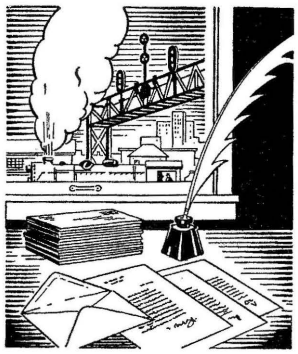

What's the Answer?

If You Have a Question That You Would Like to Have Someone Answer, Or If You Can Answer Any of the Questions Shown Below, Please Write to the Editor.

Installation of Bond Wires

"Should bonds, such as the cable type or the ordinary bond wires, be installed on the gage side of the rail or on the outside of the rail? Why?

"On the larger sized rails with adequate space behind the angle bar, what are the advantages or disadvantages of placing bonds behind the bars?"

Prefer Gage Side Bonding Outside Angles

H. D. Abernethy

Chief Signal Inspector, New York Central, Cleveland, Ohio

In the installation of bonding, consideration should be given to the necessity of periodic inspection for breakage or damage, which may be due to vibration, dragging equipment or carelessness in the use of track tools, and also to the necessity of quickly locating broken bonds, in order to avoid numerous train delays. As the bonding of both rails of a track, when bonded on the gage side of rails, can be inspected by the maintainer from the center of the track, broken or damaged bonds so installed are more readily located than bonds installed on the outside of the rail, as the latter type of bonding can be properly inspected from the outside of the track only. Also, with inside bonding, a maintainer can often see a broken or damaged bond wire while riding on his motor car.

Bonding back of the angle bar affords some additional protection from track tools and dragging equipment, but the wires cannot be inspected for deterioration, because the greater portion of the bond is hidden. After this type of bonding has been in service for several years, broken bonds are hard to locate, and in addition, it is difficult to determine if and when such bonding should be renewed. We prefer the bonding outside of the angle bars and on the gage side of the rail.

Iron Bonds Outside Angle Bar

T. C. Seifert

Assistant Signal Engineer, Chicago, Burlington, & Quincy Chicago

Bond wires should be installed on the gage side of rail for various reasons, some of which are as follows: (1) A man riding a motor car can observe bond wires while riding over his territory, resulting in the prevention of signal failures due to broken bond wires. (2) When bond wires are placed on the gage side of the rail, there is not nearly as much danger of their being tampered with, such as in the case of boys pulling them over the rail. (3) It is desirable to drill rail for bond wires from the outside, which more readily permits the removal of the drill machine from the track in the event of the approach of a train, thereby reducing the hazard involved in removing the machine. The channel pins should be driven from the same side that the rail was drilled, because the channel pin then fills the ferrules of the hole in the rail better than if driven from the opposite side.

With reference to whether the bond wires should be placed on the outside of the angle bar or between the bar and rail: It is not desirable to place iron bonds behind the angle bars on account of rapid deterioration of the iron wire. Consideration should also be given to the amount of space between the rail and the bar, as on the older types of bars and the smaller sizes of rail there is not sufficient space for proper air circulation.

The advantages of placing bond wires behind the angle bar, when they are made of non-corrosive metal, such as Copperweld, are quite numerous. The wires are protected against being pulled over the rail and cut off by

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To Be Answered in a Later Issue

(1) What logical reasoning can be advanced for the removal of switch indicators in single-track or multiple-track automatic block signal territory? Approximately what savings can be thus effected?

(2) What type of construction do you use for fouling jumpers, i.e., wires in trunking or conduit, bare cable stapled to ties, or underground parkway, etc.? Why do you prefer this type of construction?

(3) When establishing a shopping schedule for relays in service on main-line signaling, how long a period of service should be allowed between shop inspection and overhauling for d-c. relays—for a-c. relays?

