SECOND PROGRESS REPORT ON THE EVALUATION OF VARIOUS TYPES OF RAILROAD CROSSINGS

MICHIGAN DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

TESTING AND RESEARCH DIVISION
RESEARCH LABORATORY SECTION

SECOND PROGRESS REPORT ON THE EVALUATION OF VARIOUS TYPES OF RAILROAD CROSSINGS

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In April 1975, the Michigan Department of State Highways and Transportation, with the approval of the Federal Highway Administration, initiated a Category 2 experimental study to evaluate the performance of various types of railroad grade crossing materials. The work plan covering the experimental project is of the open-ended type so that new materials can be added by a letter of request to the FHWA rather than submitting a separate work plan for each new type of material being developed. The objectives of the study are to obtain information on construction procedures, evaluate the performance of new crossing materials with respect to durability and smoothness, and determine the relative cost of each type of crossing.

Although the experimental study concerns only the crossing material, the work involved generally includes rebuilding the entire crossing, installing new and better warning devices, and changes in roadway alignment and surface to increase the safety of the crossing. The work is 90 percent financed by Federal funds, appropriated under the Highway Safety Act of 1973, and 10 percent by Road Authority funds, either State or local depending on the jurisdiction of the roadway.

This is the second progress report on the installation and performance of various types of railroad grade crossing materials. The first progress report (Research Report R-1027) was issued in November of 1976.

MATERIALS

Prior to initiation of this study, approved crossing materials consisted of wood, bituminous material, concrete, and a proprietary (Goodyear) rubber panel installation. The materials included in the experimental program are: T-Core, Fab-Ra-Cast, Steel Plank, Track-Span, Gen-Trac, Safand Dri, and Parkco. All of these materials are proprietary products, and a brief description of each follows.

T-Core (74 NM-400)

The material is identified as expanded linear high density polyethylene. It is fabricated in 2-in. thick pads with the center pads measuring 52 in. in width and 3 ft in length. The side pads are 17 in. wide and 3 ft long. The pads are supported on modules fabricated from the same material as the pads. These support modules run perpendicular to the railroad ties with four supports used under each center pad and one under each side pad. A tie spacing of 18 in. on centers is required. The pads are bolted to the ties with lag bolts, twelve in each center pad and six in each side pad. A rubber and a steel washer are used under each bolt head. The surface consists of a 1/16-in. raised diamond pattern.

Fab-Ra-Cast (75 NM-433)

This crossing consists of precast reinforced concrete slabs. The center slabs are 51-1/2 in. wide by 8 ft long. The side slabs are 18 in. wide and 8 ft long. The slabs are either 5 or 6 in. thick depending on rail height. The sides of the slabs are formed and armored with inverted 60-lb rails except the rail adjacent to the roadway which is right side up. Support for each slab is obtained by placing it on several plastic bags which are filled with quick-setting grout and positioned on the ties. Temporary support, while the grout is setting, is provided by wood shims. The slabs are held in position by specially designed steel fastening devices which attach to the rails; no special tie spacing is required. The slab's surface is treated with epoxy and sand to increase the surface friction.

Steel Plank (75 NM-404)

The steel crossing consists of modular units fabricated from No. 3 gage hot-rolled steel. The center units are 50-1/2 in. wide and 6 ft 6 in. long and are fastened to the ties with 15 lag bolts. The side units are 20 in. wide and 6 ft 6 in. long, with six lag bolts used to fasten each unit to the ties. A tie spacing of 19-1/2 in. on centers is required. A steel washer and a rubber washer are used under the head of each lag bolt. The top surface of the units is coated with epoxy containing sand to increase surface friction, and the interiors of the units are epoxy coated to resist corrosion.

Track-Span (74 NM-416)

This crossing utilizes flexible epoxy and ground automobile tires and is cast in-place. The rails, ties, and pavement edges are coated with epoxy prior to pouring the crossing. A base layer of flexible epoxy containing ground tire casings is placed first. Then a wearing surface about 2-1/2 in. thick consisting of flexible epoxy with rubber buffings is placed and the surface is finished by tamping. A flange-way is formed on the inside of each rail. Approximately four hours of curing time is needed and installation is limited to dry weather and temperatures above 35 F. No special tie spacing is required.

Saf and Dri (75 NM-428)

This type of crossing consists of modular units made of structural steel tubes enclosed in an elastomer. The center units are 26 in. wide and 6 ft

8 in. long and two units are used to span the distance between rails. The side units are of the same length and are 20-7/8 in. wide. The surface pattern consists of 1/4-in. wide by 5/16-in. deep grooves spaced 1 in. apart and running perpendicular to the rails. A tie spacing of 20 in. on centers is required. The correct elevation is obtained by placing wooden shims on the ties, and a thin neoprene pad is placed on each shim prior to installing the surface units. Twelve 3/4-in. drive spikes with shock absorbing rubber washers are used to fasten each center unit, and four are used to fasten each side unit. The spike holes can be closed with a rubber plug, if desired.

Gen-Trac (76 NM-489)

The modular units for this crossing consist of a 1/4-in. structural steel arch enclosed in an elastomer. The arch is prevented from spreading at its springing line by 1/2-in. strain bolts installed perpendicular to the arch. The center units are 52 in. wide and 1 ft 6 in. long. The side units are 23 in. wide and 1 ft 6 in. long. The surface pattern consists of grooves 1/8-in. deep by 1/2-in. wide, spaced 1/2 in. apart, and running perpendicular to the rails. The units are supported directly on the ties. Each center unit is fastened by eight 3/4-in. washer-head drive spikes with a rubber washer placed under the spike heads. Four drive spikes with washers are used to fasten each side unit. Spike holes are sealed with a rubber plug. The required center-to-center tie dimension is 18 in.

Parkco (77 NM-537)

This crossing material is described by the manufacturer as molded rubber modules reinforced with steel flex plates. The slab units are placed on wood shims spiked to the ties. The slab joints are of the tongue and groove type and longitudinal channels are cast within the units. The slabs are fastened by tensioning anchor rods passing through the longitudinal channels and through holes in steel plates bolted to the end ties of the crossing. A steel plate protects the fastening rods and plates at each crossing end. Dimensions of the slab units, required tie spacing, and treatment of the joints between crossing and roadway are not provided in information submitted by the manufacturer. The surface consists of a 1/2-in. raised circle pattern to divert moisture away from the contact area of the tires of crossing vehicles.

Manufacturers of the described products generally suggest the installation of new ties in the crossing area prior to placing the crossing surface. Also, rail splices in the crossing should be avoided.

CROSSING LOCATIONS AND CONSTRUCTION PROCEDURES

During 1976, nine experimental crossings were built. Of these, four were T-Core, two were Fab-Ra-Cast, two were Steel Plank, and one was Track-Span. One each of T-Core, Steel Plank, and Saf and Dri were built in 1977. Although no Gen-Trac or Parkco crossings were built, the Department has approved the material for experimental crossings. Table 1 summarizes information on each of the experimental crossings built to date.

