

THE ADVANTAGES OF STANDARDIZED ROAD SECTION DESIGNATIONS FOR USE OF ROAD INVENTORY DATA

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SYNOPSIS

The Ohio Department of Highways supplanted an obsolete system of highway station and section marking with a system adequate for modern requirements.

The new system of marking is based on route numbers, counties, and distances from county lines. It is so designed that every point of the State System may be accurately identified. Special care was exercised that the stationing and sectioning should be adaptable to punch card recording.

The system makes available all data accumulated by the Highway Planning Survey for highway programming, cost recording, and road life studies. The system is so easily understood that it is usable by the public for accident reports, locations of pipe line and power line crossings of highways, and for locations of access to the highway by farm driveways.

Posts bearing distinguishing numbers were erected at two-mile intervals on every State Route. All sections and stations may be located from these posts.

Records are perpetuated on straight line diagrams and on punched cards. The straight line diagrams are constantly revised by the Planning Survey, as conditions change. Current straight line diagrams are kept in the hands of all interested field and office engineers of the Department of Highways. Punched cards are available in the office of the Planning Survey for use by the Survey when more extensive studies are required than may be made by use of the straight line diagrams.

When the Ohio Department of Highways was very young a method of designating various sections of the State Highway System was devised and adopted. The method was crude and cumbersome but continued in use without change in principal until 1947.

The method of designating the sections on the Highway System was never carefully thought out, but rather just grew. With a background such as this the method of designating sections had scarcely any chance of being adaptable to modern machine recording. In fact, the method of designating sections was unsuitable for one of the most ancient kinds of recording, inasmuch as many highway sections could not be accurately located on a map.

The now abandoned method of designating sections was based on an old highway numbering. Each highway on what was then known as the Inter-County Highway System was assigned a number. This number quite often was applicable only to the distance between two county seats, but sometimes applied to a road the entire distance

across the State. For example, the old National Pike extending across Ohio from Bridgeport on the Ohio River to the Indiana line near Richmond was old State Highway No. 1. For many years this road has been known as US 40. Travelers on the road, contractors interested in State projects and others referred to the road as US 40, but on State Highway Department maps, correspondence, and records, it was State Highway No. 1. All other roads had this confusing system of double numbers, with a few exceptions where the old State Highway numbers and the present route numbers happened to be identical. The old state highways whose lengths were short were more confusing than the longer ones. For example, US 42, in crossing Ohio between Cincinnati and Cleveland traversed eight old state highways. Thus US 42, in Department of Highways records, was State Highway 6, 241, 332, 334, 140, 139, 97, or 25, depending upon which part of it was under consideration.

The old method of designating short sections on the state highways was even

more confusing than the numbering. The sections had one or both of their terminals at township, county, or municipal boundaries or at points where projects had ended. Each section on a state highway within a county was designated by a letter of the alphabet but usually sections were not in alphabetical order. Frequently the same letter was assigned to different sections on the same highway in the same county. Since being originally established many sections had been relettered, overlapped, or sub-divided. Numerous sections were unidentifiable. The state highway system originally did not extend within municipalities so sections were not established there. Modern state highway extensions into municipalities were not sectioned.

With road section designations so indefinite, Planning Survey road inventory data could only be coordinated poorly with the Highway System and for many locations the data were unusable. To correct this situation, it was decided to establish a new system of stations and section designations which would permit an efficient and complete use of road inventory data. It was further decided that the new system of stationing and section designations should supplant the old system and be used throughout the Department of Highways.

THE NEW SYSTEM OF STATIONING AND SECTION DESIGNATION

After the decision was made to abandon the old system of stationing and section designations investigations were begun to devise a system to replace it. Conferences were held at which the engineers of the Planning Survey, Bureaus of Location and Design, Construction, Maintenance and Bridges, and Division Engineers responsible for work in the field expressed their opinions and made suggestions. These discussions developed five requirements which a new system had to fulfill to justify abandonment of the existing method of stationing and sectioning. These were:

1. It must be easily understood and used.
2. Every point on the State Highway System must be identifiable with no ambiguity.
3. It must be easily perpetuated.
4. It must be adaptable to punch card

recording.