(4) In your opinion should some special signal or color-light arrangement the equivalent of a high switch stand, controlled only by the position of the switch, independently of the automatic block signals, be used at spring switches? What are the advantages of such an arrangement as compared with using ordinary automatic signal protection with or without a switch target?

passing wheels. They are not disturbed by trackmen while changing the angle bars, tightening the bolts, spiking rail or performing any other work around the joint. The wires are also protected against being broken by dragging equipment. Therefore, since greater space is provided between the angle bar and the rail in the later types of rail, the advantages are in favor of placing the wires behind the angle bars. Wires should be so bent that when they become broken at the channel pin, they will give visual indication of failure.

Southern Has Few Bond Failures

W. J. Eck

Assistant to Vice President,
Southern Railway
Washington, D.C.

The practice on the Southern is to use two Copperweld solid bond wires behind the angle plates on the gage side of the rail. We have found this practice to be very satisfactory, and have almost no failures due to broken bonds.

Wires behind the angle plates are somewhat more difficult to inspect than when outside, but on account of the fact that they are protected in this position, their freedom from damage and consequently few failures warrant, we think, the slight additional labor required for their inspection.

No Bond Wires Are Perfect

F. H. Bagley

Signal Engineer,
Seaboard Air Line,
Norfolk, Va.

All bonds should be installed on the outside of the rail. If installed on the gage side, they must either be placed behind the splice bars, where inspection is difficult or they must be placed under or close to spike heads. In either position they are liable to injury from the track bolts or a spike maul. Bonds placed on the gage side do not get proper inspection because of the inability of the maintainers to detect the condition of bonds placed behind the splice bars; if they are placed outside of the splice bars, inspection is usually made on a motor car, and it is impossible to inspect bonds properly in this manner.

Bonds installed on the outside can be properly supported to decrease the vibration, (which cannot be done if placed behind the splice bar) and when so placed are in the best position for inspection. Inspection must be made in this case by the maintainer and an assistant walking track, and better inspection is thus obtained.

There is no advantage in placing bonds behind the splice bars on larger size rail, although there is more space behind the bars for them. As bonds in this position cannot be properly supported, violent vibration against the bolts will injure them and they will fail on account of rust or wear.

I have tried every type of bond made and am convinced that none are perfect. Bonding troubles can best be eliminated by proper installation and inspection afterwards. No type of bond can be installed and then forgotten.

Install Bonds on Outside of Rail

D. Guigue

Signal Maintainer,
Canadian National,
St. Lambert, Que.

My experience has proved, to my satisfaction, that bond wires should be installed on the outside of the rail. Wires so installed, with a neat bend against the ball of the rail above the splice bars, are less in danger of being injured by spikes, spike mauls, track wrenches and dragging equipment.

The only objection to installing bonds on the outside of the rail is that the wires cannot be easily inspected. However, I believe that they can be inspected more easily and broken bonds more readily detected by a maintainer walking along the outside of the rail. Of course, this necessitates walking the same track twice to make a bond-wire inspection. However, that does not necessarily mean more work in the long run, because there will be less trouble from bonds installed on the outside of the rail than there would be if they were on the gage side, even if the former were inspected only one-half as often.

Gage Side of Rail Outside the Angle Bars

C. J. Kelloway

Superintendent of Signals
Atlantic Coast Line
Wilmington, N.C.

The standard practice of the Atlantic Coast Line is to install bond wires on the gage side of the rail. This is done primarily to facilitate inspection of the bonds.

My experience has been that bond wires which have been installed behind the angle bars are not satisfactory on account of the difficulty of proper inspection.

As a Maintainer Views It

R. B. Workman

Signal Maintainer, Colorado & Southern,
Trinidad, Colo.