TABLE 1
SUMMARY OF DATA ON EXPERIMENTAL CROSSINGS IN SERVICE

Type of Crossing	Railroad	Type of Line	Crossing Length, ft	Route Location	Roadway Surface	No. of Lanes	Average Daily Traffic
T-Core	Ann Arbor	Main	36	Kress Rd	Bituminous	2	1,800
T-Core	Detroit and Mackinaw	Main	60	US 23, Omer	Bituminous	4	7,800
T-Core	Detroit and Mackinaw	Main	111	M 65, Twining	Concrete	2	3,500
T-Core	Detroit and Mackinaw	Industrial	69	US 23, Alabaster	Bituminous	2	5,300
Fab-Ra-Cast	Chesapeake and Ohio	Industrial	56	Wixom Rd	Concrete	4	11,500
Fab-Ra-Cast	Chesapeake and Ohio	Main	56	Seven Mile Rd	Concrete	4	8,300
Steel Plank	Detroit and Toledo Shoreline	Main	32	Hurd Rd	Bituminous	2	1,200
Steel Plank	Detroit and Toledo Shoreline	Main	39	Nadeau Rd	Bituminous	2	2,000
Track-Span	Chesapeake and Ohio	Industrial	52	M 46, St. Louis	Concrete	4	8,800
T-Core	Grand Trunk Western	Main	48	34th St	Bituminous	2	400
Saf and Dri	Conrail	Industrial	67	Oakland Ave	Concrete	5	25,000
Steel Plank	Detroit and Toledo Shoreline	Industrial	110	M 50, Monroe	Bituminous	4	10,100

Construction of the crossings was the responsibility of the railroad agency and was done either by their own forces or by contract. The Department's Research Laboratory is charged with the responsibility of evaluating the various types of crossing material and, as part of the evaluation procedure, construction of the experimental crossings was observed by research personnel. Installation of the crossing material was done in accordance with the manufacturer's recommended procedure and, generally, his representative was present during placement operations.

At all crossing sites the existing rails, ties, and ballast were removed and replaced for about 30 ft beyond each crossing end. The procedures used to replace these materials depended on the requirements for maintaining both rail and highway traffic at the crossing. Basically, the following three methods were employed:

1) The most efficient procedure for replacing an existing crossing was when the highway could be closed to traffic and a few hour gap in train traffic existed. The existing crossing, including the ballast, was removed by

mechanical equipment. A preassembled track section was positioned on the grade. The joints between new and old rails were bolted and new ballast added and compacted under the ties. Train movements could now be resumed if necessary, and final adjustment of rail height, compaction of the ballast, and installation of the surface material was done under normal train traffic.

2) Where traffic on the highway was maintained during reconstruction of a crossing, it was necessary to replace half of the crossing at a time. The general procedure employed consisted of first replacing the ties and ballast on half of the crossing and installing a temporary wood crossing. Road traffic was then routed over on the temporary crossing while the other half was replaced. Once the new ballast and ties were in place on the entire crossing, the old rails were removed and new welded rail sections were placed. Road traffic was stopped during replacement of the rails. The crossing material was installed on half of the crossing, traffic switched over on the completed side, the temporary wood crossing removed, and installation of the new surface material was completed.

3) The procedure for replacing a crossing where the road traffic was detoured but high speed frequent train movement prevailed, entailed a good deal of hand work. First, the old crossing surface was removed followed by removal of the ballast between the ties. The ties were then unfastened from under the rails. The ties, up to the center of the crossing, were slid and twisted out and new ties were inserted under the rails. New ballast was placed and compacted and the existing rails spiked to the ties to allow train traffic over the crossing. The ties in the other half of the crossing were replaced in the same manner. The new welded rail sections were placed and fastened into position and raised to proper elevation by adding and compacting the ballast. The crossing surface was installed during periods between train movements.

Once the ballast, ties, and rails had been replaced, the installation of the crossing surface generally was completed in a matter of hours. The actual time involved in installing the various types of crossing materials depends on the equipment, hand tools, and number and experience of the personnel. The installation of all five experimental crossing types used to date is fairly simple, but precision work is necessary. A brief account of the installation process of each material follows.

T-Core

The installation of the pads began in the center of the crossing and proceeded toward the edges. The pads were placed by hand. The center pads were positioned equidistant from the ball of each rail, whereas the side pads were positioned by placing a wood 2 x 4 between the rail and the pad. The pads were fastened by first bolting through the center row of holes in each pad followed by bolting through the end rows of holes. Installation of the 3/4-in. diameter lag bolts was preceeded by drilling 11/16-in. holes into the ties. Before placing bituminous material against the crossing edge, a 2 x 4 or 1 x 8 was installed against the side pads to prevent the material from infiltrating under the crossing surface.

Fab-Ra-Cast

Unlike other prefabricated crossing materials, which are fastened to the ties, the Fab-Ra-Cast slabs are fastened to the rails. Tie spacing, therefore, is not critical. A set of fastening hardware consists of an angle, three bolts (two with a clip and nut for attaching to the rail), an angle bracket, shock absorbing washer, and nut for each bolt for fastening the slab in position. An insulator was placed between the hardware and rail to prevent interference with the signal circuit. Four sets of hardware were used for each 8-ft length of crossing. Once the hardware was fastened to the rails, wood shims were placed on the ties and the slab temporarily positioned on the shims to ensure correct elevation and bearing. Grout-filled plastic bags were placed on the ties and the slab again lowered into position by a crane. The weight of the slab flattens the grout bags until the weight is carried by the shims. When the mortar has hardened the slab is supported on both the mortar bags and the shims. Once the slabs were in correct position, they were fastened by tightening the bolts passing through the angle brackets.

Steel Plank

The steel plank units were placed mechanically with final positioning done by hand using breaking bars. Once the units were in position, holes for lag bolts were drilled in each corner of a unit and lag bolts were installed. After all the units were fastened in this manner, the remaining holes were drilled and the lag bolts installed.

Track-Span

This type of crossing is poured in-place and therefore, as in the case of the Fab-Ra-Cast crossing, tie spacing is not critical. However, the material is not recommended for placement when the temperature is below 35 F or during wet weather. Prior to pouring the epoxy mix, the rails, ties, and pavement edges were coated with epoxy. Then epoxy mixed with ground rubber tire casings was placed to within about 2-1/2 in. of the crossing surface. The wearing surface, consisting of epoxy mixed with rubber buffings, was placed and finished by hand tamping. A flangeway was formed on the inside of each rail by using a shaped wood piece. Approximately four hours of curing time is required before the crossing can be opened to traffic.

Saf and Dri

Before placing the modular units, wood shims 3 in. thick and 8 in. wide were placed on each tie and nailed in place using two 3/8 by 10-in. spikes in each shim. The units were placed by hand and once all the units were positioned, the transverse joints were tightened by jacking from both crossing ends. The bolt holes are recessed 4-1/4 in. and a 1-3/4-in. diameter by 2-1/4-in. long shock absorbing rubber washer was placed under each spike head. The drive spikes used to fasten the pads to the ties were 3/4-in. diameter by 12 in. long. Driving of the spikes was preceeded by drilling 5/8-in. diameter pilot holes through the shims and ties. The spike holes were not plugged.