5. Old sections, where identifiable, must be tied to the new system.

THE NEW SYSTEM

The plan adopted was one basing all stations and section designations on counties and route numbers. This plan was simple and easily understood, as its basis is the route numbers which appear on highway route maps and on markers along each route.

The new stationing on each route begins with Station 0.00 at the county boundary in each county. On roads where general direction is east and west, the zero station is at the west boundary and for north-south roads, at the south boundary of the county. Each county was assigned a three letter abbreviation. In Ohio the first three letters of the county name were satisfactory, as there was no duplication. A station designation is the abbreviation of the county in which the station occurs, followed by the route number, and concluded with the distance from the county line in miles. Thus, a point in Franklin County on US 40, 12.41 miles from the county line is designated FRA-40-12.41. An exception occurs when a route originates within a county. In that case, the zero point for stationing in the county of origin is the beginning of the route.

When the routes were stationing it was realized that the lengths of routes would change due to relocations. Provision was made for this by planning for an equation in the stationing at the point where the relocation rejoined the old location.

Where the relocation shortened the route the equation is simple. For example, if US 40 were shortened 0.50 miles and rejoined the old location at FRA-40-18.21 the equation would be FRA-40-18.21 A = FRA-40-17.71 B; "A" being "ahead" and "B" being "back."

Where a relocation lengthens a route the equation is somewhat more complicated. For example, US 40 might be lengthened 3.00 miles and rejoin the old location at FRA-40-05.84. Then FRA-40-05.84 A = FRA-40-08.84 B. In such a situation there would be a duplication of stationing from FRA-40-05.84 B to FRA-40-08.84 A. From FRA-40-05.84 B to FRA-40-08.84 A the

STANDARD SURFACE & BASE CLASSIFICATIONS

SURFACE		BASE	
Code	Description	Code	Description
A	(1) Combination Surface	Z	(4) Combination-Rigid
B	(2) Mono-Brick	Y	Road or pugmill mix over combination-rigid
C	Brick other than Monolithic	X	(5) Combination-Rigid and Flex
D	(2) Reinforced Concrete	W	Road or pugmill mix over Combination-Rigid and Flex
E	(2) Plain Concrete	V	Mono-Brick
F	Dense graded for concrete, such as T-136	U	Road or pugmill mix over Mono-Brick
G	Dense grade asphaltic concrete, such as T-35 or T-50	T	Brick-Rigid Base
H	Kentucky Rock or open graded bituminous course (plant mix) such as T-40, T-60, or T-61	S	Road or pugmill mix over Brick-Rigid Base
I	Penetration Macadam, such as T-33	R	Brick-Flex Base
J	(2) WB Macadam with Bituminous surface treatment	Q	Road or pugmill mix over Brick-Flex Base
K	Open graded road mix or pugmill mix, such as T-32 or T-34	P	Reinforced concrete
L	(3) Surface seal with cover, such as T-31	O	Road or pugmill mix over Reinforced Concrete
M	Oil Mat	N	Plain Concrete
N	(2) Stabilized	M	Road or pugmill mix over Plain Concrete
O	(2) Traffic Bound-Graded and Drained (See note below)	L	Plant Mix bituminous concrete or penetration macadam such as B-33, B-34, or B-35
P	(2) Traffic Bound-Not graded and drained	K	Macadam other than penetration
Q	(2) Earth-graded and drained	J	Road or pugmill mix over Macadam
R	(2) Earth-Unimproved	I	Stabilized
		H	Road or pugmill mix over Stabilized
		G	Traffic Bound
		F	Road or pugmill mix over Traffic Bound

Note: Traffic Bound Graded and Drained is construed as Traffic Bound built to a uniform section

(1) A combination surface is one, the wearing course of which consists of two or more individual types, each being of sufficient depth (combined with base) as to be classed logically as part of the traffic bearing road surface rather than as surfaced shoulders. Widening of 2 feet or less shall be ignored and the width included as a part of the predominating type

