THE NEWS LETTER
OF THE
BUREAU OF PUBLIC ROADS

VOL. 1, NO. 1 NOVEMBER, 1925.

CONTENTS

FOREWORD

For sometime I have felt the need of a medium through which the significant developments in the work of the Bureau, the useful information picked up here and there, the practical methods and helpful suggestions developed by or brought to the attention of the several divisions and districts could be promptly and regularly passed on to all of us.

There is a dual need for such a medium. It is needed first as a means of maintaining a common point of view and concerted action by the various divisions and districts of the Bureau; and, after that, as an agency through which the important clearing-house services of the Bureau, always one of our most useful functions, may be made still more efficient and helpful.

Our organization is large, and largely decentralized. We have preferred that kind of organization; and we believe it is the form that is best fitted to deal with our peculiar problems. The natural conditions, the traffic conditions, the temper, customs, and laws of the States with which we cooperate in the Federal-aid work are so variable, and the extent of the territory in which we work is so great that we have always felt that the "man on the ground" should be permitted to exercise the greatest possible degree of initiative and judgment.

At the Washington headquarters the several divisions have different functions which employ the services of specialists in widely different lines. In addition to the engineering features of Federal-aid administration, our activities take us into the fields of physical, economic, statistical, and bibliographical research, law, accounting, education, and publication.

An organization so far-flung and so wide-ranging in its functions must necessarily depend upon the initiative and specialized ability of those who direct and man its various branches. But we must all keep before us at all times the common purpose in order that our action shall be harmonious and consistent with a general Bureau policy. It will be one of the most important functions of this News-Letter, therefore, to point the common aim in order that we shall all shoot at the same target.

Its other purpose, the extension and improvement of the clearing-house functions of the Bureau, will be accomplished, we hope, through the regular interchange of ideas, and methods developed by the various branches of the Bureau and by the highway departments and other agencies with which we cooperate. The transmission of such ideas and methods to the State organizations can not

FAIL TO BE BENEFICIAL AND PRODUCTIVE OF A GREATER EFFICIENCY AND ECONOMY OF HIGHWAY ADMINISTRATION, CONSTRUCTION, AND MAINTENANCE THROUGHOUT THE COUNTRY.

IT IS MY WISH THAT ALL MEMBERS OF THE ORGANIZATION, ESPECIALLY THOSE WHO ARE IN IMMEDIATE TOUCH WITH THE STATE HIGHWAY DEPARTMENTS, SHALL HAVE THE WIDEST POSSIBLE VIEW OF WHAT IS GOING ON IN HIGHWAY CONSTRUCTION IN THE COUNTRY; AND THAT EACH SHALL CONSIDER IT HIS DUTY TO CONVEY TO THE STATE AUTHORITIES WITH WHOM HE IS ASSOCIATED THE GOOD IDEAS AND PRACTICAL METHODS WHICH REACH HIM THROUGH THIS AND OTHER MEDIUMS.

OUR RELATION TO THE STATE HIGHWAY DEPARTMENTS, PREFERABLY SHOULD BE THAT OF CO-WORKERS RATHER THAN INSPECTORS. SO FAR AS POSSIBLE OUR VIEWS SHOULD BE EXPRESSED BEFORE - NOT AFTER - ACTION BY THE STATE AUTHORITIES, AND WE SHOULD ENDEAVOR TO SECURE THEIR ACCEPTANCE BY THE FORCE OF REASON RATHER THAN AUTHORITY. AS MUCH AS POSSIBLE IT IS MY WISH THAT WE SHALL SUGGEST; AS LITTLE AS POSSIBLE, DEMAND; AND SUGGESTION IS NEVER SO LIKELY TO WIN ACCEPTANCE AS WHEN IT HAS BEEN TRIED AND PROVED. WE SHALL TRY TO GIVE YOU IN THE PAGES OF THIS NEWS-LETTER MONTHLY ONLY THOSE SUGGESTIONS WHICH HAVE BEEN FULLY TESTED AND FOUND TO BE PRACTICABLE.

IN THE FIELD OF RESEARCH PUBLIC ROADS IS DESIGNED TO RENDER SUCH A SERVICE AND DOES, NOT TO OUR OWN ORGANIZATION ONLY, BUT TO THE ENTIRE HIGHWAY FIELD. THIS NEWS-LETTER WILL GO ONLY TO MEMBERS OF THE ORGANIZATION, AND IT WILL DEAL ONLY WITH THE MORE PRACTICAL, EVERYDAY PHASES OF OUR WORK. I SHOULD LIKE TO HAVE EVERY DIVISION AND EVERY DISTRICT REPRESENTED IN ITS PAGES FREQUENTLY. IT WILL BE A DIGNIFIED, PROFESSIONAL NEWS MEDIUM FOR THE BENEFIT OF OUR OWN ORGANIZATION ONLY. I HOPE IT WILL BE HELPFUL.

Thos. H. MacDonald

CONCRETE PAVEMENT CONSTRUCTION

A MEMORANDUM BY THE CHIEF OF THE DIVISION OF CONSTRUCTION REPORTING HIS OBSERVATIONS ON CONCRETE ROAD CONSTRUCTION MADE DURING A RECENT TRIP THROUGH THE NEW ENGLAND STATES, NEW YORK AND NEW JERSEY.

DURING A RECENT INSPECTION TRIP THROUGH NEW ENGLAND AND NEW YORK AND NEW JERSEY, THE CHIEF OF THE DIVISION OF CONSTRUCTION HAD AN OPPORTUNITY TO OBSERVE A NUMBER OF CONCRETE JOBS UNDER CONSTRUCTION AND A FEW OF THE MAIN POINTS OBSERVED ARE RECORDED IN THE HOPE THAT THEY MAY BE OF USE TO ENGINEERS OF THE BUREAU WHO ARE HANDLING CONCRETE ROAD CONSTRUCTION.

PRACTICALLY ALL NEW PAVEMENTS BUILT IN TWO HALVES.

IT WAS OBSERVED THAT PRACTICALLY ALL CONCRETE PAVEMENTS IN THESE STATES ARE NOW BEING CONSTRUCTED IN TWO SECTIONS, THAT IS, ONE HALF OF THE ROAD IS CONSTRUCTED AT A TIME. IN ADDITION TO THIS ALL OF THESE STATES ARE USING EXPANSION JOINTS AT APPROXIMATELY 40-FOOT INTERVALS. NEW JERSEY IS USING A FILLED JOINT; THE OTHER STATES ARE USING A PREMOLDED JOINT. THE MAJORITY ARE USING SOME EXPANSION MATERIAL IN THE LONGITUDINAL JOINT.

MR. MILLER STATES THAT HE HAS OBSERVED CONSIDERABLE SPALLING OF THE LONGITUDINAL JOINTS IN NEW YORK, WHICH HE AT FIRST ATTRIBUTED TO THE LACK OF EXPANSION MATERIAL. AFTER A MORE EXTENDED INSPECTION, HOWEVER, HE IS OF THE OPINION THAT THE SPALLED CONDITION IS DUE ALMOST ENTIRELY TO CARELESS HANDLING OF TRAFFIC AFTER THE FIRST STRIP OF CONCRETE HAS BEEN COMPLETED AND BEFORE THE SECOND STRIP HAS BEEN PLACED. HEAVY TRUCKS AND OTHER VEHICLES ARE APPARENTLY PERMITTED TO TURN OFF AND ON THE FIRST STRIP OF CONCRETE BEFORE IT HAS REACHED A PERMANENT SET, THUS CAUSING THE SPALLED CONDITION OF THE EDGE.

THE CONSTRUCTION OF A CONCRETE ROAD IN TWO SECTIONS, EACH ONE COMPLETED SEPARATELY, HAS, WE BELIEVE, MANY ADVANTAGES. THE TRAFFIC CAN BE TAKEN CARE OF GENERALLY WITHOUT DETOURING. IT IS POSSIBLE TO GET A MUCH SMOOTHER AND BETTER JOB THAN WHEN THE PAVEMENT IS FINISHED TO ITS FULL WIDTH AT ONE TIME. A HARD-SURFACED ROAD IS AVAILABLE FOR THE CONSTRUCTION OF THE LATTER HALF OF THE PAVEMENT; AND SUBGRADE IS EASIER TO MAINTAIN ON THE SECOND HALF ON THIS ACCOUNT. THE PRINCIPAL ADVANTAGES, HOWEVER, SEEM TO BE THE SMOOTH RIDING QUALITIES OF THE PAVEMENTS BUILT IN THIS WAY AND THE ELIMINATION OF LONGITUDINAL CRACKS. NO LONGITUDINAL CRACKS AT ALL WERE OBSERVED IN ANY OF THE PAVEMENTS SO LAID.

Finishing Methods Observed

The width of the section of pavement completed in one operation being either 9 or 10 feet, it is much easier to screed the surface and where machines are employed for finishing, a comparatively light finishing machine can be used. Most of the work observed during this inspection trip was hand-finished. Only one finishing machine was observed and that was a new Lakewood machine the operation of which eliminates tamping. By an eccentric motion a steel screed or cutting knife is operated with a motion very similar to that employed in hand screeding.

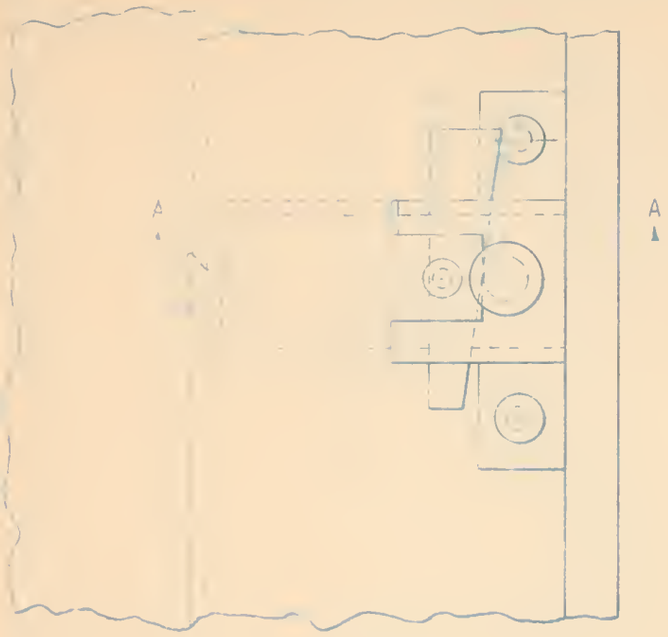
Generally, where finishing is by hand, a heavy screed is used first and followed by a lighter screed later. One very simple and effective screed noted consisted of an 8 by 8-inch timber, with 3/4-inch gas pipe handles. This screed was operated by two men and being heavy and having a wide face was very effective. It was followed later by a lighter screed and a belt. No roller was used. This manner of finishing the surface is similar to a method now receiving a trial by the Highway Department of Pennsylvania.

In Massachusetts the final finish of the concrete slabs is being accomplished by belting with a wooden belt rather than by the use of canvas or leather belt.

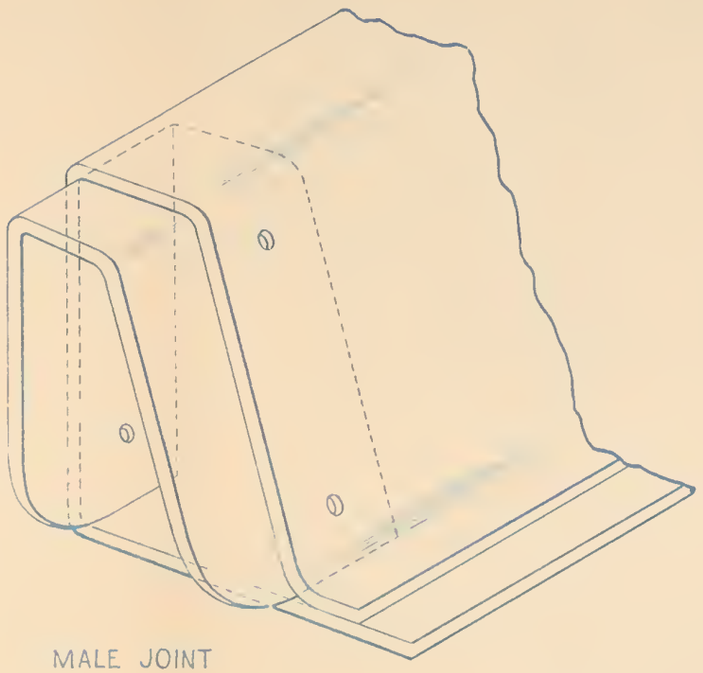
Practically all of the States visited broom the finished surface with a stiff stable broom. The purpose is to minimize the objectionable glare and slipperiness of the smooth-finished concrete and these purposes are apparently accomplished.

An Effective All-Metal Form

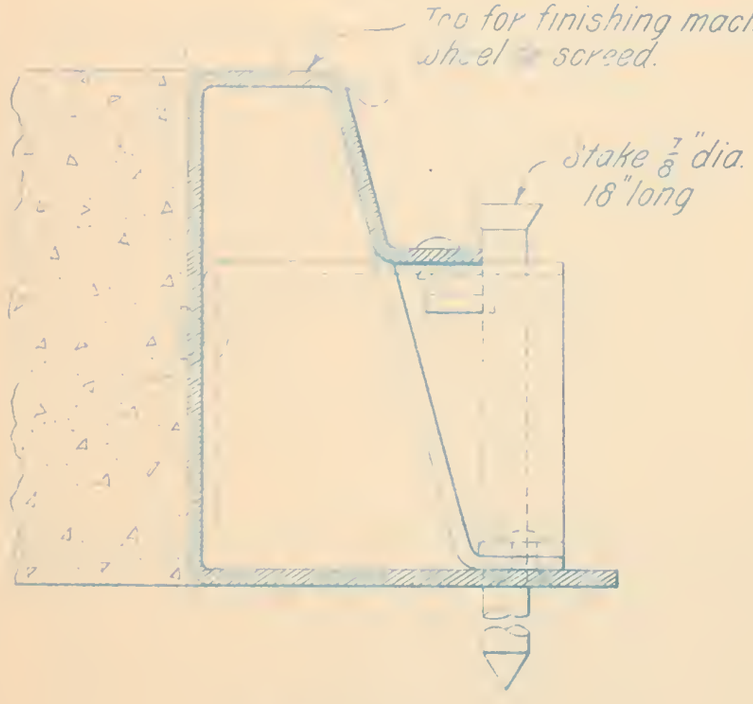
A very effective all-metal form, designed for finishing-machine or heavy-screed work is used to some extent in Massachusetts. The form is of the frame or hollow-rail type and is built of No. 10 gage steel web material, as shown in the attached plan. It is furnished in different sizes suitable for the construction of concrete pavements of various edge dimensions. Its base varies in width from $5\frac{3}{4}$ inches for a 6-inch thickness of concrete to a $6\frac{1}{4}$-inch width for 9-inch concrete. The rail is built in 10-foot sections with two stake boxes and 5 auxilliary stake holes for each section, and the male joint is formed of 3/16-inch plate metal riveted to the web.



