

PHOTOGRAPHIC INVENTORY

R. M. Hearst

Each summer for the past 5 years the British Columbia Department of Highways has been making a photographic inventory of the highway system. Total coverage is approximately 6,000 miles per year, which includes about 5,000 miles of major roads repeated each year in alternate directions and a gradually expanding coverage of secondary roads.

PHOTOGRAPHIC OPERATIONS

A 16-mm custom modified camera is set in an instrument package mounted through the roof of a van. The 10-mm (53-deg field of view) lens is pointed straight ahead and very slightly down to give good coverage of the road. The upper one-fifth of the picture frame (full width) shows the instruments through mirrors. These include date, time, and location information; odometer (with manual reset); ball bank indicator; 2 roughness meters, one for each frame interval and another for 1,000-ft sections; altimeter (reading to 10-ft elevation); speedometer; and various indicator lights.

A driver-operator loads the film, resets initial information, and controls the picture interval. Photography is automatic, with odometer drive actuation and electronic controls of interval, aperture, and flash lighting. After standard mail processing, the Kodachrome II film is edited and indexed for retrieval (5 min) and projection on a flickerless analyst projector with continuously variable speeds, forward and reverse.

ROUGHNESS METERS

The roughness meters display the amount of differential movement between the rear axle and the van body according to the following formula:

$$\text{Reading} = \log \left\{ \frac{5,280}{\text{interval in feet}} \left[\sum \text{absolute } (f_i n_i)_{i=1, 8} \right] \right\}$$

where i is the sensor number 1, 2, ... 8 for axle movement sensors set $\frac{1}{8}$ in. apart and covering ± 1 in.; f_i is 1, 2, ... 8 for $i = 1, 2, \dots 8$; and n_i is the number of counts recorded for sensor i since last reset.

The reading represents the accumulated movement, factored by the amount of movement, adjusted to an equivalent reading per mile and the logarithm taken to compress the scale.

There are 2 roughness meters. The left meter shows the reading for the individual picture interval; the right meter covers a fixed interval of 1,000 ft (changed to 1 mile in 1972) and is valid only immediately prior to reset when the appropriate indicator light is on. The roughness recording equipment includes the following:

1. Cable attached to the rear axle at centerline, which follows axle movements and transfers them through pulleys to an indicator head on the vehicle floor;
2. Light source and fiber optic pickups for zero position at $\frac{1}{8}$ -in. intervals for ± 1 -in. movement, and overrun, to sense indicator head movement;

3. Transistorized circuitry that applies appropriate multiplier factors, splits pulses into 2 paths, applies appropriate distance interval divisor factor, and accumulates charge through a logarithm simulating capacitor to read out meters;
4. Meter discharge circuit;
5. Zero adjustment control; and
6. Overrun (more than ± 1 in.) indicator light circuit.

All of the photographic instrumentation was built for the Department by the British Columbia Research Council.

ROUGHNESS METER USE

In 1971 the film inventory was reviewed, and all 1,000-ft sections with roughness reading ≥ 3.2 ($\approx 1,580$) were recorded for consideration for the current paving program.

Some 1971 roughness readings have been compared with 1969 present performance ratings, and a reasonable correlation was noted. Further work is, however, necessary.

PHOTOGRAPHIC INVENTORY USE

The photographic inventory is a valuable tool. It is used by the planning branch as the principal road inventory record. It is also used as a source of data for the computer inventory system, but data extraction is limited to basic information (e.g., mileages and landmarks) and data considered essential to daily operations of other branches and officials.

The advantages of the film record are as follows:

1. Everything within the field of view of the camera lens is recorded objectively and nonselectively. (The record is complete.)
2. One 400-ft reel stores records for 250 miles of road. (The record is compact.)
3. Viewing of film generally conveys better impressions than written descriptions of road sites (or even drawings or maps).
4. Detailed data can be extracted at any later date for specific purposes as necessary. For example, detailed frame-by-frame roughness readings can be retrieved for detailed study of pavement sections as required. (The film record is permanent.)
5. The film record costs approximately \$2 per mile, when equipment is amortized over 5 years.
6. The film is available on short notice and is particularly valuable in British Columbia, a large area.

Although the film records do not substitute for detailed on-site study and measurement, the photographic inventory is a very efficient information collection and storage system, and the simple operation in use in British Columbia is an excellent communication medium.

REFERENCE

1. Hearst, R. M. Film Inventory of British Columbia's Highways—Methods and Results. Proc. Canadian Good Roads Assn., 1968.