(2) No base entry necessary

(3) To be recorded as wearing surface only on Stabilized or Traffic Bound

(4) Combination Base-Rigid, is a base composed of two individual rigid types. According to the type classifications these could only include the following combinations:

Mono-Brick and Concrete (Plain or Reinforced)
Brick and Concrete (Plain or Reinforced)
Brick and Mono-Brick

(5) Combination Base-Rigid and Flex is a base composed of a rigid type and a flexible type, for example:

Reinforced Concrete, B-35

Figure 2

gramming, and road life records. Each surface and base type was assigned an alphabetical code letter. The code is recorded in Column 43 or 44 on the punch card shown in Figure 1. The types with code letters are shown in Figure 2.

FIELD WORK

Forces of the Division Engineer in each division located old section terminals where identifiable and points which became section terminals under the new system. A conspicuous stake was driven at each point, white stakes for old section points and red stakes for new section points.

Crews from the Road Inventory Section of the Planning Survey drove the entire State Highway System in automobiles equipped with carefully calibrated odometers graduated to 0.01 of a mile. Every section point was recorded in terms of the new system of stationing.

A cross-index of old and new sections

was prepared. This index is in book form and provides a ready transposition of old sections into the new designations and vice versa.

FIELD IDENTIFICATION

To insure that all points on the State Highway System might be easily located, posts were set every two miles. These posts are of steel, extend three feet above ground and are set as near the right-of-way line as possible and yet be visible. Each post carries on it the distance from the county line. That is, the fifth post being 10 miles from the county line carries the number "10." Any point on the State System may be accurately located by measuring from the nearest post, which at no place is at a distance greater than one mile. At locations where it was not practicable to set a post, as in an intersection or in front of a residence, an off-set post was set. The off-set post carries in addition