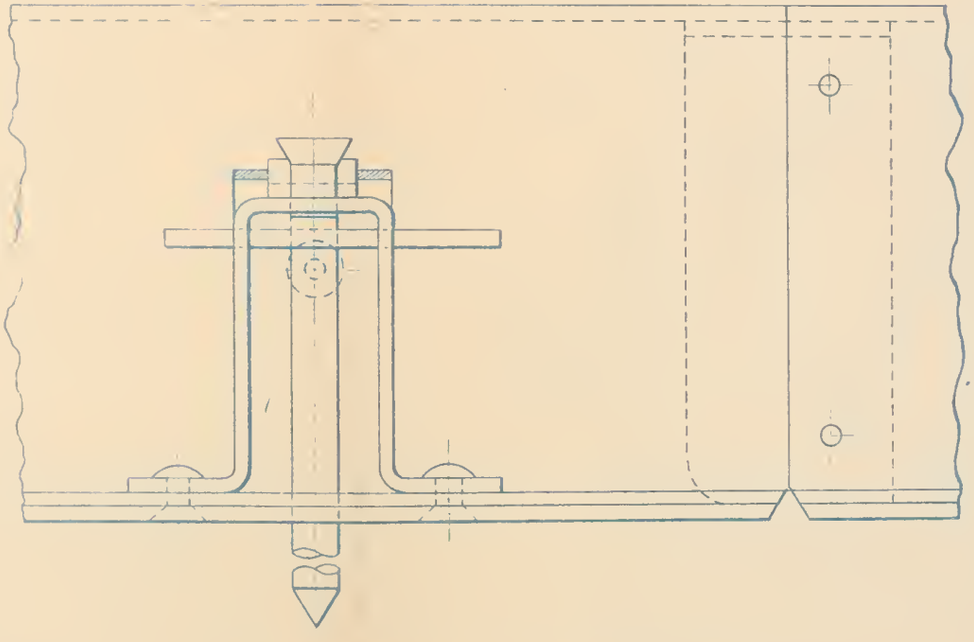
PLAN



MALE JOINT



SECTION A-A



SIDE VIEW SHOWING JOINT AND STAKE BOX

ALL METAL HOLLOW-RAIL SIDE FORM, USED IN THE STATE OF MASSACHUSETTS

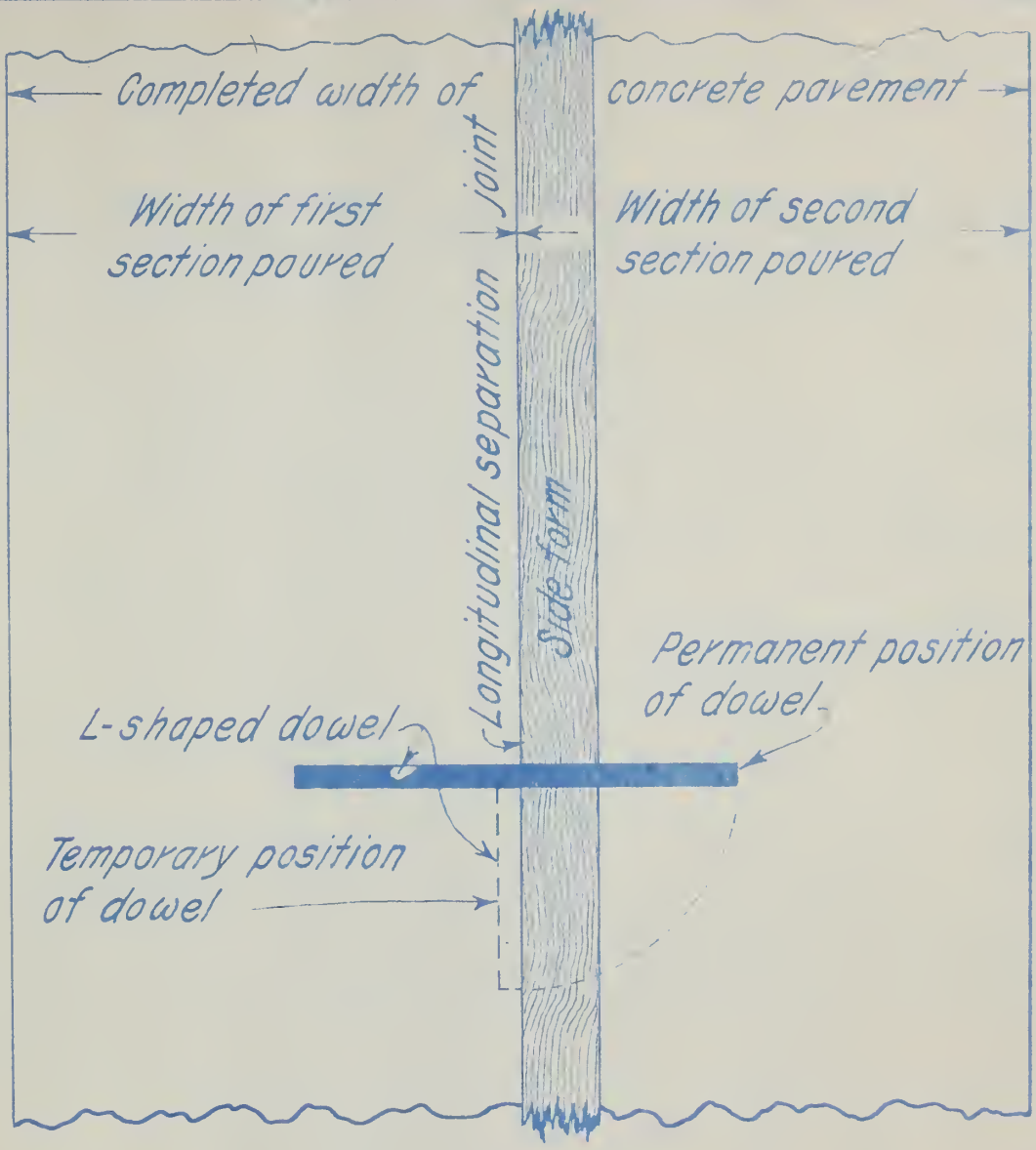
Joint Practice

The division of the pavement into short sections similar to sidewalk construction and the furnishing of expansion joints seems to eliminate cracking and blow-ups. In Massachusetts, in addition to building the divided section of highway with expansion joints at regular intervals, they are placing underneath the pavement a foot of coarse gravel. In Connecticut they are using sub-base. This furnishes a very uniform foundation and we believe assists materially in preventing cracks.

It is noted in New York that wherever the transverse joints, which are 40 feet apart, are placed in each slab exactly opposite each other there is very little cracking, but where the joints are staggered almost invariably there is a crack in the slab opposite each of these staggered joints.

In New Jersey where a poured joint is used a patented form is used for the transverse joints, known as the McGovern Poured Joint. Another form, also patented, and known as the McGovern steel center joint is used for longitudinal joints. These forms are described in another article in this issue of the News-Letter.

In Rhode Island expansion material is not used in the longitudinal joints but the two sides of the pavement are connected by dowels. These dowels are turned like an "L" and one leg is placed against the form when the concrete is laid. When the other section is built the folded leg parallel to the form is merely straightened out. This seems to be a simple and effective way of taking care of the dowels when the pavement is laid in two sections separately. A descriptive sketch of this dowel follows:



The L-shaped dowels are placed while the first section of the pavement is poured and are left in their bent position until immediately prior to pouring the other section of the pavement. After the first section has become set the side forms are removed but the dowels are left in their bent position until the other section is actually under construction when they are straightened to their permanent position.

This precludes any possibility of the dowels interfering with traffic using the subgrade before the second section is built.

COMBINATION L-SHAPED STRAIGHT DOWEL

USED BY STATE OF RHODE ISLAND

GROOVED LONGITUDINAL JOINT FORMED BY MACHINE IN DELAWARE CONCRETE PAVEMENTS

Compiled by the Division of Construction from reports by R. F. Eastham, Highway Engineer.

To eliminate the decidedly irregular, unsightly and possibly injurious longitudinal cracks which form in the wider concrete pavements when built without a center joint, and to avoid the slightly irregular appearance and other defects of joints formed by submerged metal plates, some of the later work in Delaware has employed a grooved joint formed by a special machine. In another report in this issue of the News-Letter a method of forming the longitudinal joint in pavements laid in two operations is described. The method employed in Delaware is for the forming of the joint in pavements laid to their full width in one operation.

The new method is reported as highly satisfactory and desirable by Mr. Eastham and by the present and former chief engineers of the Delaware Highway Department. In view of the extensive experience of the Delaware officials in concrete pavement construction, and the general excellence of the pavements that have been built in the State, it is believed that a description of the methods used in forming the new type of joint will be of interest to Bureau engineers.

As in the commoner submerged plate method the joint is formed by the creation of a plane of weakness, the difference being that the cross-section is partly severed by a groove formed in the surface of the pavement instead of by a submerged plate. The groove is formed by a mold or wedge which is forced into the surface of the fresh concrete by means of a machine which is leased to the contractor or road builder by its manufacturers. The machine is carried by a portable platform which travels along the side forms on flanged wheels. It is propelled with ease by one man who operates a hand wheel the motion of which is transmitted to the flanged wheels by a chain drive.

Figure 1 shows a general view of the machine with the operator at the hand wheel prepared to advance the machine. One of the chain drives may be observed at the left of the operator in this picture. There are two such driving chains, one at the extreme left of the power wheel, near the forward flanged wheel, and one on the right in the same relative position.

To form the groove in the slab a metal mold is employed. The mold is supplied in 10-foot lengths and used repeatedly during the progress of the job. In cross section it is simply a hollow

FIG. 1 – A GENERAL VIEW OF THE MACHINE WITH OPERATOR IN READINESS TO ADVANCE IT. ONE OF THE DRIVING CHAINS MAY BE OBSERVED AT THE LEFT OF THE OPERATOR. THE LEFT-HAND ARROW POINTS TO THE CHISEL USED IN CUTTING THE PRELIMINARY JOINT IN THE CONCRETE. THE RIGHT-HAND ARROW POINTS TO THE MOLD-HOLDING TONGUE. AHEAD OF THE MACHINE IS THE STRUCK-OFF AND SCREEDED CONCRETE SURFACE AND IN REAR OF IT MAY BE NOTED EVIDENCE OF THE RECENTLY INSERTED MOLD AND CORE.

GROOVED LONGITUDINAL JOINT
STATE OF DELAWARE

V-SHAPED MOLD AND CORE

Full Size

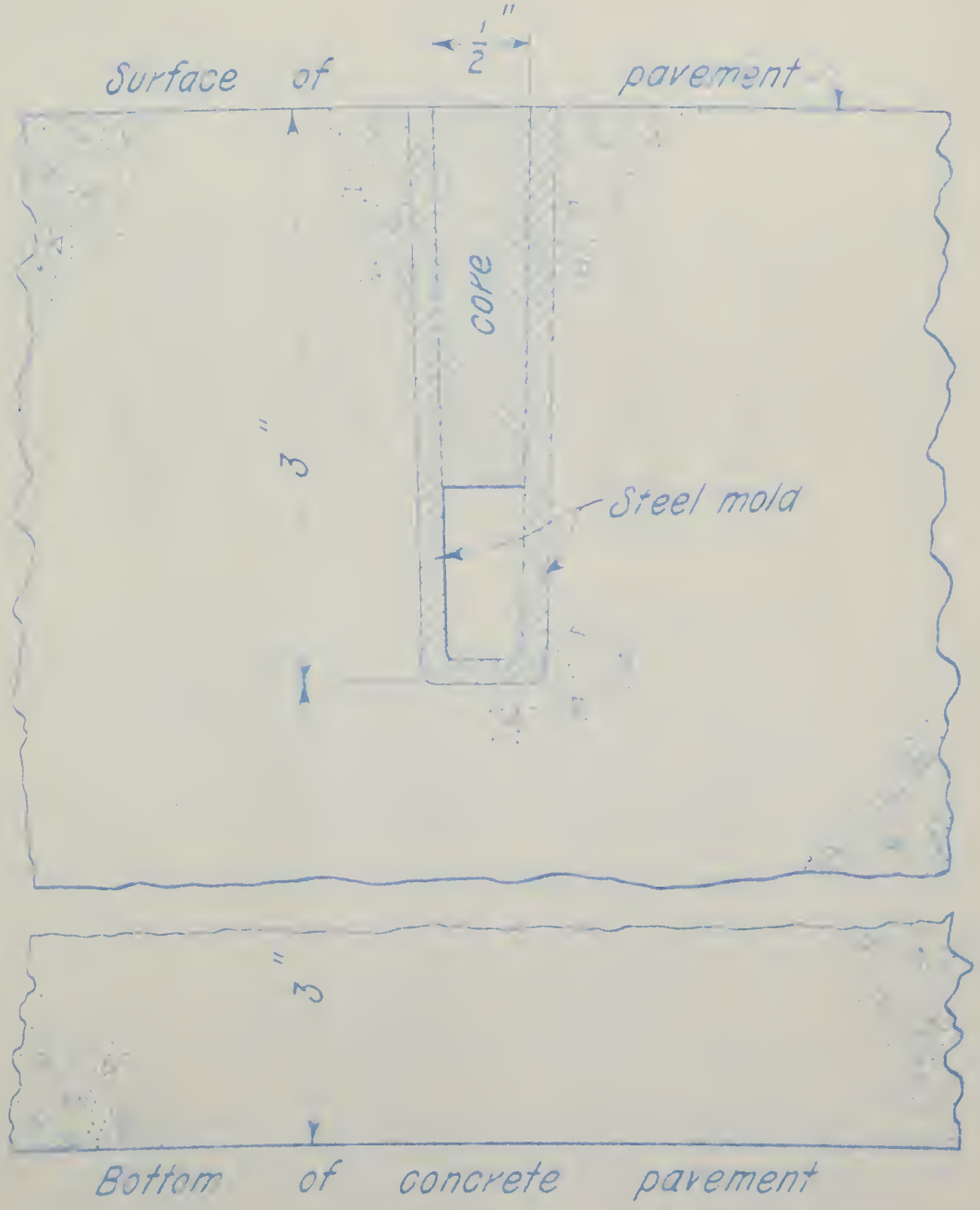


Figure II

WEDGE OF 1/8-INCH SHEET STEEL, APPROXIMATELY 3 INCHES LONG, ABOUT 1/2 INCH, INSIDE MEASUREMENT, AT THE BASE AND SLIGHTLY LESS AT THE POINT. FOR USE WITH THE MOLD IN A MANNER WHICH WILL BE LATER DESCRIBED THERE IS A CORE, ALSO WEDGE-SHAPED, ABOUT 2 INCHES LONG, SLIGHTLY LARGER AT THE BASE THAN THE INSIDE DIMENSION OF THE MOLD, AND HAVING THE SAME TAPER. FIGURE II IS A FULL-SIZE SECTION OF THE WEDGE-SHAPED MOLD WITH THE CORE IN PLACE.