Cost of Material

The average unit bid prices for each of the five types of crossing material, including fastening hardware, are as follows:

Crossing Type	Cost per Track-Foot	
	1976	1977
T-Core	$103	$ 98*
Fab-Ra-Cast	$ 98*	--
Steel Plank	$105	$120*
Track-Span	$212*	--
Saf and Dri	--	$210*

* Cost based on one crossing only.

PERFORMANCE EVALUATION

The performance of the experimental crossings is checked semiannually. The inspections consist of visual observation of the following performance factors:

1) Surface Wear - the wearing away of the material's surface as a result of tire contact with vehicular traffic.

2) Surface Damage - cracking, fracturing, or tearing of the surface resulting from either train or vehicular traffic or from snow clearing equipment.

3) Alignment of Units - the ability of the individual units to maintain both vertical and horizontal position while in service.

4) Fastening of Units - the ability of units to remain securely fastened in position during the life of the crossing material.

5) Fastening of Rails - the securing of the rails to the ties. Loose rails may indicate that settlement of the crossing has occurred.

6) Pavement/Crossing Joint - the distance between the pavement and the crossing edge. The width of the joint may vary considerably from one crossing to another and in bituminous pavement the joint is eliminated entirely. In concrete pavements, the joint is generally filled with bituminous material.

7) Crossing Smoothness - a measure of the discomfort felt by vehicle occupants while passing over the crossing. Generally, most drivers will adjust their speed to hold the discomfort to a tolerable level and on this basis the smoothness of the crossings is rated as Good, Fair, and Poor, (Good - basically no slowdown in traffic; Fair - some slowdown in traffic; and, Poor - considerable slowdown in traffic.)

In addition, the elevation of the rails, the surface materials, and the pavement--at 5 ft intervals along the curbline or pavement edge--for 25 ft each side of the crossing centerline is also measured.

The performance of each type of crossing material through the summer of 1977 is discussed in the following paragraphs.

T-Core

The two-year old Kress Rd and the one-year old 34th St T-Core crossings have performed satisfactorily to date and their smoothness is rated 'Good.' Both of these crossings are subjected to only relatively low traffic volumes (1,800 and 400 ADT for Kress Rd and 34th St, respectively) and commercial traffic is negligible at both locations.

There appears to be no appreciable surface wear of the T-Core pads at the Omer, Twining, and Alabaster locations. However, cracks were noted in the surface shortly after the crossings were installed. At the Omer crossing, cracks were noted in the surface and the supports under two side pads fractured after three months service. The two side pads were replaced in October 1976. Further cracking developed during the winter and 15 pads were replaced in April 1977. Our September 1977 survey revealed cracks in one center and one side pad. Cracks in the surface were also noted at the Twining crossing in the fall of 1976, and four of the center pads were replaced in April 1977. As of September 1977, there were five center and seven side pads with surface cracks. Three of the cracked side units also have fractured supports. At the Alabaster crossing, cracks in the surface were not noted before April of 1977 when three center pads were found to have cracked. These pads were exchanged with uncracked ones from outside the traffic area of the crossing. When surveyed in September 1977, one center pad was found to have cracked for its full width and a 6 by 6-in. piece of its surface had been punched out. Three side units were cracked and one of these also had a fractured support.

Alignment of the pads has remained satisfactory and the pads are securely fastened to the ties, except for one bolt which has broken off at the Omer crossing. The rails appear securely fastened at the three crossings. Cracks have developed in the bituminous surface along the crossing edges. The crossing smoothness was given a 'Good' rating at all three locations.

As a result of the cracking experienced at these three locations, the use of the T-Core crossing was suspended by the Department about a year ago. Discussions with the supplier indicate that the cause of the failures has been traced to a batch of contaminated material and their testing also indicates a need for an increase in the strength of the supports at crossings with heavy and high-speed traffic volumes. According to the supplier a "heavy duty" crossing with stronger supports under the side pads, extra supports under the center pads, and manufactured under more stringent quality control conditions should be available in the late spring or early summer of this year. Until then, the Department will continue to suspend the use of T-Core crossings.

Fab-Ra-Cast

The original crossings installed in 1975 were replaced at no cost to the Department in 1976 because of concrete deterioration which the manufacturer attributed to the concrete taking a flash set during slab casting. The surfaces of both the Wixom and Seven Mile Rd replacement crossings show no wear after about one year of service. Spalling along the joints between slabs has developed on both crossings. Alignment of the slabs has remained good. At the winter inspection, it was noted that five anchor bolts had broken on the Seven Mile Rd crossing and one was missing on the Wixom Rd crossing. These bolts were found to have been replaced when the summer survey was conducted. Two side slabs appear to deflect under traffic at the Seven Mile Rd crossing and most of the side slabs at the Wixom crossing also appear to deflect. The rails were securely fastened and the pavement joints, which at these locations are about 12 in. wide, were performing satisfactorily. There appeared to be no slowdown in traffic and consequently, the smoothness of the crossing was rated 'Good.'

Steel Plank

The M 50 crossing, constructed in June 1977, was performing satisfactorily and was given a smoothness rating of 'Good' when inspected in August of 1977. The Hurd and Nadeau Rd crossings have been in service about a year and a half and the epoxy coating is showing signs of wearing off in the wheel paths. A derailed car was dragged over both crossings prior to the summer survey. The north end panels and all center and all west side panels on both crossings sustained damage, but not to the extent that repair was necessary to maintain traffic. Alignment and fastening of the panels and fastening of the rails appeared satisfactory. The bituminous pavement adjacent to the crossing edges exhibited cracks in some areas. The damage inflicted by the derailed car increased the roughness somewhat and some slowdown in traffic was noted which resulted in the crossings being rated 'Fair' with respect to smoothness.

Track-Span

After one year service, the crossing surface shows no measurable wear. Cracking in the surface layer in the westbound lanes has developed and small pieces of the surface are missing where a night joint was made during pouring of the top layer. The rails appear securely fastened. Cracking in the bituminous overlay along the crossing edges has occurred. The smoothness of the crossing is rated 'Good.' Repair of the cracked area was begun by the manufacturer last fall, but was discontinued because of cold weather.

Saf and Dri

This crossing, on Oakland Ave in Lansing, was constructed in November 1976, and has shown no surface wear to date. A small cut in the surface was noted to have occurred during the winter. Alignment and fastening of the units, and also fastening of the rails, are satisfactory. Cracking in the asphalt along the west crossing edge has developed. The smoothness of the crossing is rated 'Good.'

The performance of the various crossing types is illustrated photographically in the Appendix.

Level measurements taken at the crossing sites indicate relatively little change in the pavement edge profiles. The most change has occurred at the joint between the crossing and the pavement. The elevations with respect to the pavement as constructed, and six to twelve months later, at the leading and trailing edge at each roadway edge or curb line at each of the nine crossings constructed in 1976 are shown in Figure 1. The change in elevation from the as-constructed elevation is quite small in most cases. Since the elevations are measured along the pavement edge, the elevation differences shown do not necessarily reflect the 'bump' that may be felt in the wheel tracks. However, it is anticipated that the measurements eventually will show whether or not the elevation difference from the pavement to the crossing surface will become a serious problem.