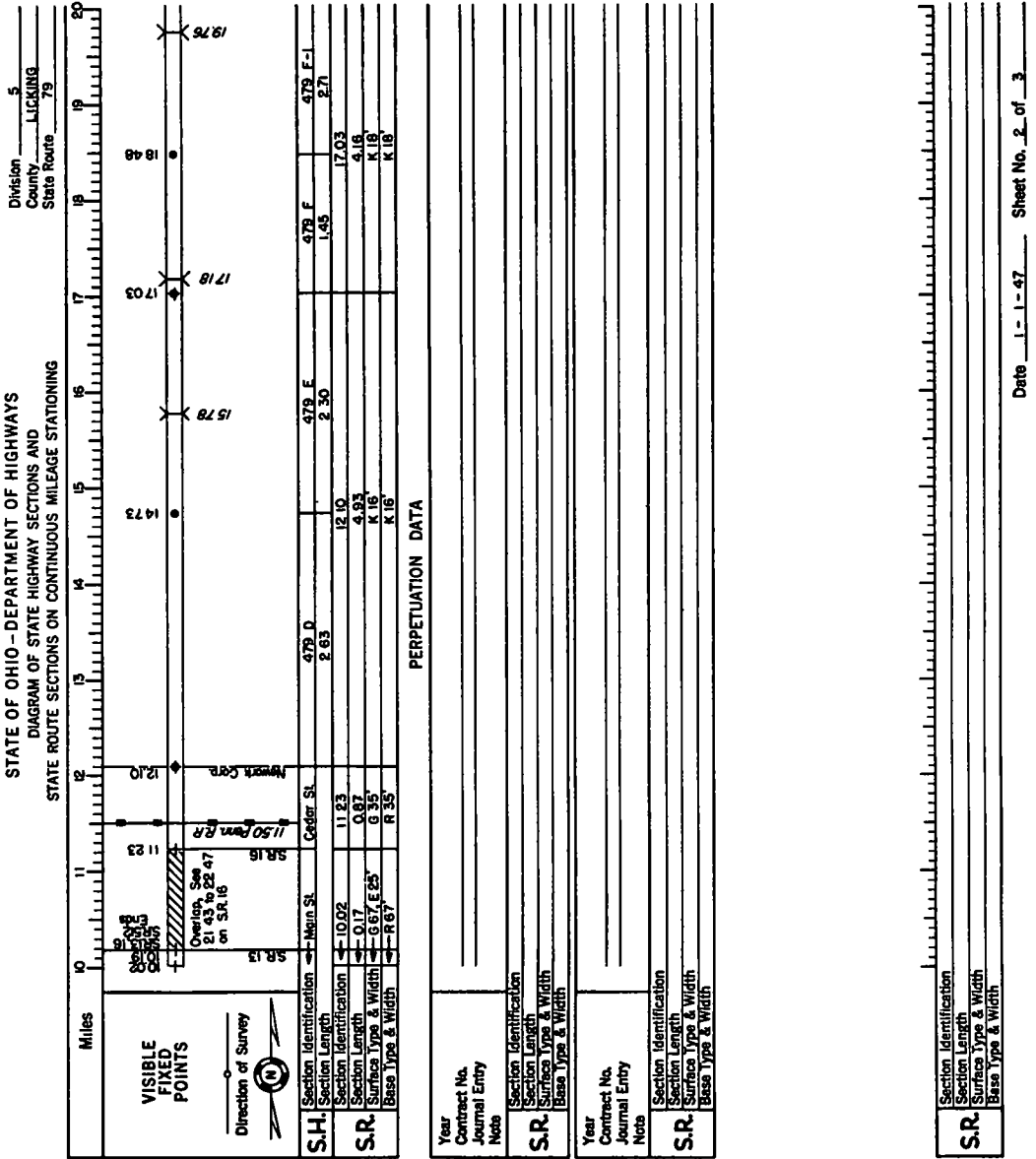


Figure 3

to the mileage number the off-set distance, in small figures. As a warning, off-set posts are designated by a red band painted a short distance above the ground.

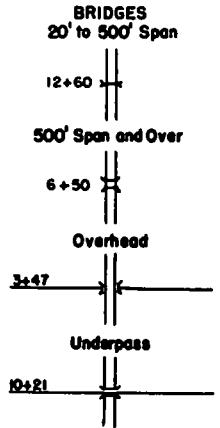
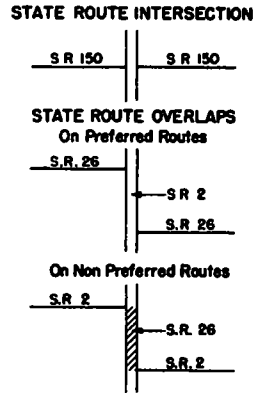
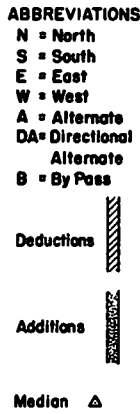
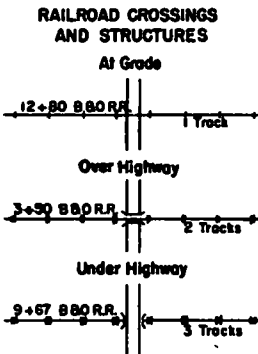
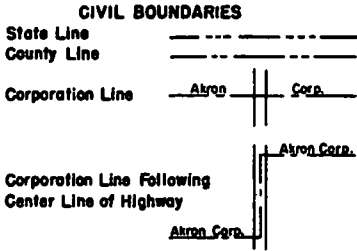
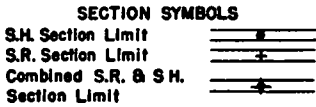
The two-mile distance between posts was selected because it was believed that a post within one mile of any point was sufficiently close, and also for reasons of economy.

STRAIGHT LINE DIAGRAMS

Straight line diagrams were prepared under the new system of sectioning for the entire State Highway System. A typical diagram and legend sheet are shown in Figures 3 and 4.

When any change occurs on a highway, it is recorded on the appropriate diagram

LEGEND S.H. & S.R. SECTION LOG



NOTE: The VERTICAL numbers and letters refer to Sections. The numbers and letters in ITALICS refer to Control Points.