THE METHOD OF FORMING THE JOINT AS OBSERVED ON ONE PROJECT WAS AS FOLLOWS: THE MIXED CONCRETE AFTER BEING DUMPED ON THE SUBGRADE WAS SPREAD IN THE USUAL MANNER AND BROUGHT TO A UNIFORM SURFACE WITH THE AID OF TWO SCREEDS OF DIFFERENT WEIGHTS. CLOSELY FOLLOWING THESE OPERATIONS THE MACHINE ARRIVES TO FORCE THE MOLD INTO THE SHAPED AND FINISHED, BUT STILL GREEN CONCRETE. FIGURE I SHOWS THE NEWLY SHAPED CONCRETE SURFACE WITH THE MACHINE ABOUT TO SINK THE MOLD.

IN ORDER TO FORCE THE MOLD INTO THE FRESH CONCRETE WITHOUT INJURY TO THE SHAPED AND SCREEDED SURFACE, A LINE OF SEPARATION OF THE COARSE AGGREGATE AND MORTAR MUST BE FORMED TO RECEIVE THE MOLD, I.E., THE COARSE AGGREGATE MUST BE FORCED ASIDE SO AS TO FORM A PRELIMINARY CREVICE TO ACCOMMODATE THE MOLD. THIS IS ACCOMPLISHED BY A VERTICAL CHISEL, PLACED IN FRONT OF THE PLATFORM, OPERATED IN AN UP AND DOWN MOTION, "SIMILAR TO THE NEEDLE OF A SEWING MACHINE" BY A CAM ARRANGEMENT EMPLOYED IN CONNECTION WITH THE HAND WHEEL AND DRIVING MECHANISM. THE LEFT HAND ARROW IN FIGURE I INDICATES THE POSITION OF THIS CHISEL. THE UPPER ARROW IN FIGURE III INDICATES ONE OF THESE PRELIMINARY JOINTS RECENTLY CUT BY THE PLUNGER.

UPON COMPLETION OF THE SCREEDING OPERATIONS AHEAD OF THE MOLD-INSERTING MACHINE, AND AFTER ONE SECTION OF MOLD IS IN PLACE, THE MACHINE ADVANCES 10 FEET, THE LENGTH OF A SECTION OF MOLD, AND PROCEEDS TO INSTALL ANOTHER. THIS IS PERFORMED IN THE FOLLOWING MANNER: AT THE FRONT AND REAR OF THE MACHINE A PLATE CARRYING TWO PARALLEL GUIDES IS PIVOTED DIRECTLY ABOVE THE LONGITUDINAL AXIS OF THE ROAD TO THE CARRYING TRUSSES. THE GUIDES ARE JOINED AT THE TOP BY A YOKE THROUGH WHICH PASSES A SCREW SHAFT WHICH CAN BE TURNED BY HAND. TO THE LOWER END OF THE SCREW SHAFT, AT EACH END OF THE MACHINE, IS ATTACHED A 10-FOOT SECTION OF ANGLE IRON, TRUSS-REINFORCED LATERALLY, AND CARRYING ON THE UP-TURNED LEG A SHEET STEEL PLATE, DESCRIBED AS A CARRYING TONGUE, WHICH EXTENDS APPROXIMATELY 2 INCHES BELOW THE OTHER LEG OF THE ANGLE. BY TURNING THE GUIDE PLATES AT EACH END ON THEIR PIVOTS THIS CARRYING TONGUE CAN BE TURNED INTO AN INCLINED POSITION TO PERMIT A SECTION OF THE WEDGE-SHAPED MOLD TO BE FITTED TO IT. THE RIGHT-HAND ARROW IN FIGURE I POINTS TO THE TONGUE IN THIS POSITION. HAVING FITTED A THOROUGHLY GREASED SECTION OF THE MOLD TO THE TONGUE, THE SHAFT AND GUIDE PLATES ARE TURNED BACK TO THE UPRIGHT POSITION AND THE MOLD IS FORCED INTO THE CREVICE PREVIOUSLY CUT IN THE CONCRETE

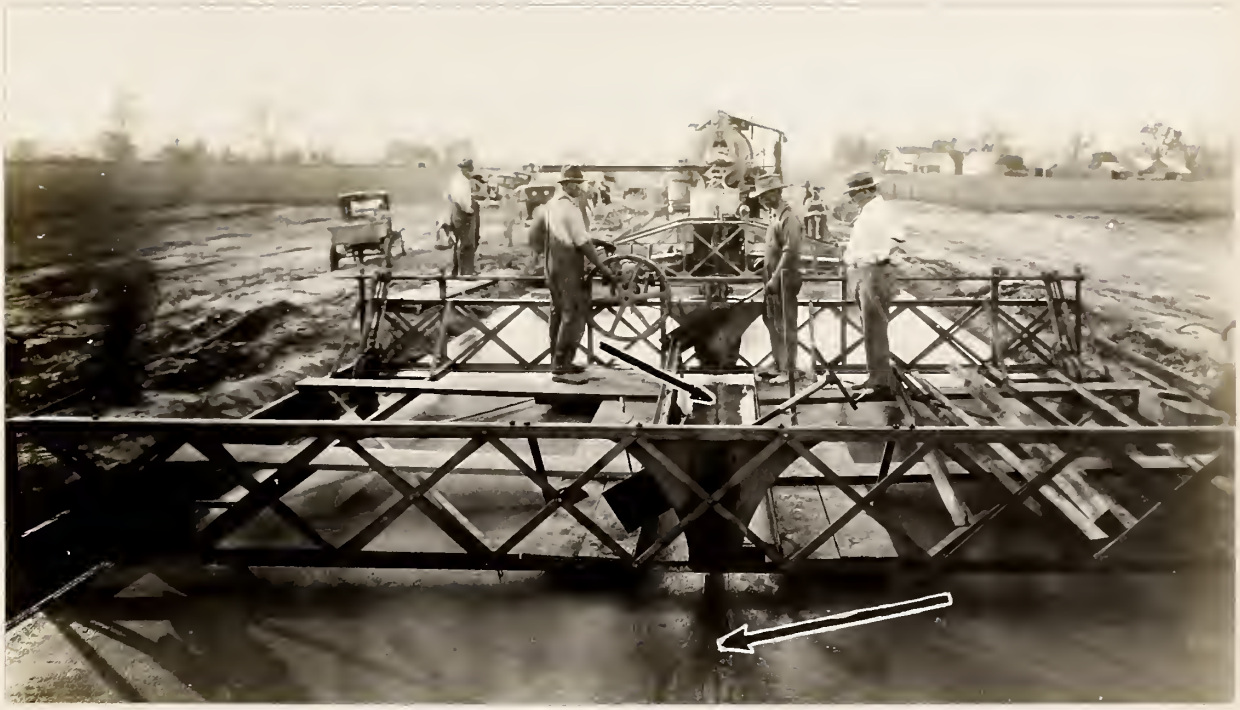


FIG. III – ANOTHER GENERAL VIEW OF THE OUTFIT. THE UPPER ARROW POINTS TO A PRELIMINARY JOINT CUT BY THE PLUNGER. THE LOWER ARROW INDICATES THE MOLD AND CORE IN PLACE.

FIG. IV – SHOWING 10-FOOT SECTION OF MOLD BEING FORCED INTO THE CONCRETE.

BY THE CHISEL. THE FORCE NECESSARY TO INSERT THE MOLD IN THE CONCRETE IS PROVIDED BY SCREW SHAFTS AT THE TWO ENDS WHICH ARE OPERATED BY TWO MEN AS ILLUSTRATED BY FIGURE IV. AFTER THE MOLD HAS BEEN FIRMLY PLACED, TWO CLASPS WHICH SECURE THE MOLD TO THE TONGUE ARE RELEASED, AND THE TONGUE IS ELEVATED AND TURNED BACK TO THE INCLINED POSITION. FIGURE V SHOWS A RECENTLY INSERTED MOLD.

THE 2-INCH CORE DESCRIBED ABOVE IS NOW THOROUGHLY GREASED, INSERTED IN THE "V" SHAPED OPENING OF THE MOLD, AND BOTH CORE AND MOLD ARE FIRMLY RAMMED INTO THE CONCRETE SLAB FLUSH WITH ITS SCREEDED SURFACE. THIS AUXILIARY RAMMING IS USUALLY DONE WITH THE AID OF LIGHT COBBLE-STONE RAMMERS OR CONCRETE TAMPERS. FIGURE III SHOWS THE JOINT WITH BOTH MOLD AND CORE IN PLACE. THE 2-INCH CORE HAS THE SAME LENGTH AS THE MOLD THAT IT REINFORCES BUT IT IS SO PLACED AS TO EXTEND BACK APPROXIMATELY 6 INCHES INTO THE PRECEEDING MOLD IN ORDER TO MAINTAIN A TRUE ALIGNMENT IN THE SUCCEEDING MOLD AND RESULTANT LONGITUDINAL JOINT. THE CORE IS UTILIZED FOR THIS PURPOSE AND ALSO TO PROVIDE RIGIDITY FOR THE MOLD WHILE THE SURFACE OF THE PAVEMENT IS RECEIVING ITS FINAL BOARD BELTING AND BURLAP FINISH. ANOTHER FUNCTION OF THE CORE IS TO WEDGE THE MOLD FIRMLY INTO THE CONCRETE; AND, ON REMOVAL, TO PERMIT THE MOLD TO COLLAPSE SLIGHTLY AND ELIMINATE ANY POSSIBILITY OF TEARING THE CONCRETE WHEN THE MOLD IS FINALLY REMOVED FROM ITS TEMPORARY POSITION IN THE SLAB.

AFTER THE MOLD AND CORE HAVE BEEN PROPERLY PLACED, THE MACHINE IS ADVANCED 10 FEET, AND THE OPERATIONS REPEATED. ON ONE OF THE JOBS INSPECTED, THREE MEN WERE EMPLOYED ON THE MOLD SETTING MACHINE; ON ANOTHER ONE ONLY TWO MEN WERE USED.

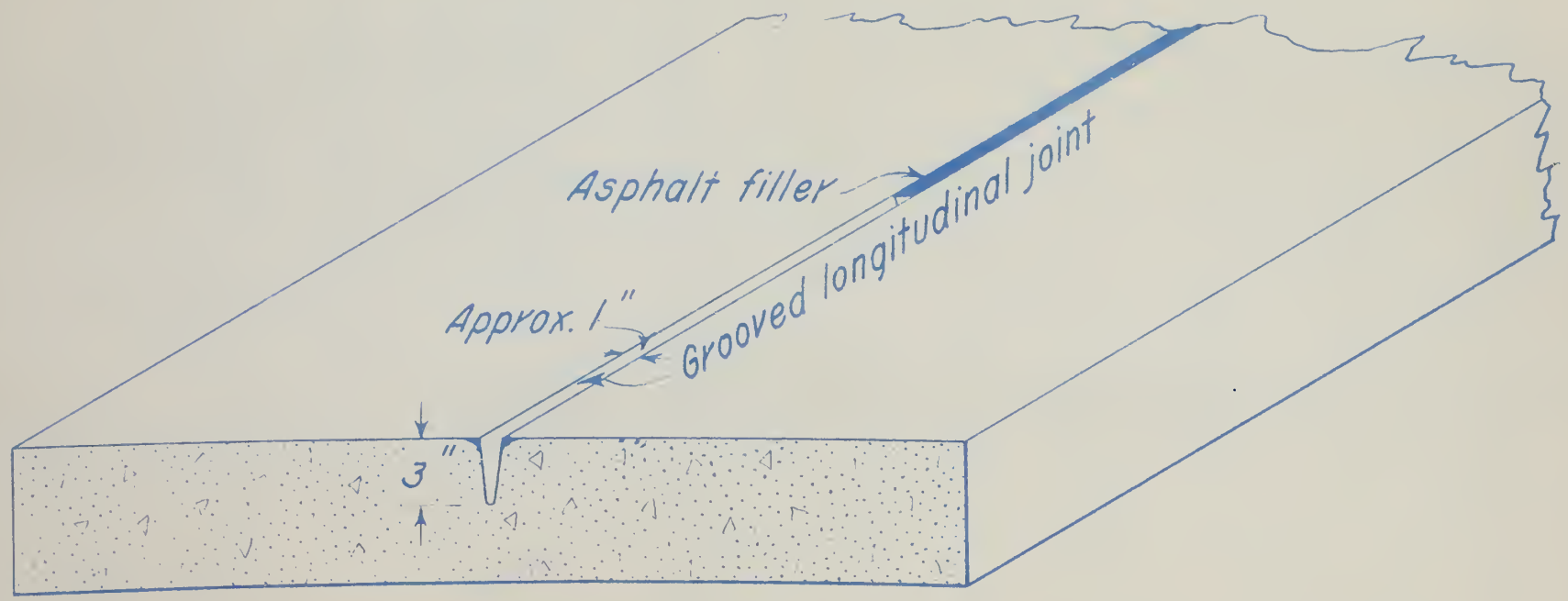
ON ONE CONTRACT, DELAWARE FEDERAL-AID PROJECT NO. 30, AFTER THE MOLD AND CORE HAD BEEN SET, BUT WHILE THEY WERE STILL IN PLACE, THE PAVEMENT SURFACE WAS BELTED WITH A 12-INCH BOARD BELT WHICH WAS IMMEDIATELY FOLLOWED BY A FINAL BURLAP BELTING TO GIVE THE SURFACE AN IRREGULAR CORDUROY FINISH AND REDUCE SLIPPERINESS. AFTER THE FINAL BELTING OPERATIONS ARE COMPLETED, AND THE CONCRETE HAS REACHED A SUITABLE INITIAL SET THE CORE AND MOLD ARE REMOVED AND THE ADJACENT SURFACE HAND-TOOLED, READY FOR FILLING THE GROOVE WITH BITUMINOUS MATERIAL.

THE REMOVAL OF THE MOLD IS ACCOMPLISHED BY ONE MAN WITH THE AID OF HOOKS OR PLIERS WORKING ON A MOVABLE PLATFORM. FIGURE VI ILLUSTRATES THE REMOVAL OF THE MOLD AND THE PLATFORM USED BY THE WORKMAN. FIGURE VII IS A TYPICAL SECTION OF THE FINISHED PAVEMENT, SOMEWHAT DISTORTED TO BETTER ILLUSTRATE THE GROOVED JOINT. POURING OF THE JOINT IS NOT NECESSARILY DELAYED UNTIL THE CONCRETE IS COMPLETELY CURED; ON THE CONTRARY IT IS USUALLY DONE IMMEDIATELY AFTER THE MOLD IS DRAWN AND THE EDGES OF THE GROOVE HAND-TOOLED.