CONCLUSIONS

Since the experimental crossings have only been in service a relatively short time, it is too early to draw any conclusions with regard to length of time the various types of crossing will continue to perform satisfactorily. As mentioned earlier, problems have developed at three T-Core crossings, at the two Fab-Ra-Cast crossings, and, more recently, at the Track-Span crossing. Problems like these are not uncommon when new materials are tested under actual service conditions. Solutions to the problems are being sought by the manufacturers and suppliers, and, hopefully, will result in better performing crossings.

Changes are being incorporated into the reconstruction procedures which should improve the overall performance of crossings. Wherever possible, the roadway traffic is detoured to allow the use of techniques and equipment that should increase the quality of the crossing. Drainage is now being considered when outlets are available, and filter cloths are beginning to be used to prevent contamination of the ballast. Changes on the Standard Plan for Track Crossings have been made to require full-depth bituminous material to be placed and compacted in a space, 1-ft wide, along the crossing edges when the crossings are located in either bituminous or concrete pavement, and when existing concrete headers are required to be removed during reconstruction. Current plans also indicate the rate of pavement taper at crossings where the reconstruction procedure requires the crossing to be raised. Implementation of these plan changes is anticipated to improve the joint area performance.

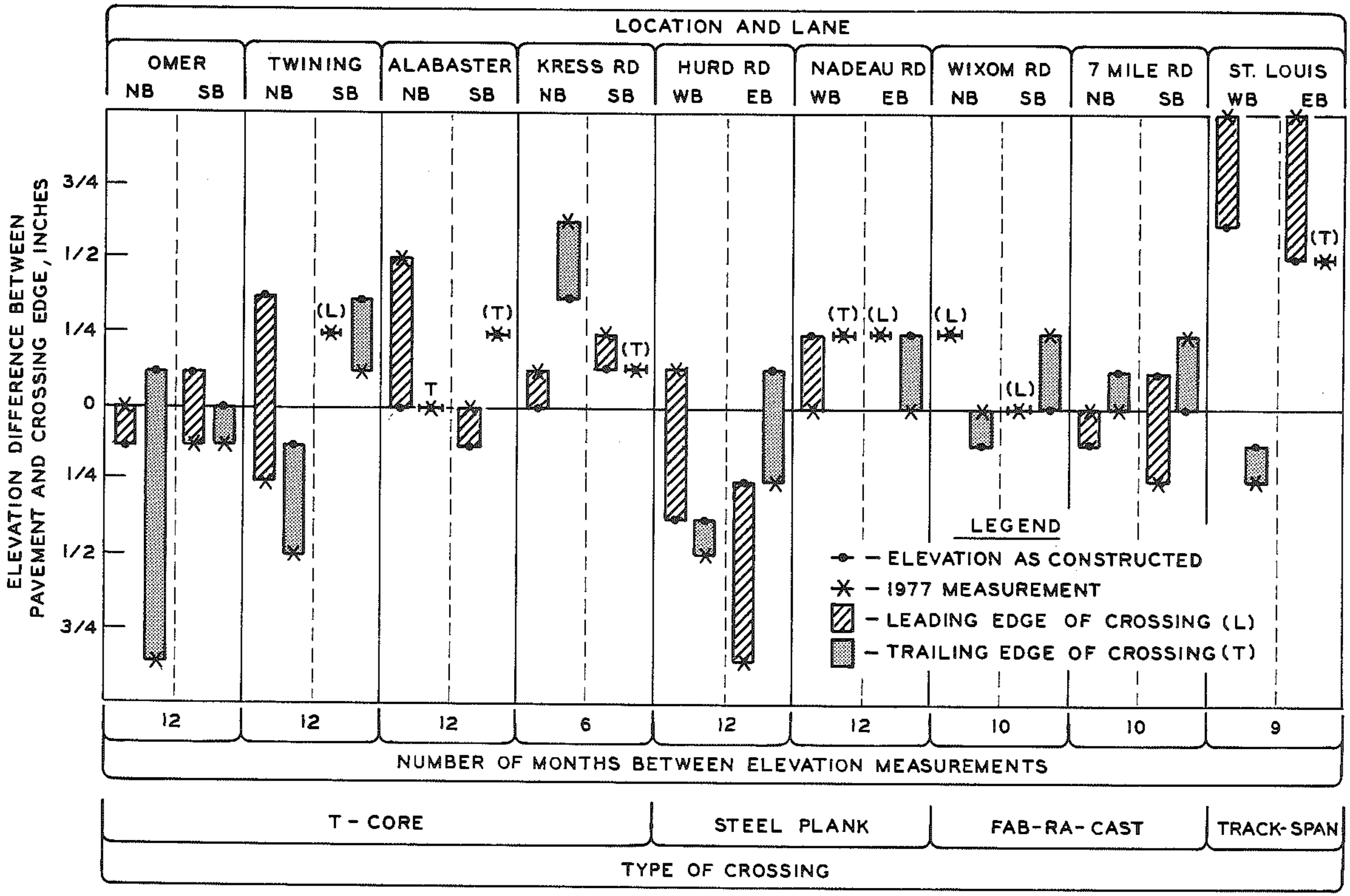


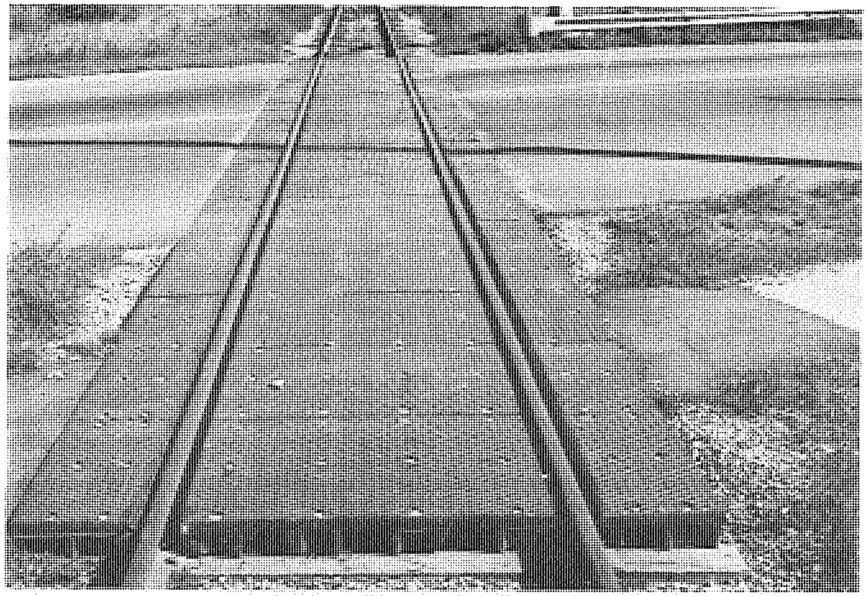
Figure 1. Elevation differences between pavement and crossing edge at nine experimental crossings.