Figure 4

in the spaces provided under "Perpetuation Data." The straight line diagrams are the ordinary source of reference for engineers in the field and office, with the punched cards available for extensive studies. Each of the four regional planning engineers in Ohio have complete sets of straight line diagrams for their respective regions. Each of the 12 division engineers has a set for his division, a county engineer for his county, and numerous other engineers have sets covering the territory in which they are interested.

The Planning Survey has been assigned the responsibility of keeping the straight line diagrams up-to-date. When a change occurs on a highway, the change is recorded on the appropriate original tracing in the

space provided for the perpetuation of data. Reproductions of the revised tracing are sent to each engineer who maintains a file of straight line diagrams.

USE OF STANDARDIZED SECTIONS

Ohio Highway Planning Survey data have never been used by the remainder of the Department of Highways to the extent their value indicates they should have been used. The reason for this scant use was the inability of engineers outside of the Planning Survey to identify information furnished by the Survey with specific locations on the highways. This serious defect was eliminated by the establishment of

the system of station and section designations previously described. Various uses of road inventory data made accessible by the standardized designations will be discussed.

COST RECORDS

It is planned that in the future there will be maintained by the Ohio Department of Highways detailed cost records on punched cards based on the new system of section designations. This system of cost recording is not yet in operation.

For construction records it is thought that it will be advantageous to punch a card for each item of each contract. These cards will record quantities, estimated unit prices, unit prices bid, and other desirable data. A tabulation from these cards will reveal quantities and costs of various items by sections, routes, counties, or highway divisions. A comparison of costs of like items in different sections of the State will be readily available and of great potential value.

For each individual contract it is proposed that a card be punched. This card will record, among other data, the name of the contractor, the number of bids received, the estimated prices, the actual bid prices, time required for completion, over-run on time, and other pertinent data.

For maintenance records it is proposed that for each section two cards be punched for each principal item, one for labor and one for material. These cards will afford a comparison of maintenance costs by items for any section, county, or division.

Systems of card recording will be developed for office and field engineering. These cards will record expenditures for materials and engineering services by sections and contracts.

PROGRAMMING

Since the establishment of the Planning Survey in 1935, several attempts have been made to use Planning Survey road life data in formulating a program for highway improvements. These attempts failed because of the inability of engineers to identify data with specific locations on the highways. Thus, the potential value

of road inventory data for planning was not utilized. Since the revision of stations and sections all engineers in the Department of Highways are using one system. All Planning Survey data have become available for programming highway improvements. This is possibly the greatest advantage of the new sectioning system.

That Planning Survey data may be used efficiently for programming, it is proposed that a system be devised whereby an index number is assigned for each road characteristic for each section of the State Highway System. These road characteristics will consist of width of pavement, gradients, sight distances, safety records, curvature, riding qualities, structural strength, maintenance costs, and probably others. Each characteristic will be assigned an index number reflecting the variance of the characteristic from a standard adequate for that section. It is now proposed that a completely inadequate characteristic be designated zero, with a large finite number assigned for a completely adequate characteristic.

With this system the cards for a route, division, or the entire Highway System can be run through the tabulators and the indexes added mechanically. The section with the smallest total of indexes should, theoretically at least, be first on the program of improvements. It is realized that one characteristic rated zero might make a section impassible, but other characteristics with high index numbers might make the section appear satisfactory when, in fact, it required attention immediately. Such instances will require exercise of judgment. At no place is it assumed that the index can supplant engineering judgment, but it can always serve as a program guide.

ROAD LIFE

On the straight line diagrams, Figures 3 and 4, are recorded the surface and base types and dates of construction and retirement. Eventually an easily understood, graphic record of the life of each type will evolve.

Further, the date of construction, length, width, and date of retirement for each surface and base type will be recorded on punch cards. A sort of the cards by

pavement type, with a tabulation of the pertinent data, will provide the material for computation of the weighted average life of each type of surface and base.

The surface and base types are represented by an alphabetical code on the straight line diagrams and punched cards. The alphabetical code and classifications are shown by Figure 2.