FIG. V - ILLUSTRATING RECENTLY PLACED MOLD.

FIG. VI - DRAWING THE WEDGE-SHAPED MOLD.

GROOVED LONGITUDINAL JOINT
STATE OF DELAWARE
TYPICAL CROSS-SECTION



Concrete pavement

Longitudinal joint with
mold and core removed

Figure VII

The work incidental to forming the joint does not delay the mixer in any way and causes little, if any, delay in finishing the surface and curing the concrete pavement. Of course the man actually engaged in removing the mold and tooling the edges must necessarily rem, in after hours. He must remain after the mixer has shut down and until the concrete has reached initial set in order that the mold may be easily drawn and the groove hand-tooled before final set is reached. This requires probably from one hour during warm weather to three or four hours during the early spring and fall. Figure VIII shows completed work following closely back of mixer. In this instance the joint has not been poured.

As is apparent from the foregoing, the grooved joint formed produces a weakened plane which controls the line of fracture; eliminating the more or less zigzag crack which forms when the joint is formed by a submerged metal plate.

The highway officials of Delaware report that the cost of the grooved joint averages about seven cents less per lineal foot than the metal-strip joint. After it is filled with bituminous material, the joint presents a permanent line of demarcation along the center of the pavement which is very serviceable for traffic separation. This saves the expense of marking such a line in some other manner and its subsequent upkeep.

The groove-forming machine is leased by its producers to contractors and highway departments. The Delaware officials quote the following leasing prices per lineal foot of pavement as charged by the company:

For projects under	1½	miles	in	length;			$0.06	per	lineal	foot
"	"	from	1½	to	2	miles	in	length;	0.06	"	"	"
"	"	"	2	to	3½	"	"	"	0.05⅓	"	"	"
"	"	"	3	to	4½	"	"	"	0.05	"	"	"
"	"	"	4⅓	to	10	"	"	"	0.04	"	"	"

The company supplies field service men to instruct the lessee in beginning projects.

The platform or bridge used by the workman while extracting the steel mold after the concrete has taken its initial set is built of wood, or formed of angle irons or 2-inch iron pipe, carried by flanged wheels, running on the side forms.

FIG. VIII - COMPLETED WORK FOLLOWING CLOSELY BACK OF MIX.

EXPANSION JOINT CONSTRUCTION IN NEW JERSEY

REPORT BY J. E. MINCHER, HIGHWAY ENGINEER, THROUGH
GUY H. MILLER, DISTRICT ENGINEER.

BOTH PREMOLDED AND POURED JOINTS HAVE BEEN SPECIFIED FOR THE RECENT CONCRETE PAVEMENT WORK OF NEW JERSEY. IN EITHER CASE IT IS REQUIRED THAT THE SURFACE SHALL BE FINISHED CONTINUOUSLY OVER THE JOINTS.

FOR THE CONSTRUCTION OF THE POURED JOINTS THE STATE HAS USED RECENTLY TWO TYPES OF FORM INVENTED BY WILLIAM F. McGOVERN OF THE McGOVERN POURED JOINT COMPANY, TRENTON, N. J. ONE OF THE FORMS IS DESIGNED FOR TRANSVERSE JOINT AND THE OTHER FOR LONGITUDINAL JOINT CONSTRUCTION.

THE FORM FOR THE TRANSVERSE JOINT CONSISTS OF A COMBINATION PAPER BOARD MADE OF THREE UNIFORM THICKNESSES OF CARDBOARD, THE OUTSIDE SECTIONS BEING OF CORRUGATED CARDBOARD, THE INNER BOARD BEING PLAIN, AND ALL THREE BEING HELD TOGETHER TOP AND BOTTOM BY MEANS OF A HEAVY PAPER STICKER AT BOTH PLACES. ON TOP OF THIS PAPER FORM IS FITTED A LIGHT-WEIGHT STEEL CAP TO PROVIDE FOR ADJUSTMENT OF ABOUT 1 INCH IF NECESSARY TO BRING THE FORM FLUSH WITH OR SLIGHTLY UNDER THE FINISHED PAVEMENT AND ENABLE CONTINUOUS SCREEDING OPERATION OVER THE JOINTS. THE TRANSVERSE CARDBOARD FORM IS HELD RIGIDLY VERTICAL ON THE SUBGRADE BY MEANS OF CLOSE-FITTING U-SHAPED STAKES (ABOUT FIVE FOR A 10-FOOT SECTION), AND WHEN THE FORM IS REACHED IN CONCRETING OPERATIONS, THE DELIVERY BUCKET LOAD IS DROPPED CENTRALLY OVER THE FORM TO FURTHER INSURE A VERTICAL JOINT AND AVOID TILTING DUE TO UNEQUAL CONCRETE PRESSURE. AFTER THE CONCRETE IS PLACED AND BEFORE SCREEDING, THE U-SHAPED STAKES ARE REMOVED AND THE STEEL CAP ON THE PAPER FORM IS ADJUSTED TO JUST CLEAR THE SCREED BOARD AFTER WHICH A CONTINUOUS SCREEDING IS CARRIED ON OVER THE TRANSVERSE JOINTS.

WHEN THE CONCRETE HAS SUFFICIENTLY DRIED OUT THE STEEL CAP IS REMOVED AND THE EDGING TOOL IS USED ALONGSIDE THE TRANSVERSE FORM TO SECURE THE PRESCRIBED CURVATURE OF THESE EDGES. LATER IN THE SAME DAY OR WHILE THE CONCRETE IS STILL GREEN, THE PAPER STICKER AT THE TOP OF THE FORM IS BROKEN AND THE INNER, PLAIN CARDBOARD IS REMOVED, LEAVING THE TWO OUTER SECTIONS IN PLACE TO PREVENT ENTRANCE OF DIRT INTO THE JOINT UNTIL SUCH TIME AS POURING OCCURS. THE PAPER FORM IS MOST EASILY REMOVED SHORTLY AFTER CONCRETING. LATER IF THE TRANSVERSE JOINT DOES NOT EXTEND THROUGH TO THE SIDES, OR DOWN TO THE SUBGRADE, THE CONCRETE CAN BE READILY CUT TO EFFECT A COMPLETE SEPARATION. IT CAN BE SEEN, ALSO, WHETHER THE JOINT IS VERTICAL THROUGHOUT AND IF NOT, MORE ATTENTION CAN BE GIVEN TO REMEDY THIS CONDITION. AFTER CURING, JOINTS ARE POURED WITH

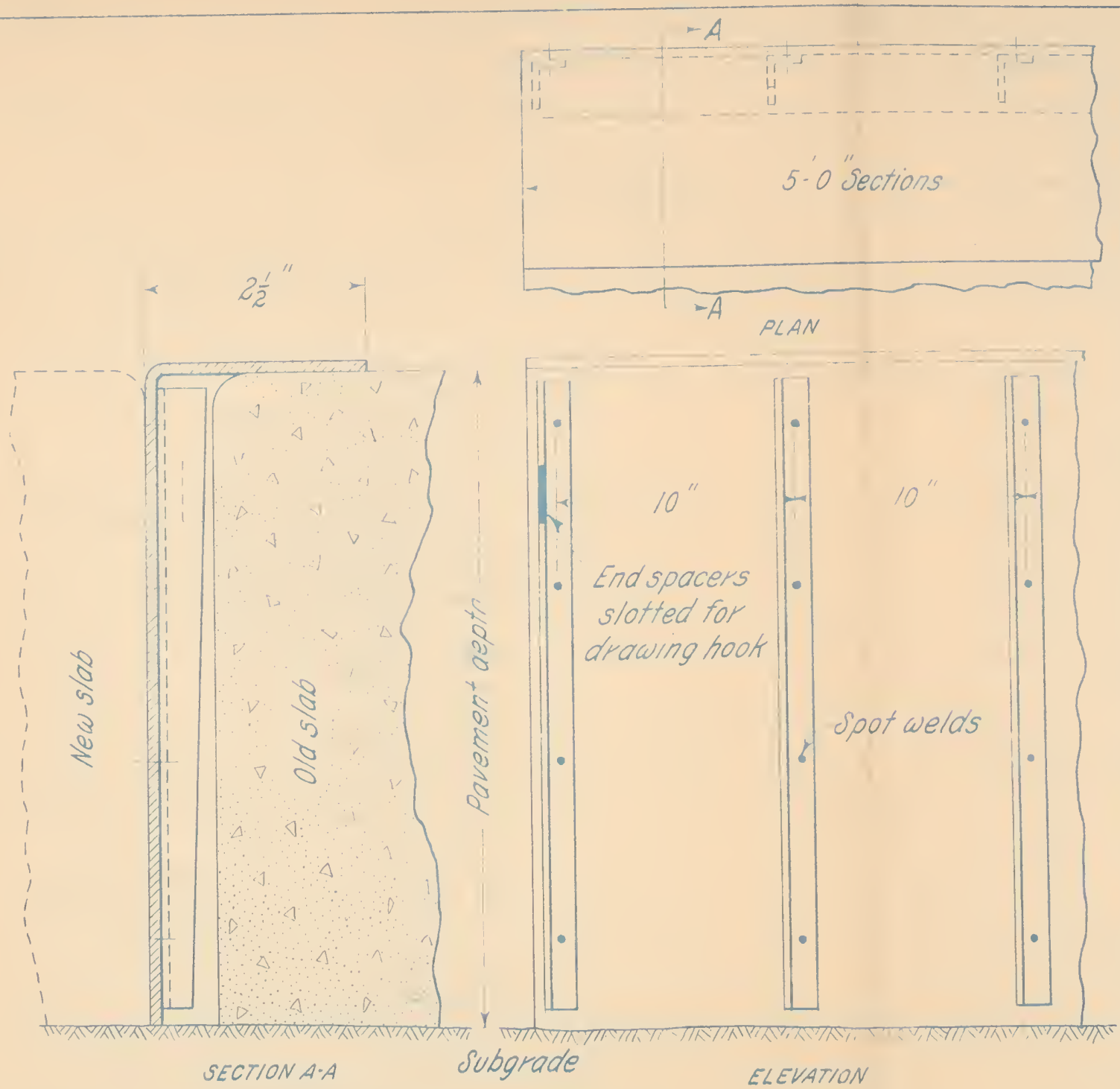
BITUMINOUS MATERIAL USING SAND OR LIMESTONE DUST AS A FILLER, GENERALLY ABOUT 50 PER CENT OF THE LATTER. THE PROCESS PROVIDES A WELL-SEALED JOINT.

FOR FORMING THE LONGITUDINAL JOINT WHEN THE TWO HALVES OF THE PAVEMENT ARE CONSTRUCTED SEPARATELY, A SHEET-STEEL FORM IS PROVIDED IN 5-FOOT SECTIONS MADE UP IN ANGLE SHAPE WITH ONE LEG THE DEPTH OF THE PAVEMENT AND THE OTHER OR TOP FLANGE $2\frac{1}{2}$ INCHES WIDE, WHICH IS SUPPORTED BY THE STRIP OF PAVEMENT FIRST CONSTRUCTED.

TO PERMIT EASY WITHDRAWAL OF THE FORM AND TO PROVIDE THE PROPER WIDTH OF SLOT FOR THE THICKNESS OF JOINT SPECIFIED, A SPACING BAR, ANGLE-SHAPED, IS SPOT-WELDED EVERY 10 INCHES ALONG THE 5-FOOT SECTION, AND THIS SPACER IS TAPERED FROM TOP TO BOTTOM SO AS TO PULL OUT EASILY AFTER THE CONCRETE HAS TAKEN ITS INITIAL SET. THE END SPACERS OF EACH SECTION HAVE A SLOT CUT IN THEM SO THAT A HOOK CAN BE USED TO WITHDRAW THE FORM.

IN FINISHING THE SECOND STRIP OF PAVEMENT ONE END OF THE SCREED RESTS ON THE SIDE FORM AND THE OTHER END ON TOP OF THE STEEL TOP FLANGE ABOVE DESCRIBED. LATER IN THE DAY, WHEN THE CONCRETE HAS SET UP BUT IS STILL GREEN, THE STEEL FORM MAY BE EASILY REMOVED AT ONE END BY MEANS OF A HOOK OR COMMON STOVE POKER AND THE WHOLE FORM MAY THEN BE WITHDRAWN.

A DRAWING OF THE STEEL CENTER JOINT FORM FOLLOWS.



McGOVERN

STEEL CENTER JOINT FORM

McGOVERN POURED JOINT CO.
TRENTON, N.J.

REPORT OF JOINT BOARD ON INTERSTATE HIGHWAYS SUBMITTED TO SECRETARY

REPORTED BY E. W. JAMES, CHIEF, DIVISION OF DESIGN

FOLLOWING THE AUGUST MEETING OF THE JOINT BOARD ON INTERSTATE HIGHWAYS, THE DRAFTING COMMITTEE IN CHARGE OF THE PREPARATION OF THE OFFICIAL REPORT TO THE SECRETARY OF AGRICULTURE, AND THE NUMBERING COMMITTEE CHARGED WITH THE ACTUAL DESIGNATION OF NUMBERS ACCORDING TO A PREARRANGED SYSTEM APPROVED IN GENERAL OUTLINE BY THE BOARD, CONTINUED THEIR WORK. THE FURTHER WORK WITH WHICH THEY WERE CHARGED HAS NOW BEEN COMPLETED, AND THE REPORT OF THE BOARD WAS SUBMITTED TO THE SECRETARY ON OCTOBER 30.

THE SYSTEM AS CONFIRMED BY THE STATE HIGHWAY DEPARTMENTS AND INCORPORATED IN THE FINAL REPORT OF THE BOARD, INCLUDES APPROXIMATELY 75,800 MILES OF ROAD, OR 2.65 PER CENT OF THE TOTAL ROAD MILEAGE CERTIFIED IN ACCORDANCE WITH THE FEDERAL HIGHWAY ACT. SO FAR AS POSSIBLE THE SELECTED ROUTES ARE INCLUDED IN THE FEDERAL-AID SYSTEM, AND WHERE NOT INCLUDED ARE ELIGIBLE FOR INCLUSION WITHIN THE AVAILABLE MARGIN REMAINING TO THE SEVERAL STATES.

ON OCTOBER 26 COPY FOR A BLACK OVERLAY OF THE SELECTED ROUTES TO BE PRINTED ON THE ORIGINAL FEDERAL-AID SYSTEM MAP OF NOVEMBER 1, 1923, CORRECTED TO DATE, WAS FURNISHED THE GEOLOGICAL SURVEY, WHICH WILL DO THE PRESS WORK.