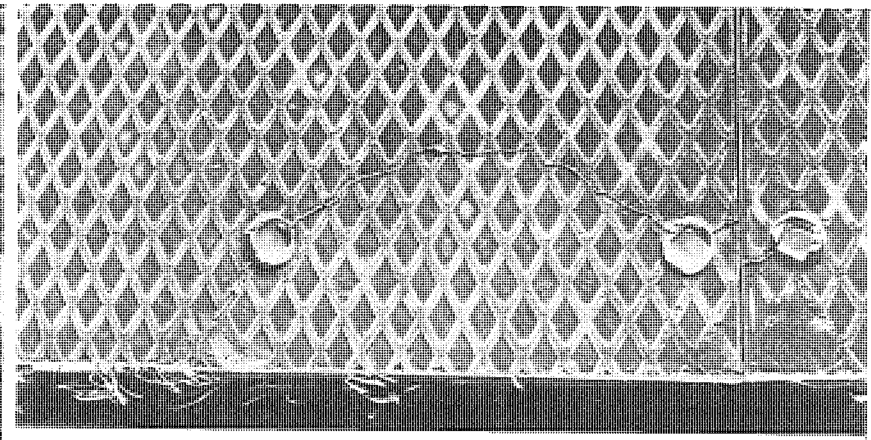
In the area concerning properly sized and installed ties, little progress has been made. As stated in the first progress report, the ties should be of full cross-section throughout their length and should have square-cut ends. They should be of uniform length and installed so that they extend an equal distance beyond each rail. The length should be as recommended by the crossing material manufacturer and the ties should be spaced as required for a particular material type.

Another area where problems have arisen, is the use of wood header boards. Although the manufacturer of the crossing material requires the use of certain size headers, it is normally the railroad's responsibility to furnish them. Apparently, the railroads are not aware of this; thus the correct headers are not always available when needed at the site and makeshift headers are used which appear to contribute to early failures in the joint area.

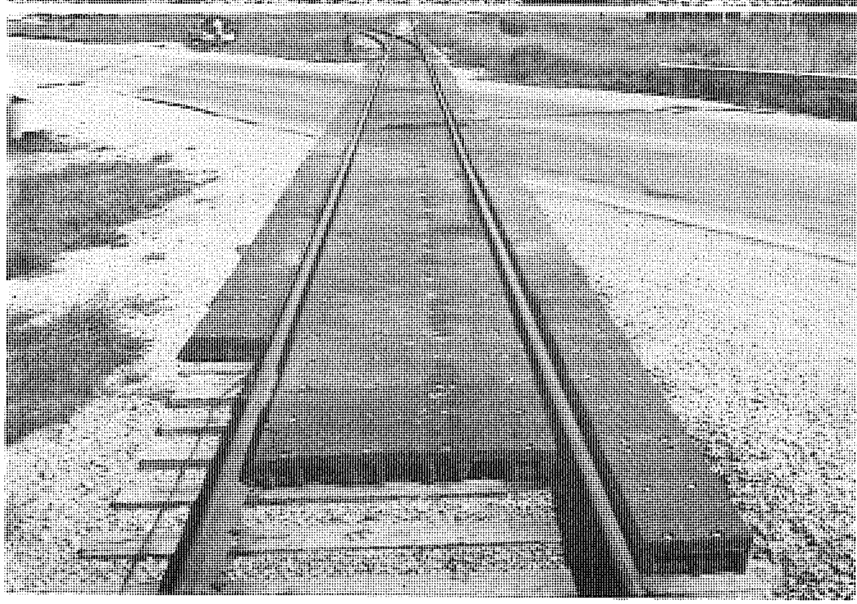
It is hoped that discussions with railroad agencies and material manufacturers concerning the tie and header problem will lead to the use of properly sized ties and headers during the 1978 construction year.

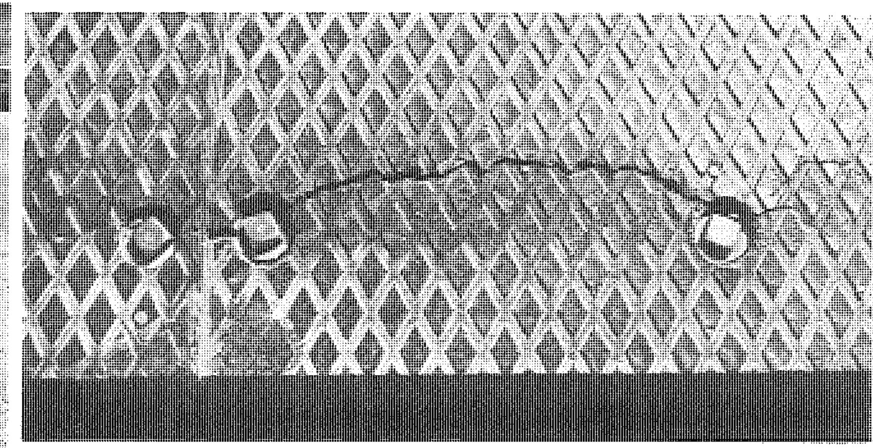
APPENDIX





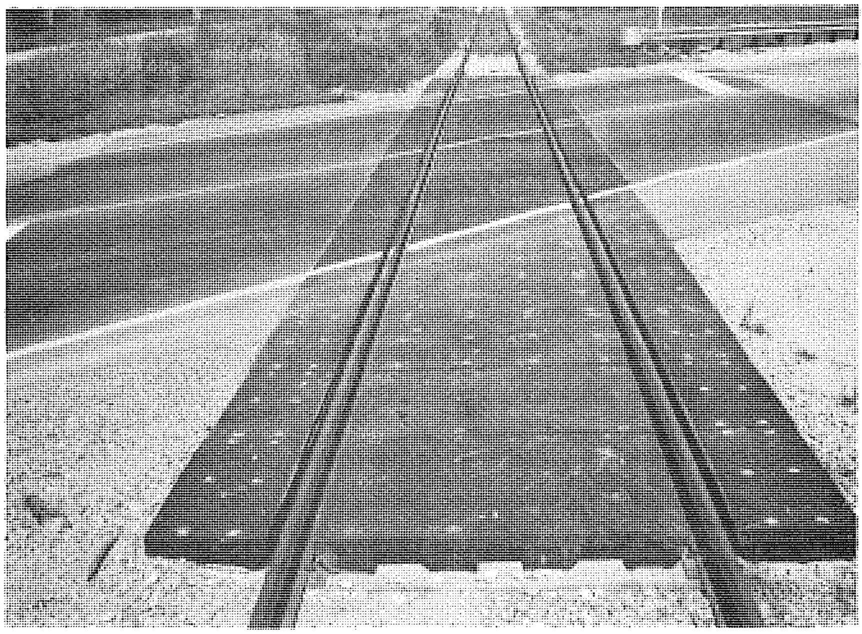
Condition of crossing on US 23 in Omer after one and one-half years of service (left). Cracked surface in side pad (above).