ACCIDENT RECORDS

Heretofore accident records have been of less use than was desirable, as no way was available to record exactly where an accident occurred. The State Highway Patrol reported accidents with location referred to nearby municipal boundaries, road intersections, or conspicuous land marks. With varying degrees of success the Department of Highways coordinated these reports with their confusing system of section designations.

With the new system of designations the Highway Patrolman drives from the scene of an accident to the nearest two-mile post and reports the distance as shown by his speedometer. The highway section and the station are thus definitely known. These will be recorded on punch cards, along with code numbers describing pertinent details of the accident.

Ohio is not fortunate enough to have compulsory reporting of highway accidents. When and if a report of accidents is required by law the new system of section designations will become more valuable. Without doubt the prescribed forms for the reports would provide spaces for locating the scene of an accident with reference to a section post. These data, along with those from the report of the Highway Patrol, would be recorded on punch cards.

A tabulation of the accident record cards readily discloses the accident prone locations on the State System.

OLD SECTIONS

All abstracts of Department of Highways real estate and records of old contracts are based on the old system of section designations. To allow continued use of the old designations where necessary, a cross-index of the old and new sections

was prepared. This cross-index is in book form. Also, the index for each division is bound separately, making 12 smaller books. All identifiable old sections are easily transposed into the new sections and vice versa.

The cross index will continue in use indefinitely by the engineers and lawyers interested in rights-of-way and real estate. The cross index books are now used extensively by other field and office engineers, but as they become familiar with the new designations it is expected the use of the cross index will be nearly discontinued.

USE BY PUBLIC

The nature of the old system of designations was such that they could be of no use to anyone outside of the Department of Highways. Access to Highway Department records and some research was usually involved in identifying a section.

Heretofore proposed contracts were described as being located on certain State Highways and sections, old numbering. Nothing in the field or on an ordinary map indicated where the project was located. A proposed project is now described by the familiar highway route number and the new section designation. An interested contractor may drive along the route indicated and locate a section post. From there he can locate the site of the proposed project by his speedometer.

Comments by the Public are now made at times with accurate place locations. As the Public becomes aware of the meaning of the two-mile posts it is believed this practice will improve. A communication to a Division Engineer describing a situation which has developed at a definite distance from a designated post is a vast improvement over a communication attempting to locate a position by describing it as being near a certain farm, cross-roads, or land mark.

All permits are now being issued according to the new section designations. Previously they were located by a general description which was transcribed into the section designations which only the Department of Highways recorded or understood. Now a public utility desiring a power line or pipe line installation across a highway, or a farmer requesting an ac-

cess to a highway can describe the location in the same terms as those used by the Department of Highways.

VOICE OF EXPERIENCE

As was to be expected, if Ohio were installing the sectioning system with the experience now available, the decisions in some instances would vary from those made at the beginning of the project.

In Ohio the routes were driven by automobiles and the data recorded for the straight line diagrams and cross-index. The straight line diagrams and the cross-index of new sections and identifiable old sections were then made. Crews later went into the field to set the two-mile marker posts. In some locations cumulative errors caused the sectioning already recorded on the straight line diagrams and in the cross-index to be at variance with the post locations. It was necessary to redraw some straight line diagrams and correct the cross-index. If the work were to be performed in the light of present

knowledge, the section posts would be set first and all later work referenced to them. No attempt would be made in the entire State to use the new sectioning for any purpose until all posts were set, all straight line diagrams completed and distributed, and the cross-index completed.

The present steel posts erected near the right-of-way line are inconspicuous in some locations. Consideration should be given to heavier, higher posts, possibly located nearer the pavement. The present posts have only one figure on them, except the off-set posts, and this figure faces the highway. For example, a post 10 miles from a county line carries only the figure "10." There would be many advantages to a post which carried also the County abbreviation and the route number. This would be especially advantageous on overlaps, on roads which are on County lines, or on roads which repeatedly cross a county boundary. Consideration should be given to having the numbers face traffic, or possibly use a square post set diagonally and place the figures on two sides to be read by traffic of both directions.