THE FIRST EDITION OF 1,000 COPIES OF THE MAP IN 2 SHEETS, SCALE 37 MILES TO THE INCH, WILL BE MADE FOR GENERAL DISTRIBUTION AND PREPARATION WILL BE MADE FOR A LARGER EDITION IF NECESSARY. IT IS EXPECTED THAT IN THE EVENT OF THE APPROVAL OF THE REPORT BY THE SECRETARY IT WILL BE READY FOR RELEASE AT THE ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS AT DETROIT NOVEMBER 18 TO 20, IN WHICH EVENT THE JOINT BOARD WILL IN ALL PROBABILITY BE DISCHARGED.

INTERSTATE TRAFFIC ON FEDERAL-AID HIGHWAYS

Reported by J. Gordon McKay, Chief, Division of Highway Transport and Economics

To what extent is highway traffic an interstate as contrasted with a local movement? That motor vehicles have vastly widened the range of both passenger and freight transportation, is a fact of common knowledge, and cars displaying license plates from far-distant States attract only passing glances.

Surveys of highway utilization recently made by the Bureau in cooperation with the highway departments of several States give a basis for a reasonably accurate measure of interstate vehicle movement. In the course of these surveys, detailed information has been obtained from the drivers of all vehicles passing designated points on the State highway systems during given periods of time.

How important the interstate movement of vehicles has become is revealed in statistics gathered at Ohio traffic survey station 202, just west of Zanesville. Here a random sampling of passenger cars during a single day each month from December 1924, to September 1925, showed 19 per cent of "foreign" cars (i.e., those vehicles bearing licenses from outside the State). Of these, 60 per cent were from Pennsylvania, West Virginia, Kentucky, Indiana, Michigan, and New York, while the remaining 40 per cent represented other States from California to Maine, as well as the Dominion of Canada.

A large part of the highway traffic crossing State boundaries, however, is only a local movement, and depends upon the relation of the marketing and social center to the areas on either side of the State line. As an extreme example, the large number of Maryland and Virginia cars seen in the District of Columbia may be cited. The fact is further evidenced by the large percentage of foreign cars found in the Bureau's surveys on the highways near the State line.

Almost half of the passenger cars and more than a third of the trucks recorded at a number of survey stations in Pennsylvania within 16 miles of the State line were of foreign registration; and the proportion was nearly as high at a number of Ohio stations similarly located with respect to the State borders. The local character of much of this traffic in Pennsylvania is clearly shown by the fact that when the foreign vehicles recorded are classified according to the distance they travel over the

PENNSYLVANIA HIGHWAYS, THE PERCENTAGE FALLS OFF RATHER SHARPLY WITH INCREASE IN THE MILEAGE OF PENNSYLVANIA HIGHWAYS TRAVERSED.

THE REAL MEASUREMENT, THEREFORE, OF THE FOREIGN USE OF HIGHWAYS, IS TO BE MADE AT A CONSIDERABLE DISTANCE FROM STATE BOUNDARIES, WHERE THE PURELY LOCAL INTERSTATE MOVEMENT DOES NOT DOMINATE TRAFFIC. TABLES 1 AND 2 SHOW FOR PENNSYLVANIA AND OHIO, RESPECTIVELY, THE PROPORTION OF FOREIGN VEHICLES FOUND AT DISTANCES RANGING FROM 40 TO 120 MILES FROM THE NEAREST STATE LINE. THE PERCENTAGE OF FOREIGN PASSENGER CAR TRAFFIC AT THESE POINTS VARIES FROM A MINIMUM OF APPROXIMATELY 9 PER CENT TO AS HIGH AS 30 PER CENT ON SUCH A THROUGH ROUTE AS THE NATIONAL PIKE IN OHIO.

TABLE 1.- FOREIGN VEHICLE TRAFFIC AT INTERIOR POINTS IN PENNSYLVANIA

LOCATION	MILES TO STATE LINE	AVERAGE PASSENGER CARS PER 24-HOUR DAY	FOREIGN PASSENGER CARS		AVERAGE LOADED MOTOR TRUCKS PER 24-HOUR DAY	FOREIGN LOADED MOTOR TRUCKS	
			NUMBER	PER CENT		NUMBER	PER CENT
6 MI. N. OF SCRANTON	42	2739	482	17.6	221	8	3.6
MILLERSTOWN	68	773	98	12.7	45	-	-
1½ MI. S. OF SALINA	53	904	104	11.5	30	-	-
¼ MI. W. OF WOMELSDORF	66	1054	102	9.7	73	1	1.4
3⅗ MI. S. OF SUNBURY	110	1572	168	10.7	90	1	1.1
4 MI. N. OF WILLIAMSPORT	61	997	167	16.8	48	2	4.2
1 MI. N. OF HARRISBURG	47	2879	274	9.5	213	1	0.5
1 MI. E. OF E. MCKEESPORT	47	2696	297	11.0	163	3	1.8
WEIGHTED AVERAGE				12.4			1.8

TABLE 2.- FOREIGN VEHICLE TRAFFIC AT INTERIOR POINTS IN OHIO

LOCATION	MILES TO STATE LINE	AVERAGE PASSENGER CARS PER 10-HOUR DAY	FOREIGN PASSENGER CARS		AVERAGE MOTOR TRUCKS PER 10-HOUR DAY	FOREIGN MOTOR TRUCKS	
			NUMBER	PER CENT		NUMBER	PER CENT
3½ MI. W. OF DALTON	77	881	77	8.7	119	1	0.8
2½ MI. N. OF WOOSTER	91	588	53	9.0	72	1	1.4
½ MI. S.W. OF MT. VERNON	120	940	88	9.4	68	2	2.9
1 MI. E. OF CAMBRIDGE	48	843	253	30.0	82	7	8.5
1½ MI. N. OF SIDNEY	41	502	102	20.3	42	3	7.1
5 MI. N. OF CHILLICOTHE	48	669	68	10.2	52	1	1.9
1 MI. S.W. OF ELYRIA	100	1574	256	16.3	187	8	4.3
5 MI. E. OF ZANESVILLE	53	770	214	27.8	64	5	7.8
7 MI. N. OF FINDLAY	42	1242	244	19.6	85	7	8.2
2 MI. E. OF SPRINGFIELD	58	1175	223	19.0	69	2	2.9
N.E. OF CLEVELAND AT WICKLIFFE	54	2376	293	12.3	287	9	3.1
2 MI. E. OF BELLEVUE	56	1387	310	22.3	142	11	7.7
WEIGHTED AVERAGE				16.8			4.5

TRUCK TRAFFIC, BEING LARGELY A SHORT-HAUL MOVEMENT, BECOMES OF FAR LESS IMPORTANCE AT SUCH DISTANCES FROM THE STATE BOUNDARIES. IN PENNSYLVANIA AT THE TRAFFIC SURVEY STATIONS SHOWN IN THE TABLES, THERE WERE IN NO CASE MORE THAN 4 PER CENT OF FOREIGN TRUCKS RECORDED. IN OHIO IT IS SURPRISING TO DISCOVER A PERCENTAGE OF BETWEEN 7 AND 8.5 AT CERTAIN POINTS.

IN THE SUMMER MONTHS, AS MIGHT BE PREDICTED, INTERSTATE TRAVEL ASSUMES ITS HIGHEST PROPORTIONS. AT THE 12 OHIO STATIONS LISTED IN TABLE 2, DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER, THE PERCENTAGE OF FOREIGN PASSENGER CARS WAS 22.2.

Taking the traffic at the survey stations distributed over the State as a whole, we have the proportions shown in Table 3. Ohio appears to have a slightly higher proportion of foreign passenger car traffic and a slightly lower percentage of truck traffic, despite the high percentage of the latter on a few of the principal routes.

Table 3.- Average percentage of foreign vehicles in Pennsylvania and Ohio

	Pennsylvania: 94 stations: 24-hour day	Ohio 36 stations 10-hour day
Total daily passenger cars	147,466	32,577
Total daily foreign passenger cars	26,137	6,054
Total daily motor trucks	9,954*	3,321
Total daily foreign motor trucks	815*	247
Percentage of foreign passenger cars	17.7	18.6
Percentage of foreign motor trucks	8.2*	7.4

*Loaded motor trucks only.

Similar studies resulting from a survey in Connecticut showed 21.1 per cent of the passenger cars and 10.9 per cent of the motor trucks to be of foreign registration. That these foreign vehicles tend to make greater use of the highways in proportion to their numbers is indicated by the fact that the 21.1 per cent of foreign passenger cars accounted for 43.4 per cent of the passenger car-miles on the State highways, and provided transportation to the extent of 43.7 per cent of the passenger-miles. Similarly, the 10.9 per cent of foreign motor trucks are responsible for 32.8 per cent of the total gross ton-miles of traffic on the State highways.

These analyses show clearly that highways are no longer neighborhood affairs, to be discussed in town meeting and to be maintained by local organizations. It is some time since their care became properly a function of the State. Now motor vehicles have given them decided interstate importance. The indiscriminate use by the average automobile owner of the highways of several States, suggests the logic of enlarging the political unit which plans and builds the primary highway system, and enlarging also the taxable area which pays for such development. Federal-aid is national recognition of this altered situation.

ALLOTMENT OF FEDERAL AID ON ALTERNATE - TYPE PROJECTS

THE DIVISION OF DESIGN, IN COOPERATION WITH THE DIVISION OF CONSTRUCTION, IS TRYING TO WORK OUT A BETTER METHOD OF CHECKING THE UNIT PRICES SUBMITTED ON CONTRACT ESTIMATES, IN ORDER TO MAKE SURE THAT THE FEDERAL-AID PRO RATA IS BASED ON THE ACCEPTABLE LOW BID PRICES.

THIS IS A PROBLEM WHICH HAS CONFRONTED THE BUREAU EVER SINCE FEDERAL-AID WORK STARTED, BUT BECAUSE OF ITS MANY PERPLEXING ANGLES, CHANGES IN POLICY FROM TIME TO TIME HAVE BEEN NECESSARY. THE GROWING PRACTICE OF CALLING FOR COMPETING PRICES ON SEVERAL TYPES OF PAVEMENT, CULVERTS AND GUARD RAIL, MAKES IT DESIRABLE THAT A MORE UNIFORM POLICY BE FORMULATED FOR ALLOTTING FEDERAL AID IN SUCH CASES.

MATTERS COULD BE SIMPLIFIED IF THE STATE HIGHWAY DEPARTMENTS WOULD DETERMINE IN ADVANCE OF THE ADVERTISING JUST WHAT MATERIALS WERE BEST SUITED FOR EACH PARTICULAR JOB, AND REQUEST BIDS ON ONE TYPE ONLY. THIS IS NOT ALWAYS POSSIBLE, HOWEVER, AND IF COMPETING MATERIALS MUST BE PUT UP FOR BIDS, THE ONLY FAIR POLICY THE BUREAU HAS BEEN ABLE TO WORK OUT IS TO BASE THE FEDERAL AID ALLOTMENT ON THE LOW BID REGARDLESS OF TYPE.

IT IS OBVIOUS THAT ALL COMPETING MATERIALS ARE NOT OF EQUAL SERVICE VALUE, AND IF IT WERE PRACTICABLE IT WOULD SEEM PROPER TO SET UP DIFFERENTIALS FOR THE VARIOUS CLASSES OF MATERIAL. THIS PLAN WAS TRIED AT ONE TIME AND SOON DISCARDED BECAUSE IT PROVED IMPOSSIBLE TO SET UP FAIR DIFFERENTIALS. IT WAS FOUND THAT NO TWO ENGINEERS HAD THE SAME VIEWS OF THE RELATIVE MERITS OF THE COMPETING MATERIALS AND A DIFFERENTIAL ESTABLISHED FOR ONE JOB WAS NOT APPLICABLE TO ANOTHER JOB IN THE SAME STATE OR EVEN IN THE SAME COUNTY BECAUSE NO TWO JOBS HAVE THE SAME CONDITIONS OF HAUL, FREIGHT RATES, LABOR, ETC. THE SETTING UP OF DIFFERENTIALS ALSO MET WITH STRONG OBJECTIONS FROM THE MATERIAL INTERESTS.

THE POLICY NOW IN FORCE IS TO ALLOW COMPETING MATERIALS TO BE PUT UP FOR BIDDING PROVIDED ALL OF THE MATERIALS ARE ADEQUATE FOR THE CONDITIONS PREVAILING ON THE PARTICULAR JOB. THE MATERIALS NEED NOT NECESSARILY BE OF EQUAL SERVICE VALUE, BUT AT LEAST THEY MUST ALL BE ADEQUATE AND SATISFACTORY TO THE BUREAU. IF ALL THE MATERIALS ARE CONCEDED TO BE ADEQUATE FOR THE JOB, THEN IT SEEMS LOGICAL TO BASE THE FEDERAL-AID ALLOTMENT ON THE LOWEST RESPONSIBLE BID REGARDLESS OF TYPE. THIS IS THE POLICY NOW BEING FOLLOWED AND IT SEEMS TO BE WORKING SUCCESSFULLY.

To carry out this policy intelligently it is important that information be submitted with the contract estimates explaining whether the Federal-aid allotment is based on the low bid for competing materials and the general letter to District Engineers dated October 13, 1925, conveyed this request to the field.

If the tabulation of bids has not already been submitted, it must be sent in with the contract estimate so that action can be taken without delay. If the award has not been made to the low bidder, the Division of Design will cooperate with the Division of Construction in order to reach an agreement as to the allowable Federal aid consistent with the Bureau policy. When vouchers are submitted there should be no delay due to this feature because it will have been settled before the estimate is approved. It is believed that this plan of action will materially expedite the work.

PERMISSABLE AMENDMENTS OF FOREST ROAD CONTRACTS LIMITED

Several amendments or modifications of forest road contracts were recently submitted to provide for the contractor to do work beyond the limits of the original contract, work in no sense contemplated by the original contract and not even provided for by contingent provision in the original contract. In one instance, the amount of work proposed to be given the contractor through the medium of a supplementary agreement amounted to approximately 50 per cent of the original contract, all being beyond the termini of the original contract. Such a supplemental agreement is tantamount to awarding a contract without competition. Supplemental contracts may be entered into respecting the work contemplated by the original contract and necessarily incidental thereto, if in the interest of the Federal Government, but not for work entirely beyond and outside the limits of the original contract unless a public exigency is clearly shown. Convenience and the fact that the contractor can handle the additional work does not constitute an exigency. All amendments of contracts signed by the Secretary should be executed on behalf of the Department by the Secretary.

