

8. Review and study design of highways and intersections

Photo/File film is used frequently in preliminary planning, pre-design, and alignment studies. It is a valuable source of data pertaining to the geometrics of specific areas and is used to determine the proximity of privately owned buildings and other structures in relation to the existing roadway.

9. Review and study pavement markings, signs, and traffic signals

Extensive use of Photo/File data is made in the determination of sign type and location as well as pavement marking and traffic signals. It has not been used to establish no-passing zones but may be used in the verification of such zones after they have been established.

10. Review field installations involving channelized intersections

Channelized intersections are reviewed by using Photo/File film in conjunction with official plans of the intersection under study.

11. Study of vehicle accident locations correlated to road geometrics

The location of vehicle accidents can be accurately determined from odometer readings on the Photo/File data board when used in conjunction with reference points such as milepost markers or other established reference points. The film is used to determine what conditions were present at the location such as sight distance, signing, and pavement marking.

12. Location of sites for radar speed studies

Extensive application of Photo/File data is made in connection with the preliminary planning for the location of sites for radar speed studies. Sight distance and safety hazards at the proposed sites are noted and evaluated prior to the establishment of the radar station.

13. Evidence in legal actions

Photo/File data has tremendous potential for use as evidence in settlement of insurance claims against the state in cases involving charges of alleged negligence. Since the camera which is used to gather Photo/File data is mounted at a height approximately eye level of a driver in a passenger car, the film therefore presents an authentic view of the roadway as it would appear from a standard automobile. Photo/File film is particularly useful in cases which involve sight distance, location and establishment of no-passing zones, signing, surface type and condition, curves, general visibility,

etc. In other words, we are able to bring the highway into the courtroom with proof of visibility as it exists at the site of the accident.

Insurance claims involving alleged negligence on the part of the state often run into hundreds of thousands of dollars and the favorable settlement of just one of these claims would justify and compensate the cost of the entire Photo/File program many times over.

It should also be noted that if current film of an accident site is not available, the Photo/File van can be sent on special assignment on short notice to any location in the state to gather a short strip of film for use in legal actions.

A somewhat different legal application may be made in cases involving suits which claim loss of business as a result of route relocation or change of access. Photo/File film, because of its permanent nature, can be used as a part of "before and after studies" to refute or substantiate such claims by providing historical data pertaining to specific locations.

14. Study of access control

Present evaluation of access control problems is made on the basis of field inspection. Current film of the area under study would be of value as a general preview of the

area prior to the field inspection and for review after the inspection has been completed.

HIGHWAY IMPROVEMENTS AS SHOWN ON PHOTO/FILE FILM

Before

After

Improvements made at the above intersection include reconstruction of the roadway, stabilized shoulder, channelization, lighting, addition of rumble strip, and reduction of sight restriction.

Before

After

Improvements noted in the above photos are reconstruction of roadway, widening of the shoulder, stabilized shoulder, reduction of grade, increased sight distance, removal of no-passing zone, removal of intake and lip curb and improved drainage.

HIGHWAY IMPROVEMENTS AS SHOWN ON PHOTO/FILE FILM

Before

After

Improvements noted above include reconstruction of roadway, increased shoulder width, removal of bridge, improved drainage.

Before

After

Changes in the above photos include reconstruction of roadway increased to four-lane capacity, and overpass which is part of a diamond interchange.

HIGHWAY IMPROVEMENTS AS SHOWN ON PHOTO/FILE FILM

Before

After

Improvements noted above include reconstruction of roadway, increased shoulder width, full width bridge, removal of curb and intake, addition of guardrail on bridge approach, no-passing sign in addition to paint strip, addition of lighting at intersection and improved drainage from the hill in the background.

The above photos were taken at different locations on the same highway in the fall of 1970. Note the legibility of signs in foreground, storage lanes, pavement markings, median strip, shoulder width, guardrail, etc.