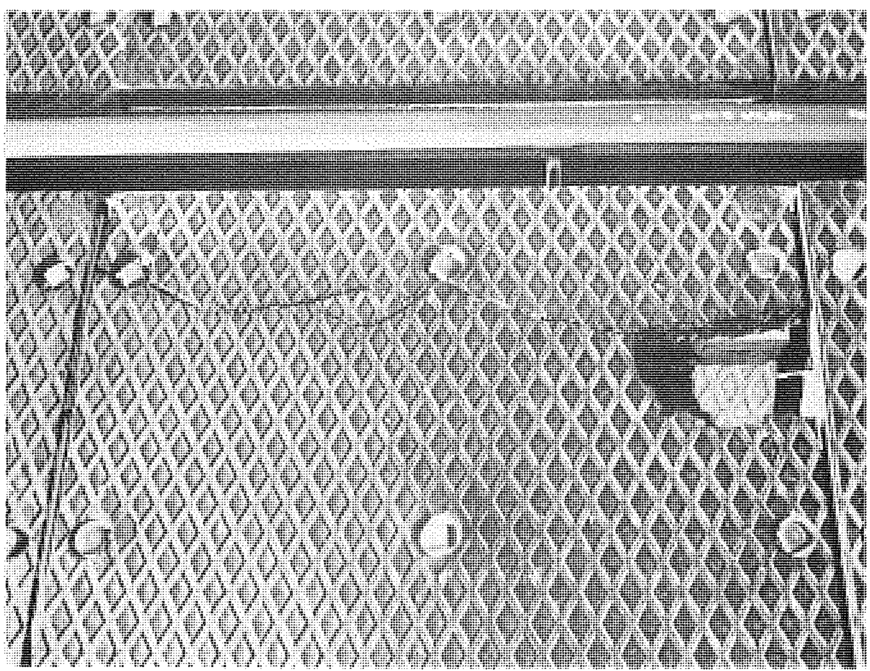


Condition of crossing on M 65 in Twining after one and one-half years of service (left). Cracked surface in side pad (above).

T-Core crossings on US 23 in Omer and M 65 in Twining.

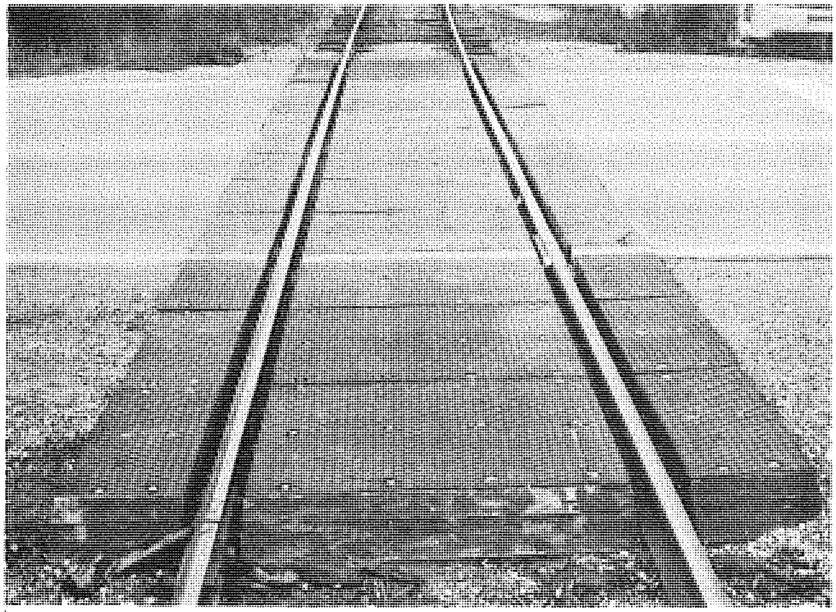


Condition of crossing after one and one-half years of service.

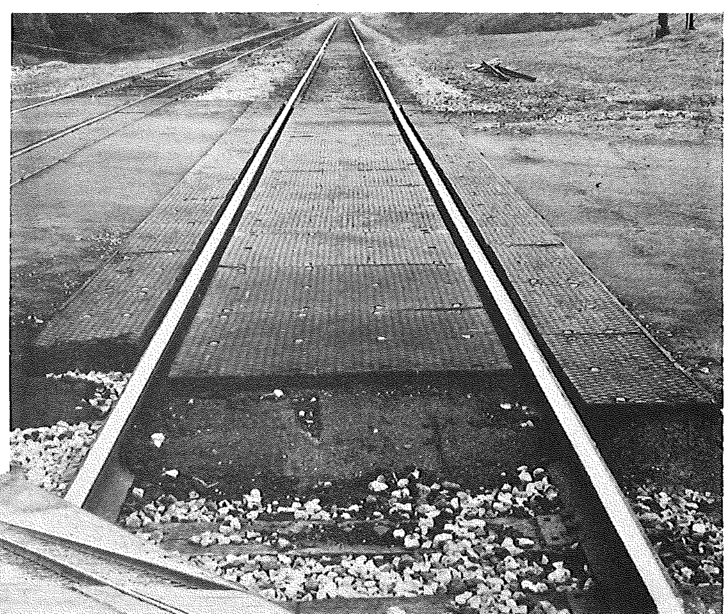


Cracked and fractured surface of a center pad.

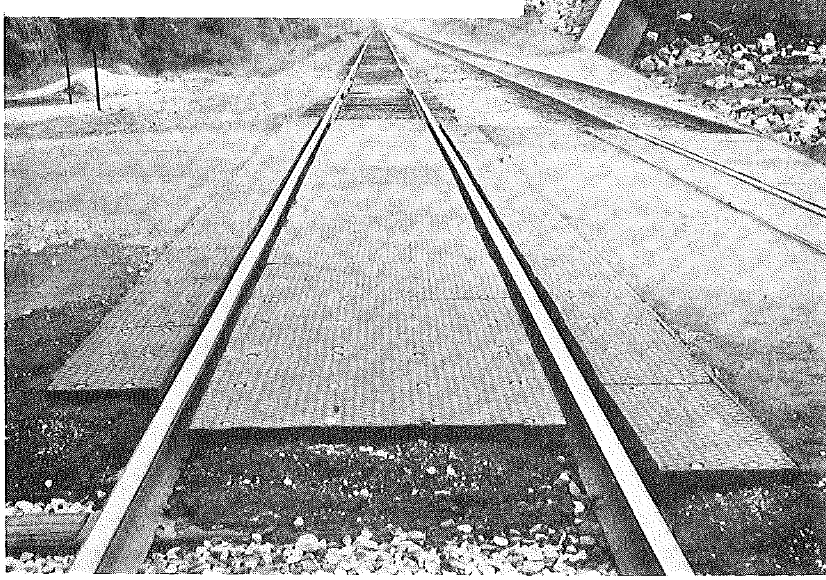
T-Core crossing on US 23 in Alabaster.