HIGHWAY RESEARCH NEWS

Reported by the Division of Tests and Research

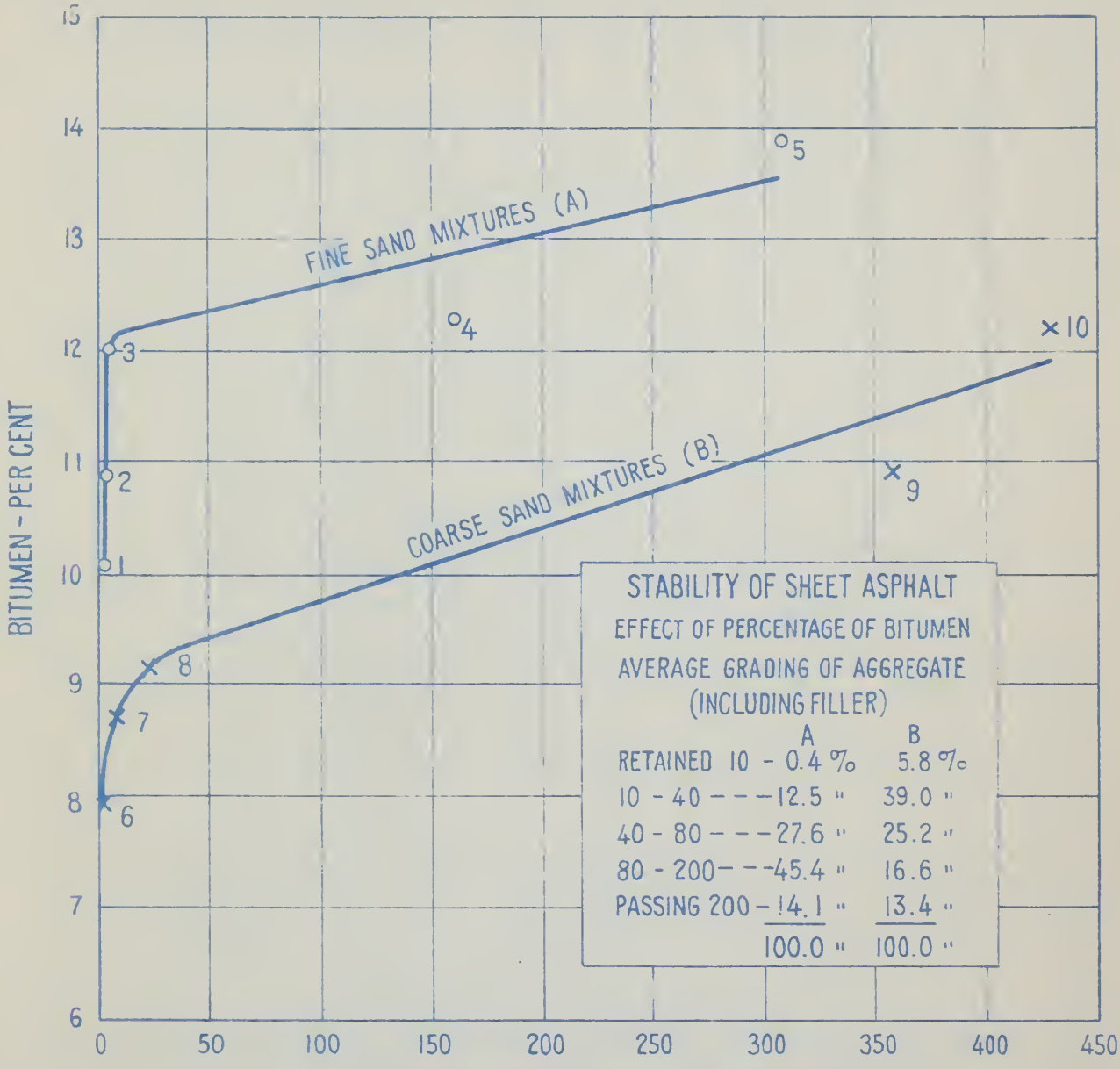
The Bituminous Stability Experiment

During the late summer of 1924 a second series of asphaltic mixtures was laid on the circular track at Arlington Farm. Thirty-three different mixtures were used; each occupying a section of about 25 square yards. Twenty-eight sections were constructed of sheet asphalt without the customary binder course and 5 sections were of limestone-asphaltic concrete. It was intended to study the stability of these several mixes as affected by variations in: (1) Sand grading; (2) bitumen content; (3) filler content; and (4) consistency of the asphaltic cement, both steam-refined and blown. The test is now considered complete after subjecting the several sections to 75,000 passages of a truck loaded to about 7 tons. The distortion of painted lines across each section on which 25 reference plugs were set, indicates that several of the mixes have shoved and rutted very badly. Others have proved extremely resistant to the traffic imposed.

It will require considerable study to explain the behavior of all of the sections. However, the effect of variations in the bitumen content upon the stability of mixtures containing the same aggregate combination is clearly evident. The accompanying chart indicates this effect in connection with 2 series of 5 sections each. Bitumen content is here plotted against the sum of the forward movement of 25 plugs set in the surface across the 13-foot width of the pavement. Mixes Nos. 1, 2, 3 and 6 all present excellent surfaces at the end of the test. Mixes 7 and 8 show a very slight tendency to rut but very little evidence of shoving. Sections 4, 5, 9 and 10 are very badly rutted and distorted. The greatest forward movement was recorded in the very rich mixture, No. 10, in which one plug was shoved ahead approximately 9 feet.

Proposed Tests of Thin Paving Brick

The Division of Tests is about to conduct a series of tests for the purpose of establishing, if possible, a measure of the comparative value of vitrified paving brick of various depths, particularly those less than 3 inches thick. For this purpose it is proposed to utilize the concrete base of the circular track at Arlington Farm, from which the sheet asphalt sections comprising



DISPLACEMENT OF 25 PLUGS - INCHES

EFFECT OF BITUMEN CONTENT UPON THE STABILITY OF CERTAIN SHEET ASPHALT MIXTURES

THE SECOND SERIES OF STABILITY TESTS ARE NOW BEING REMOVED, AS THE BASE FOR A SERIES OF VITRIFIED PAVING BRICK WEARING COURSES OF THE FOLLOWING DEPTHS: 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$ AND 4 INCHES. THE SECTIONS WILL BE CONSTRUCTED BY EXPERT PAVERS AND WILL BE LAID ON A 1-INCH SAND BED, THE JOINTS BEING FILLED WITH ASPHALT.

IT IS PROPOSED TO TEST THE EXPERIMENTAL PAVEMENT BY MEANS OF A MOTOR TRUCK EQUIPPED WITH SOLID-RUBBER TIRES, WHICH WILL BE DRIVEN AROUND THE CIRCLE AT A GIVEN SPEED AND UNDER VARIOUS INCREMENTS OF LOADING. THIS WILL BE FOLLOWED BY A SECOND SERIES OF TESTS, USING THE SAME TRUCK AND LOADS BUT WITH THE WHEELS EQUIPPED WITH NON-SKID CHAINS. IT IS HOPED BY MEANS OF THIS SERIES OF TESTS TO DETERMINE WHETHER VITRIFIED BRICK LESS THAN 3 INCHES IN DEPTH WILL SATISFACTORILY WITHSTAND THE ABUSE OF ACTUAL TRAFFIC. THE TEST SECTIONS WILL BE LAID ABOUT THE MIDDLE OF NOVEMBER AND THE TESTS WILL BE BEGUN IMMEDIATELY THEREAFTER.

Freezing and Thawing Tests of Concrete

ATTENTION HAS BEEN ATTRACTED RECENTLY BY FAILURES OF CONCRETE WHICH HAVE BEEN ATTRIBUTED TO THE INABILITY OF THE AGGREGATES USED TO RESIST REPEATED FROST ACTION WITHOUT DISINTEGRATION AND CONSEQUENT INJURY TO THE CONCRETE. CERTAIN LABORATORY TESTS HAVE BEEN PROPOSED, NOTABLY THE SODIUM SULPHATE ACCELERATED SOUNDNESS TESTS, WHICH ATTEMPT TO PRE-DETERMINE THIS CHARACTERISTIC OF THE AGGREGATE. IT IS THOUGHT, HOWEVER, THAT LABORATORY TEST DATA OBTAINED BY MEANS OF THIS TEST SHOULD BE CORRELATED WITH ACTUAL FREEZING TESTS ON THE CONCRETE IN WHICH THE AGGREGATES ARE INCORPORATED BEFORE THE RESULTS CAN BE INTERPRETED CORRECTLY.

FOR THIS PURPOSE THE DIVISION OF TESTS NOW HAS UNDER WAY A SERIES OF FREEZING AND THAWING TESTS ON CONCRETE, IN WHICH VARIOUS TYPES AND GRADES OF COARSE AGGREGATE ARE USED. MATERIALS BEING STUDIED INCLUDE TRAP ROCK, SEVERAL GRADES OF LIMESTONE, INCLUDING CHERTY LIMESTONE, LIMESTONE CONTAINING THIN SHALE BANDS, ETC., DOLOMITES, SOFT SANDSTONES, GRAVELS RANGING IN QUALITY FROM HARD QUARTZ TO GRAVELS CONTAINING RELATIVELY SOFT, EASILY DISINTEGRATED MATERIALS, AN EXCESS OF FLAT PIECES, SHALE, ETC. BOTH HEAVY AND LIGHT-WEIGHT BLAST FURNACE SLAGS WILL ALSO BE INVESTIGATED. THE TESTS WILL BE MADE ON BEAMS WHICH ARE TO BE ALTERNATELY FROZEN AND THAWED A NUMBER OF TIMES AND THEN TESTED FOR MODULUS OF RUPTURE. FOR THIS PURPOSE THE BUREAU HAS SECURED THE USE OF ONE OF THE LOW-TEMPERATURE ROOMS IN THE COLD STORAGE PLANT AT ARLINGTON, WHERE A TEMPERATURE OF ABOUT 20° F. CAN BE MAINTAINED. IT IS BELIEVED THAT THE RESULTS OF THESE TESTS WILL CLEAR UP SOME DOUBTFUL POINTS REGARDING THE SIGNIFICANCE OF THE ACCELERATED SODIUM SULPHATE SOUNDNESS TEST AND THE VALUE IN GENERAL OF CERTAIN TYPES OF

materials as aggregate for concrete.

Sodium Silicate Curing Tests

The Bureau has recently investigated to a limited extent the value of sodium silicate as a curing agent for concrete. The results of a number of tests for modulus of rupture on concrete beams cured in both the conventional way and by means of sodium silicate indicated that the actual strength of the concrete at the expiration of 28 days was slightly higher in the case of the sodium-silicate-cured specimens. This data, though interesting, should not be considered however as evidence that sodium silicate will make a satisfactory curing agent because we have no information regarding the possible service behavior under traffic of roads cured in this manner. A service test of sodium silicate as a curing agent was recently begun in Jefferson County, Mo., in cooperation with the State Highway Department, the results of which should be of interest.

Vibrolithic Concrete Tests

Tests of concrete slabs made in connection with a study of the effect of the patented Vibrolithic method of constructing pavements have been made after 28 days of damp-earth curing. An equal number will be broken at the age of one year.

There has not yet been sufficient time to complete the necessary computations but the original data obtained are indicative of certain interesting characteristics. In general, it has been found that the tensile strength as indicated by the modulus of rupture was greater in the top of the test sections made in the ordinary manner than in the bottom. The Vibrolithic concrete showed practically no difference in strength between top and bottom. It should be remarked in this connection that the voids in the bottom of the normal concrete were much more apparent than in the Vibrolithic. Those voids which occurred in the Vibrolithic sections seemed to be located at or a little below the center of the slab.

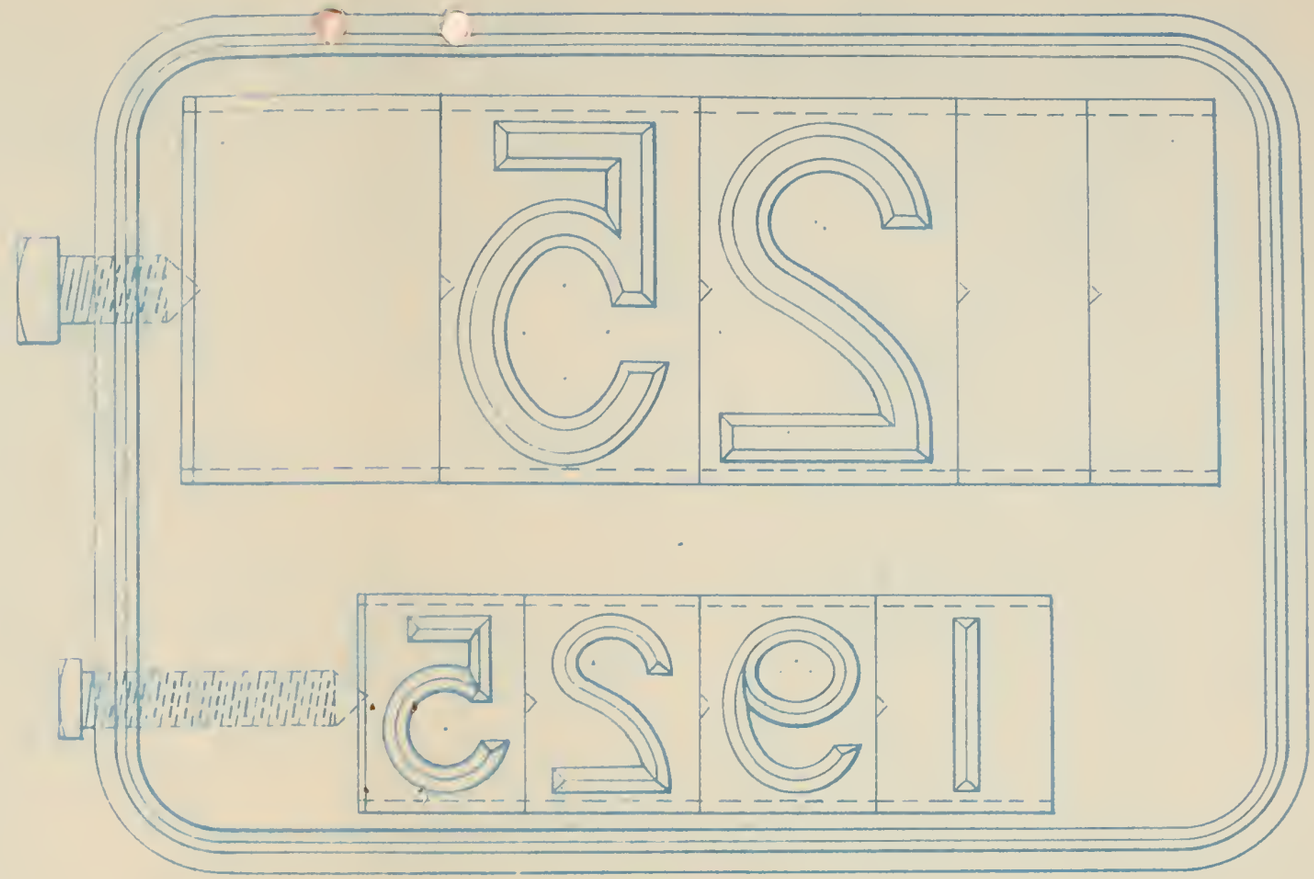
CONCRETE PAVEMENT STATION MARKER

COMPILED FROM SKETCH AND DESCRIPTION
BY DISTRICT ENGINEER J. T. VOSHELL

THE FOLLOWING SKETCH SHOWS A STATION MARKER, AND METHOD FOR ITS USE SUGGESTED BY MR. VOSHELL FOR PERMANENTLY MARKING THE STATIONS AND YEAR OF IMPROVEMENT ON CONCRETE ROADS DURING CONSTRUCTION. THE MARKING FRAME IS PROVIDED WITH DETACHABLE FIGURES, THE MANIPULATION OF WHICH MAY BE READILY OBSERVED FROM THE DRAWING.