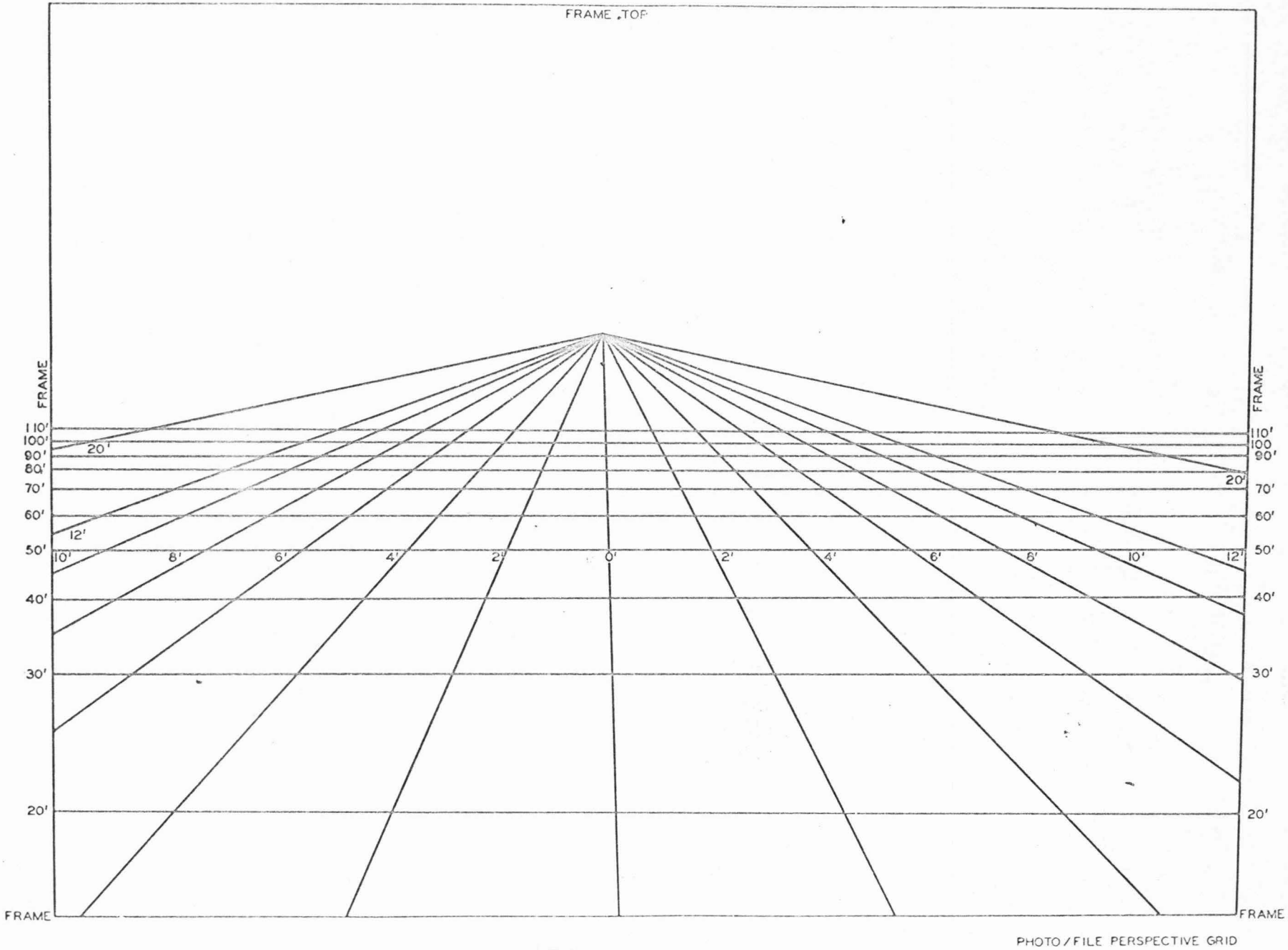

PHOTO / FILE PERSPECTIVE GRID