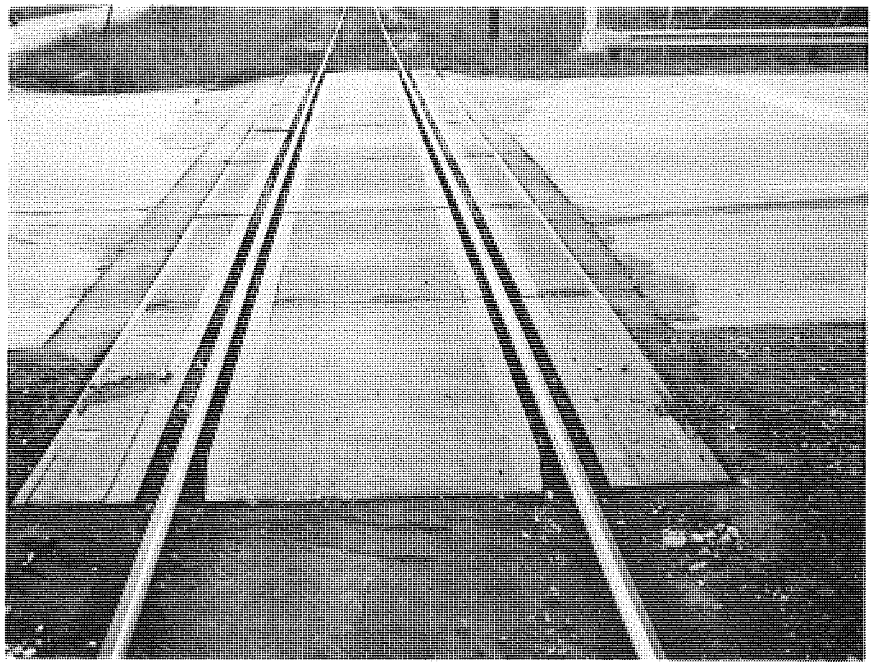
Condition of crossing on Kress Rd after two years of service.



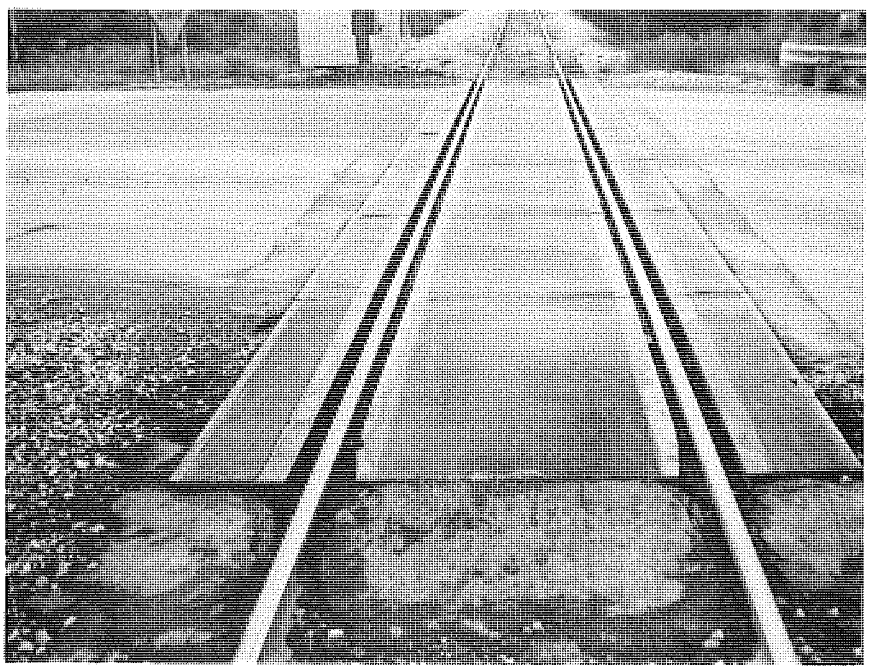
Condition of crossings on 34th after one year of service. South crossing (right) and north crossing (below).



T-Core crossings on Kress Rd and 34th St.

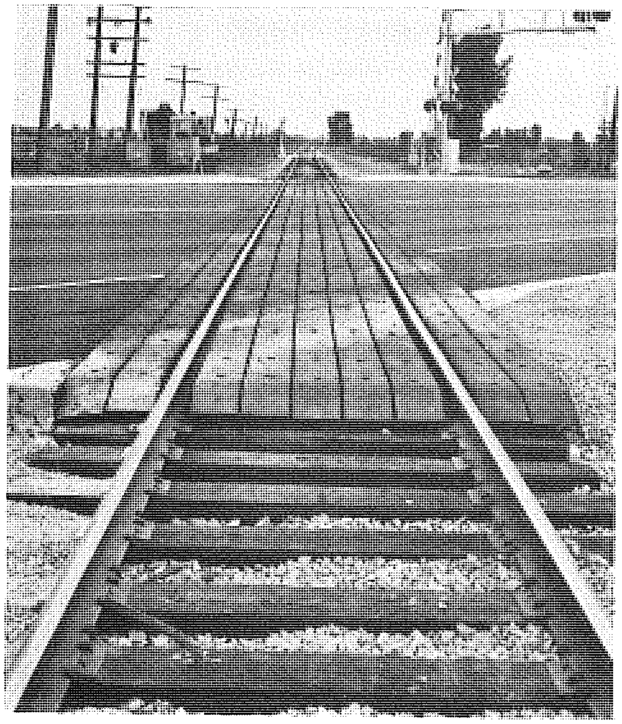


Crossing on Wixom Rd.

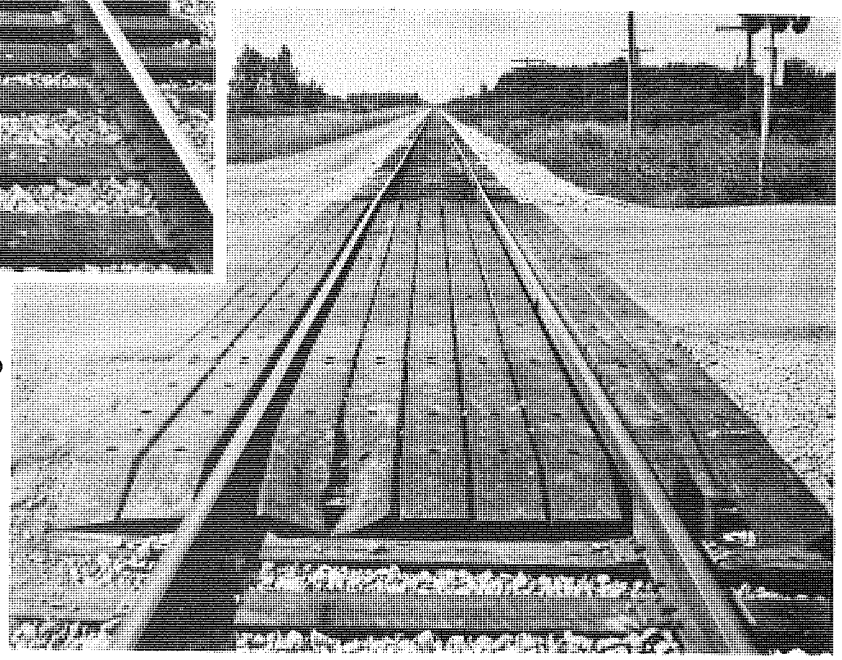


Crossing on Seven Mile Rd.