THE MARKING OF STATIONS ON CONCRETE PAVEMENTS APPEALS TO US VERY STRONGLY, AND WE BELIEVE THE OBVIOUS MERITS OF THE PROPOSAL WILL WIN THE INSTANT APPROVAL OF INSPECTING AND MAINTENANCE ENGINEERS ESPECIALLY. THE DISTANCE BETWEEN MARKINGS AND THEIR POSITION ON THE PAVEMENT ARE MATTERS OF OPINION. MR. VOSHELL SUGGESTS THAT THE STAMP BE PLACED AT 500-FOOT INTERVALS AND AT STATION LOCATIONS DIVISIBLE BY FIVE; THAT THE OUTER MARGIN OF THE PAVEMENT ON BOTH SIDES BE USED FOR THE LOCATION; AND THAT THE STAMP BE PLACED IN SUCH A WAY THAT IT MAY BE READ WHILE WALKING ON THE LEFT SIDE OF THE ROAD.

STATION MARKER – CONCRETE PAVEMENT



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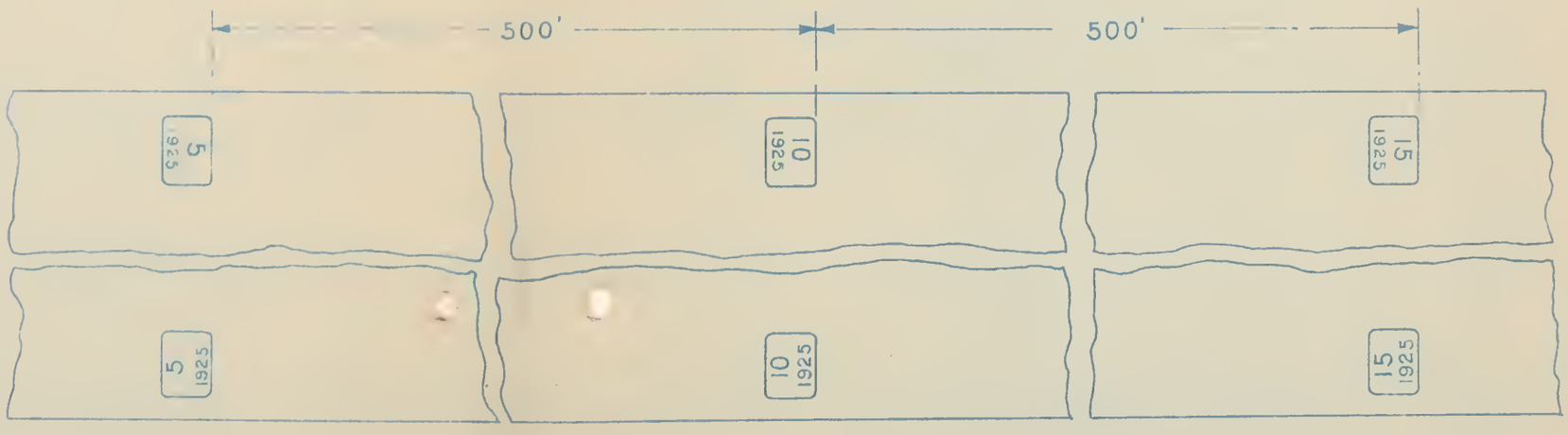
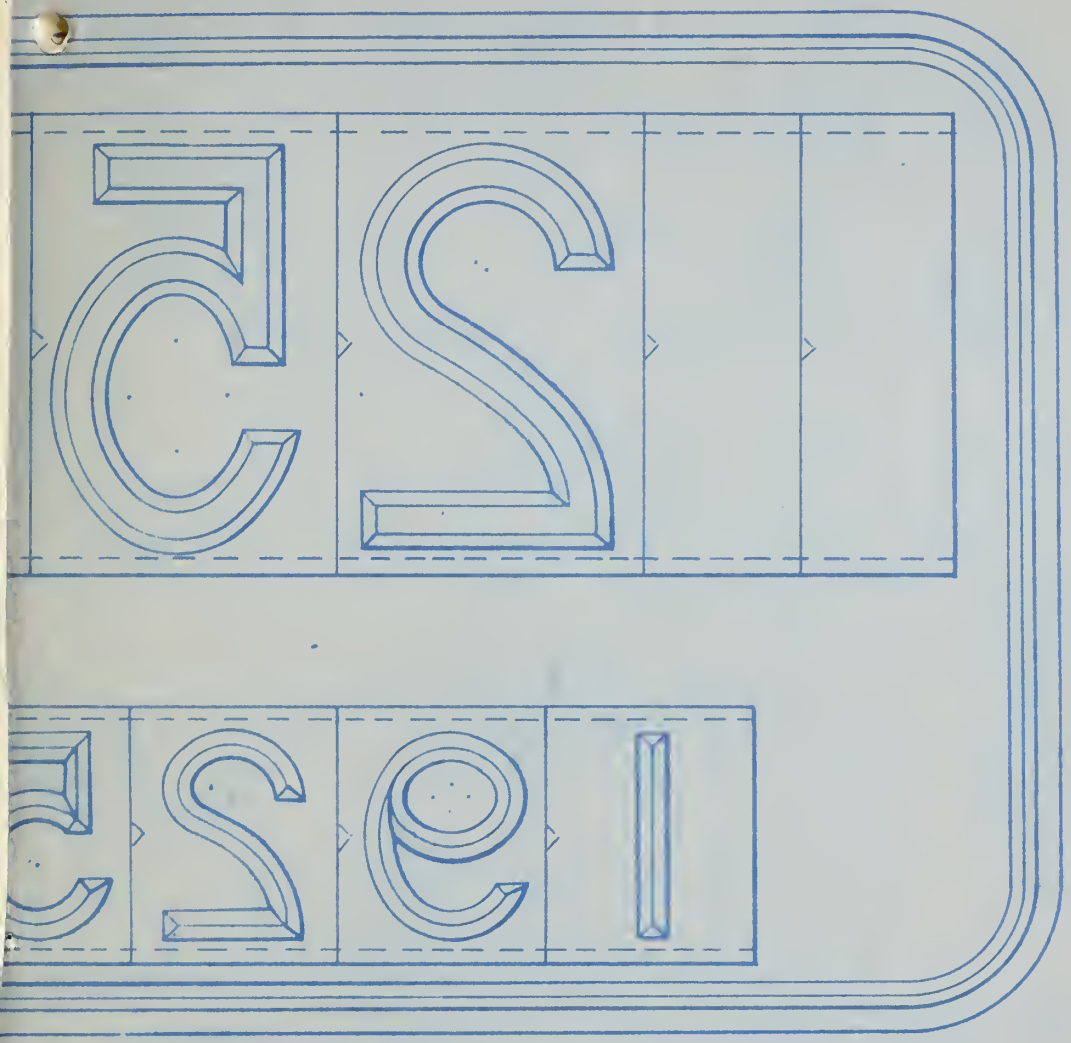


MARKER – CONCRETE PAVEMENT



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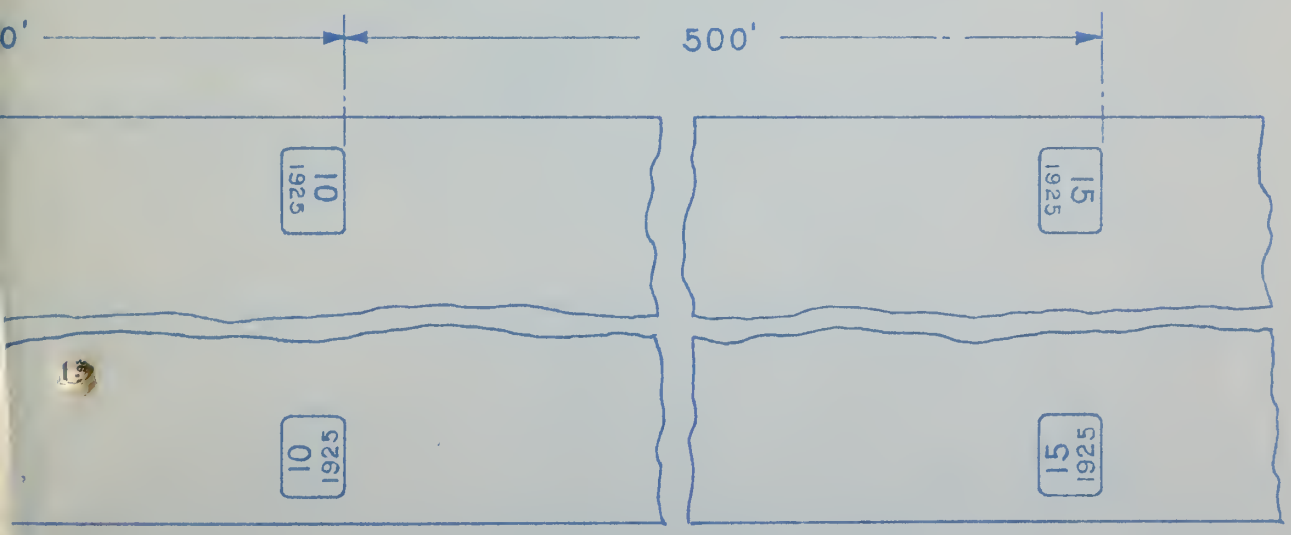

RELATIVE COSTS OF STEEL BRIDGE SPANS CARRYING WOOD AND CONCRETE FLOORS

REPORTED BY O. L. GROVER, BRIDGE ENGINEER

SOMETIMES THERE IS A QUESTION AS TO THE RELATIVE COST OF TWO STEEL SPANS, ONE TO CARRY A CONCRETE FLOOR AND THE OTHER A WOOD FLOOR.

MANY DESIGNS ARE AVAILABLE, THE ESTIMATED COSTS OF WHICH CAN BE HAD FOR COMPARISON. UNFORTUNATELY, IN NEARLY ALL CASES THERE ARE OTHER DIFFERENCES THAN THE FLOOR. ABOUT TWO YEARS AGO IT WAS NECESSARY TO ESTIMATE THIS DIFFERENCE IN COST AS CLOSELY AS POSSIBLE FOR A RATHER LARGE BRIDGE. DESIGNS WERE MADE OF THE SEVERAL DIFFERENT SPANS OF WHICH THE BRIDGE COULD BE MADE FOR EITHER A 7-INCH CONCRETE FLOOR SLAB OR A 4-INCH WOOD FLOOR AND ESTIMATES OF COST SHOWED A PROBABLE DIFFERENCE IN COST OF FROM $5000 TO $8000 FOR A BRIDGE 500 FEET LONG WITH AN 18-FOOT ROADWAY. THIS MEANS THAT THE CONCRETE-FLOORED BRIDGE WOULD COST FROM $10 TO $16 PER LINEAL FOOT MORE THAN THE WOOD-FLOORED BRIDGE.

DURING THE PAST FEW MONTHS WE HAVE HAD ANOTHER OPPORTUNITY TO COMPARE COSTS, THIS TIME ON A STEEL VIADUCT 381 FEET LONG WITH A 20-FOOT ROADWAY ON CONCRETE PEDESTAL FOUNDATIONS. BIDS WERE TAKEN ON A WOOD-FLOOR DESIGN BEFORE THE QUESTION CAME UP. THE BRIDGE WAS REDESIGNED FOR THE SAME LOADING BUT USING A CONCRETE FLOOR AND THE CONTRACTOR AGREED TO DO THE WORK AT THE PRICE BID FOR THE WOOD-FLOOR STRUCTURE ALTHOUGH THE ESTIMATED QUANTITIES INDICATED AN ADDITIONAL COST OF ABOUT $1400.

THE AUTHORITY OF SURETY COMPANY AGENTS

As a general rule agents of surety companies are without authority to ratify on behalf of their companies modifications of contracts. Bonding companies file with the Treasury Department lists of agents throughout the country, and a statement as to the authority vested in each agent. When modified agreements are received with ratification executed on the part of a bonding company by its agent, inquiry is made of the Treasury Department as to whether such agent is authorized to bind the company and, if not, ratification must be obtained from the home office of the company. This necessarily consumes time and frequently delays the execution of supplemental agreements where such action is necessary.

The lists of agents filed by bonding companies with the Treasury Department give not only the names of the agents but the extent of their authority and the territory within which they may exercise such authority. In ascertaining from the Treasury Department whether an agent of a bonding company has authority to execute a bond on a contract, therefore, it is important to know where the instrument was executed. Frequently where bonding company agents undertake to execute ratifications of supplemental agreements there is nothing to indicate at what place the instrument was executed by the agent. This information should always appear. We will then be able to determine whether the agent was acting within the territory assigned to him.

SUSPENSIONS AND DECISIONS OF THE COMPTROLLER GENERAL

The General Accounting Office recently made the following statement in connection with reimbursement accounts where the employee was in a travel status during the entire month:

> "As the right of an employee to actual expense of subsistence, or to a per diem in lieu thereof, is determined by the actual facts or circumstances, rather than by any arbitrary designation of post of duty, it is necessary to state the place where the present per diem was incurred; when employee left place designated in voucher as his official station, what duties, if any, were performed thereat; and the approximate date when the duties performed at place where per diem is claimed will be completed."

The information requested above must be shown on all expense accounts where the employee last left his official station on a date prior to the period covered by the account.

In the case of an employee who paid cash for garage rent on a Government automobile for one month and claimed reimbursement in his expense account, the General Accounting Office stated:

> "There is no authority of law for the creation of a claim against the Government by the advance payment of private funds to pay an obligation of the United States. Since the above appears to be a voluntary payment on the part of the employee out of his private funds, of an obligation which he is not legally required or authorized to incur, it is not a proper charge against the Government."