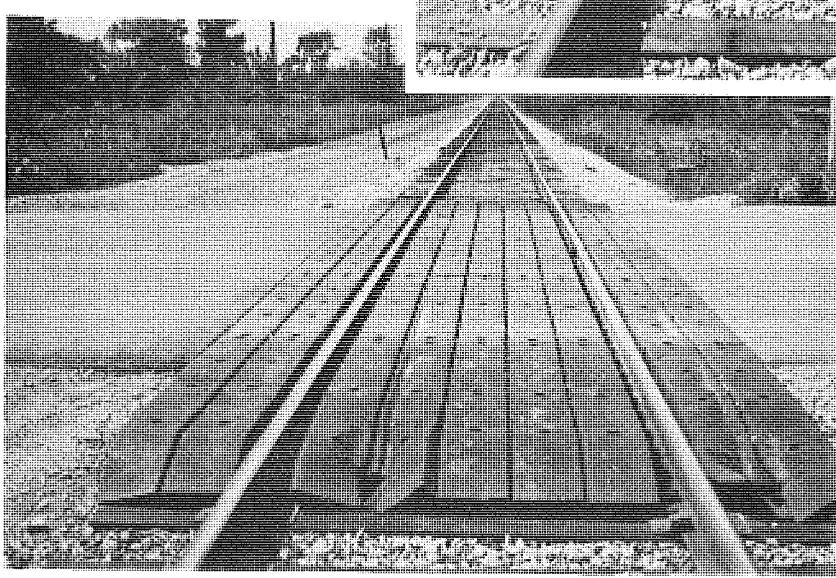
Condition of the Fab-Ra-Cast crossings after one year of service. Spalls are developing on the joints between slabs.



Crossing on M 50 after two months of service.

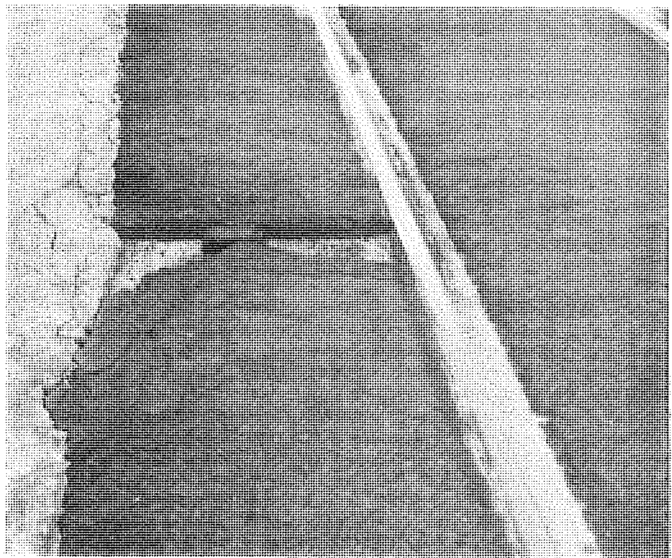


Crossing on Nadeau Rd after one and one-half years of service. Damage was caused by derailed car being dragged over crossing.



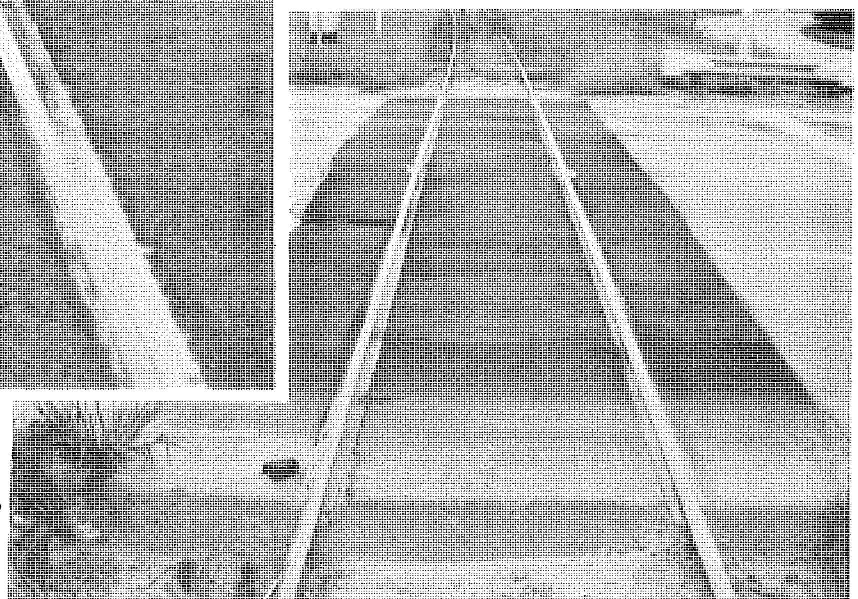
Crossing on Hurd Rd after one and one-half years of service. Damage was caused by derailed car being dragged over crossing.

Condition of steel plank crossings.

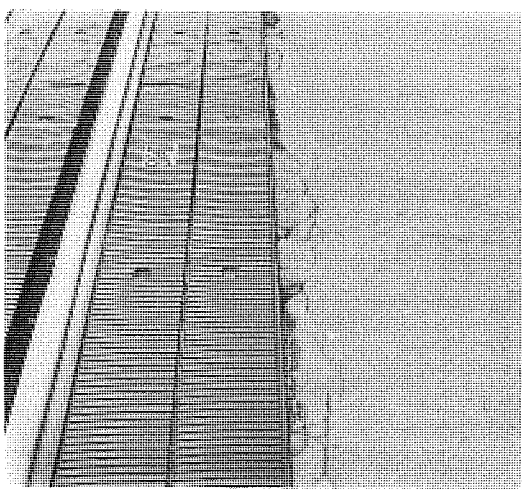


Crack problem in the surface layer at the night joint and crack development in the bituminous overlay.

Condition of crossing after one year of service.

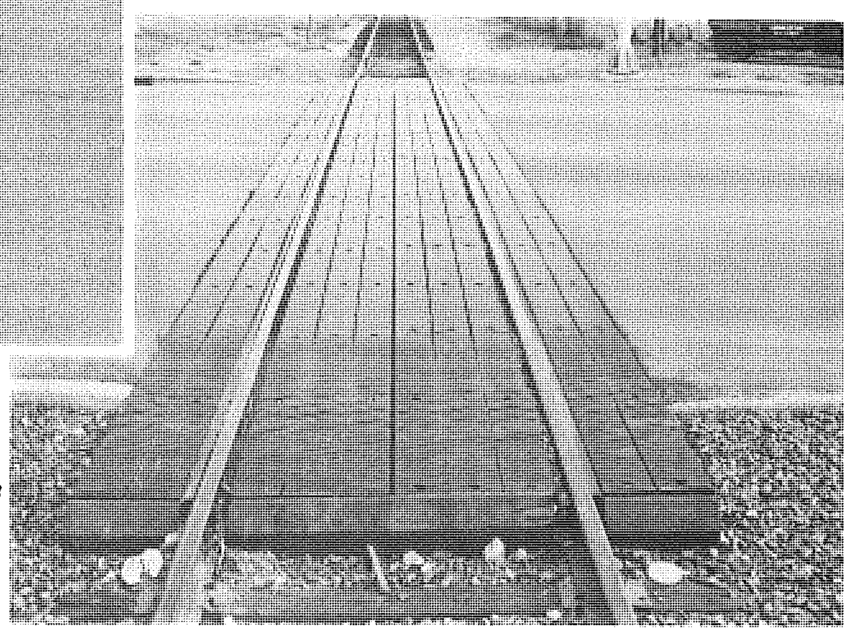


Track-Span crossing in St. Louis.



Cracks developing in the bituminous overlay next to crossing edge.

Condition of crossing after 10 months of service.



Saf and Dri crossing on Oakland Ave in Lansing.