Under these conditions, it is advisable to have all claims against the Government, submitted on regular departmental voucher forms by the original claimants wherever possible.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

STATUS OF FEDERAL AID ROAD CONSTRUCTION FUNDS

AS OF SEPTEMBER 30, 1925

B.P.R. - F.A. - A - 1
M - Sept. 30, 1925 A

STATES	1	2		3		4	5		6						STATES
	APPORTIONMENT FROM JULY 11:1916 TO DATE	ALLOTTED TO PROJECTS (SEE COLUMN 6 FOR DETAILS)		PLACED UNDER CONSTRUCTION		PAID TO STATES	BALANCE OF APPORTIONMENTS		ALLOTMENTS TO PROJECTS (SUBDIVISION OF AMOUNTS SHOWN IN COLUMN 2)						
							NOT ALLOTTED TO PROJECTS (COLUMN 1-2)	NOT YET PLACED UNDER CONSTRUCTION (COLUMN 1-3)	COMPLETED AND PAID		AGREEMENT STAGE		P.S.&E. STAGE RECOMMENDED BY DISTRICT ENGINEER		
		FEDERAL AID	MILES	FEDERAL AID	MILES				FEDERAL AID	MILES	FEDERAL AID	MILES	FEDERAL AID	MILES	
ALABAMA	$ 12,809,656.00	$ 10,628,792.34	1,452.0	$ 10,463,742.34	1,440.4	$ 8,512,611.45	$ 2,179,853.66	$ 2,354,913.66	$ 4,090,622.15	746.2	$ 6,328,350.92	694.2	209,819.27	11.6	ALABAMA
ARIZONA	8,561,341.00	6,691,852.39	813.6	6,411,431.42	778.1	5,827,075.76	1,969,488.61	2,149,909.58	5,161,517.00	620.9	1,082,781.41	174.9	347,553.98	17.9	ARIZONA
ARKANSAS	10,337,897.00	9,793,232.84	1,609.8	9,276,929.90	1,524.0	7,999,984.15	654,664.06	1,060,967.10	6,129,497.51	1,109.0	2,685,384.46	366.5	968,350.97	134.3	ARKANSAS
CALIFORNIA	19,588,109.00	17,090,900.64	1,278.8	16,358,484.78	1,189.7	13,497,975.60	2,497,208.36	3,229,624.22	11,229,001.69	919.2	4,476,969.36	240.9	1,384,929.59	118.9	CALIFORNIA
COLORADO	10,945,428.00	8,762,527.23	908.3	8,652,579.99	894.7	7,355,825.01	2,182,900.77	2,292,948.11	8,369,025.01	672.1	1,838,106.22	175.1	555,396.00	61.1	COLORADO
CONNECTICUT	3,860,253.00	2,619,876.28	142.0	2,600,551.29	140.5	2,261,977.66	1,240,377.72	1,259,701.72	1,991,315.80	111.1	555,909.36	29.2	72,750.12	1.7	CONNECTICUT
DELAWARE	2,108,433.00	2,097,520.36	142.1	2,097,520.36	142.1	1,689,111.87	10,912.65	10,912.65	1,676,774.50	119.2	158,080.85	5.4	262,665.00	17.6	DELAWARE
FLORIDA	7,187,769.00	5,980,379.34	359.9	5,776,197.57	348.1	4,297,764.47	1,207,389.66	1,411,571.43	1,405,487.97	98.3	4,370,709.60	251.8	204,181.77	11.8	FLORIDA
GEORGIA	16,450,764.00	16,022,674.24	2,372.1	15,587,456.00	2,281.1	13,512,024.33	428,089.76	863,308.00	10,159,215.95	1,587.2	4,852,376.55	667.5	1,011,081.74	117.3	GEORGIA
IDAHO	7,623,038.00	7,035,227.05	834.9	6,623,846.09	797.6	5,343,690.95	587,910.95	999,191.91	4,916,699.74	621.1	1,526,177.93	156.6	592,349.38	57.2	IDAHO
ILLINOIS	26,655,582.00	23,146,767.14	1,551.1	23,146,757.14	1,551.1	21,294,030.28	3,509,924.96	3,509,924.86	18,930,917.50	1,261.2	3,765,420.41	262.9	400,519.23	27.1	ILLINOIS
INDIANA	16,268,466.00	15,132,227.82	938.7	15,076,147.42	934.5	11,912,655.56	1,136,237.18	1,192,317.58	7,106,998.52	463.3	7,514,508.98	442.0	510,620.32	33.4	INDIANA
IOWA	17,425,094.00	15,284,343.57	2,599.9	14,588,015.92	2,476.9	13,255,111.96	2,140,750.43	2,837,078.08	11,146,988.94	2,013.2	3,733,136.22	507.8	404,218.41	78.8	IOWA
KANSAS	17,392,245.00	15,915,503.61	1,580.9	15,450,479.62	1,477.4	13,456,077.70	1,476,741.39	1,941,765.38	10,922,852.50	946.6	4,112,796.50	470.0	979,954.51	164.4	KANSAS
KENTUCKY	11,796,000.00	10,361,752.13	943.5	10,321,926.20	936.6	9,027,703.33	1,434,247.87	1,474,074.90	6,771,014.67	630.5	3,450,748.74	293.0	139,988.72	20.1	KENTUCKY
LOUISIANA	8,271,544.00	7,299,480.28	1,123.2	7,016,423.39	1,101.4	6,596,988.25	972,153.72	1,255,220.61	5,691,182.30	992.5	1,455,308.97	107.9	152,988.41	22.7	LOUISIANA
MAINE	5,781,254.00	4,937,917.66	365.8	4,545,084.30	330.2	4,206,263.47	843,336.34	1,236,169.70	3,993,603.92	288.0	551,480.38	42.2	392,933.36	35.5	MAINE
MARYLAND	5,290,433.00	6,271,540.65	436.4	5,271,540.65	436.4	4,425,644.27	18,792.35	18,792.35	3,978,109.00	304.1	1,293,531.65	131.3			MARYLAND
MASSACHUSETTS	9,019,671.00	7,371,933.99	404.6	7,198,999.86	396.5	5,823,734.71	1,647,737.01	1,820,772.14	5,632,676.88	311.6	1,522,504.14	87.1	216,752.97	5.9	MASSACHUSETTS
MICHIGAN	18,124,947.00	15,052,738.24	1,117.1	14,939,527.67	1,117.1	12,897,982.23	3,072,208.76	3,185,419.33	8,662,636.18	727.0	6,375,937.99	368.7	414,264.07	20.5	MICHIGAN
MINNESOTA	17,461,612.00	17,016,264.11	3,634.2	16,962,464.11	3,585.7	15,271,232.98	446,347.99	499,147.89	13,487,064.11	2,897.9	2,387,200.00	552.9	1,141,000.00	183.6	MINNESOTA
MISSISSIPPI	10,834,915.00	10,066,851.05	1,383.2	9,638,400.86	1,314.7	8,177,401.37	769,163.95	1,196,414.14	6,506,663.67	880.2	3,765,378.46	400.1	794,508.82	102.9	MISSISSIPPI
MISSOURI	20,379,589.00	19,981,282.26	2,036.2	19,936,276.73	1,993.3	14,320,034.84	398,306.74	443,312.27	9,071,593.76	1,204.6	10,532,993.34	789.7	376,799.16	41.9	MISSOURI
MONTANA	11,873,226.00	7,448,329.19	1,224.5	6,986,763.30	1,121.8	6,472,052.41	4,424,996.81	4,986,461.70	5,707,983.54	971.1	1,729,798.18	250.7	10,547.47	2.7	MONTANA
NEBRASKA	13,047,097.00	10,563,823.05	2,779.7	9,286,577.24	2,551.1	7,369,290.92	2,493,273.95	3,761,519.76	4,926,625.93	1,670.2	4,305,411.13	834.5	1,321,785.99	276.0	NEBRASKA
NEVADA	7,846,997.00	7,701,252.88	843.4	7,603,173.93	823.9	6,721,776.16	145,644.12	243,723.17	3,219,476.72	375.5	4,397,755.32	454.0	84,021.94	13.9	NEVADA
NEW HAMPSHIRE	2,803,967.00	2,590,939.02	249.9	2,568,129.02	248.4	2,183,469.78	213,027.98	235,737.98	1,986,226.97	208.1	583,921.30	40.0	20,690.96	1.9	NEW HAMPSHIRE
NEW JERSEY	7,632,712.00	7,482,099.17	310.7	7,482,099.17	310.7	5,274,236.06	50,612.83	50,612.93	3,952,591.06	227.2	2,908,636.75	73.1	720,972.37	10.4	NEW JERSEY
NEW MEXICO	9,785,122.00	8,124,626.68	1,622.4	7,933,696.29	1,505.0	7,253,476.42	1,660,495.32	1,851,425.71	6,308,324.98	1,252.2	1,501,167.97	236.3	315,133.93	33.9	NEW MEXICO
NEW YORK	30,398,028.00	25,892,773.87	1,688.1	23,670,271.37	1,540.6	17,905,287.61	4,505,255.13	6,727,757.53	13,296,162.32	899.4	11,966,211.55	739.9	731,400.00	48.8	NEW YORK
NORTH CAROLINA	14,008,652.00	13,550,313.37	1,412.3	12,953,855.52	1,375.1	10,996,168.36	458,339.63	1,054,796.48	9,613,489.57	1,191.9	2,933,797.39	168.6	1,103,026.41	61.9	NORTH CAROLINA
NORTH DAKOTA	6,554,939.00	7,952,177.25	2,656.4	7,446,015.07	2,538.7	6,254,538.81	1,502,761.76	2,108,923.93	6,556,793.34	2,069.4	1,731,121.23	454.6	665,262.68	142.4	NORTH DAKOTA
OHIO	22,954,759.00	20,933,265.72	1,547.2	20,444,525.50	1,610.5	17,743,716.57	2,021,493.28	2,510,233.50	15,889,753.30	1,247.5	3,441,588.43	272.1	1,601,923.99	127.6	OHIO
OKLAHOMA	14,307,542.00	14,039,684.70	1,274.4	13,772,676.97	1,243.0	11,966,894.27	267,857.30	534,866.13	10,357,395.07	904.5	2,921,587.05	297.2	760,702.68	72.7	OKLAHOMA
OREGON	9,696,402.00	9,565,873.82	1,023.0	9,428,106.57	1,000.0	8,071,186.54	130,528.18	268,295.43	7,378,218.35	820.7	1,928,024.61	159.0	259,630.96	44.3	OREGON
PENNSYLVANIA	27,991,861.00	27,433,454.53	1,607.1	26,089,185.97	1,495.3	22,798,957.73	558,396.47	1,902,675.13	16,735,310.73	882.9	9,555,173.41	543.9	1,042,980.39	80.6	PENNSYLVANIA
RHODE ISLAND	2,301,944.00	1,901,627.68	102.0	1,901,627.68	102.0	1,302,999.10	500,316.32	500,316.32	1,119,688.09	54.8	654,039.69	35.3	27,900.00	1.9	RHODE ISLAND
SOUTH CAROLINA	6,749,531.00	8,684,533.97	1,684.9	8,303,037.96	1,623.3	7,250,488.84	64,997.03	446,493.04	5,478,948.29	1,294.4	2,708,603.98	327.0	496,983.71	63.4	SOUTH CAROLINA
SOUTH DAKOTA	9,944,592.00	9,892,406.99	2,590.2	9,848,193.21	2,662.0	8,197,162.13	52,185.01	96,398.79	6,575,763.32	1,589.8	3,252,466.44	916.8	64,177.23	83.6	SOUTH DAKOTA
TENNESSEE	13,662,172.00	12,471,097.38	938.2	12,321,250.81	920.7	10,969,062.02	1,191,074.62	1,340,921.19	7,993,717.80	582.3	4,204,038.58	338.4	273,341.00	17.6	TENNESSEE
TEXAS	35,179,614.00	34,512,949.77	5,900.6	32,694,622.25	5,491.0	28,153,740.37	1,666,664.23	3,484,991.75	22,546,277.89	4,136.1	9,252,912.21	1,361.9	2,613,759.67	302.6	TEXAS
UTAH	6,970,528.00	6,129,398.22	686.6	6,112,343.49	684.6	5,271,586.01	841,129.78	868,184.51	3,918,717.26	429.0	1,967,696.84	231.0	243,084.12	25.6	UTAH
VERMONT	2,902,982.00	2,379,983.47	154.1	2,307,280.24	149.3	1,888,006.63	522,998.53	596,601.76	1,529,791.88	111.0	663,933.00	33.0	196,258.69	10.1	VERMONT
VIRGINIA	12,055,662.00	11,919,021.44	1,112.6	11,358,433.77	1,067.5	9,806,509.22	136,640.66	697,228.23	7,969,693.64	816.4	3,346,790.76	249.8	703,537.05	47.3	VIRGINIA
WASHINGTON	8,016,596.00	8,096,450.61	689.3	8,096,450.61	689.3	7,279,916.45	920,245.49	920,246.49	6,667,660.61	590.8	1,324,900.00	94.4	103,000.00	4.1	WASHINGTON
WEST VIRGINIA	6,558,575.00	6,443,061.41	563.8	6,076,971.12	518.6	4,396,183.55	115,513.59	482,603.88	3,353,307.22	339.6	2,654,888.21	172.4	434,865.98	41.8	WEST VIRGINIA
WISCONSIN	15,568,563.00	12,006,482.88	1,771.6	11,767,963.38	1,736.9	9,610,623.40	3,562,080.12	3,800,589.62	8,973,186.79	1,458.3	1,831,876.65	177.6	1,201,439.54	136.8	WISCONSIN
WYOMING	7,630,680.00	7,458,344.78	1,293.6	7,411,089.78	1,283.8	6,486,065.94	172,335.22	219,590.22	6,113,647.26	1,032.4	2,269,767.53	247.2	84,930.00	13.9	WYOMING
HAWAII	734,528.00	97,440.00	6.6	97,440.00	6.6	19,063.26	637,088.00	637,088.00			97,440.00	6.6			HAWAII
TOTALS	599,250,000.00	538,610,796.06	63849.0	521,689,560.31	61385.6	443,204,160.47	59,639,203.94	76,560,439.69	350,147,974.67	44668.1	161,848,039.24	16031.6	26,614,782.26	2949.4	TOTALS

PROJECTS NOT TO BE REOPENED FOR MAINTENANCE WORK

The importance of proper distinction between work necessitated by lack of proper maintenance on the part of the State and that due strictly to other causes in connection with the reopening of projects to provide for such work is emphasized by questions recently raised by the General Accounting Office in regard to vouchers for reopened work.

In the case of one project which was washed out by flood waters, the original agreement was reopened and modified to provide for reconstructing the drainage structures which were destroyed and for reconstructing the road bed. The General Accounting Office has requested detailed information as to whether the destruction of the road was due to negligence or improper maintenance on the part of the State and has suspended the voucher pending receipt of this information.

There have been a number of reopened projects as to which it was difficult to determine whether the work provided by the reopening of the project was due to inadequate road construction, lack of proper maintenance after construction, or was not itself maintenance work. All such projects so far submitted have been passed but in the future it will be necessary to give more careful consideration to proposals to reopen projects and avoid reopening any in which the work to be done is necessitated by lack of maintenance on the part of the State.