Bond wires should be installed on the gage side of the rails because such bonding can be quickly inspected, is less exposed to brine drippings, and broken bonds are more easily detected. Inside bonding can be inspected by the maintainer using a motor car traveling at a speed between five and seven miles per hour. Outside bonding must be walked for proper inspection, and it is also necessary that the maintainer carry the bonding tools and repair materials, which is a considerable handicap. On account of this slow and tiresome duty, the maintainer is liable to postpone the inspection as long as possible. The time saved in inspecting inside bonds on a motor car enables the maintainer to allow more time to the needed maintenance of other signal units. My territory includes 40 mi. of copper-clad bonds with 3/8-in. channel pins, and I can inspect the entire territory in one day. It is easy to appreciate the saving in time.

There is far less trouble from the corrosive effects of brine drippings on inside bonding than in the case of bonding outside the rail.

Quite often when one wire of a duplex bond breaks, it is held in place by the other wire so that it is not easily noticeable. However, when the second wire breaks by vibration, the alert signal maintainer will nearly always notice and repair the bond before a track-circuit failure occurs. This is not the case with outside bonding. There is no argument about dragging equipment damaging bonding, as this has an equal effect regardless of whether the wires are inside or outside of the track.

The advantages of installing bond wires behind the angle bars are as follows: There is less vibration, permitting longer life of the bond. There is less damage due to dragging equipment. The wires do not work up close to the ball of the rail where they will be pinched and cut. Such bonding presents a neater appearance than bonds outside the bars, where track forces are continually pulling the wires out of shape in tightening bolts or driving spikes. It is not unusual that such wires are cut in two by a spike maul. Also the angle bars may protect the wires against brine drippings. However, this advantage is cancelled by the

(Continued on page 46)

fact that the wires rust more easily on account of moisture and dirt remaining behind the bars.

The disadvantages are as follows: Track men will often cut a bond wire in two in trying to drive a bolt through the joint. Wires that are behind the bars are liable to work upward in a loose-fitting joint, after which the track men tighten the bolts and pinch the bonds. The wires are then broken by vibration and rail expansion and contraction. Also, it is necessary to walk the track in inspecting bonding which is behind the angles, and each bond must be pulled to discover the broken ones.

Outside and Above the Angle Bar

A. H. Rudd

Chief Signal Engineer, Pennsylvania, Philadelphia, Pa.

Our bond wires are installed on the opposite side of the rail from the gage in order to avoid damage from flanges, because we run them on top of the angle bar. We place them on the outside of the angle bar so as to obtain better inspection and also because, in a great number of cases, there is not room behind the bars.

Gage Side Preferred

C. F. Grundy

Signal Engineer, Kansas City Southern, Kansas City, Mo.

If the angle bar and height of the rail will permit placing a bond so that it is reasonably safe from injury by trackmen when tightening the bolts or driving the spikes, I prefer the bonds on the gage side on account of the ease of inspection. Four years ago, when new 127-steel with non-slotted angle bars was laid on 14 miles of track, we installed cable-type bonds on the gage side of the rail, using two clips per bond, and to date none of these bonds have broken.

Placing of bonds behind the angle bars seems necessary at certain isolated locations on account of trespassers pulling the wires over the top of the rail. However, in time, iron wires behind the bars will rust and break, while the copper wires are more likely to be crushed and finally break, thus causing intermittent circuit failures. A bond, if used behind the bar, should be of non-corrosive material and heavy enough that it will not be easily mashed.

▼ ▼ ▼

Parkway Cable to Light Signals

"Where parkway cable is being used to run from a relay case under the track to a light signal on the opposite side, do you run the parkway cable up the mast to the signal head or terminate the cable in a terminal box at the base of the mast? Which is the most satisfactory method?

Cable Run Up Signal Mast

G. E. Beck

Signal Supervisor, New York Central, Toledo, Ohio

On the New York Central, where we run trench or parkway cable to a light signal on the side of the tracks opposite the relay case, we run the cable on the outside of the mast, continuous to the light unit. Where the cable leaves the ground-line, we use a piece of cast soil-pipe 18 in. long and of the size required to house the cables. The top of the soil-pipe is packed and filled flush with compound.

As these cables are held in position by half-clamps which are held by ladder-clamp bolts, no additional clamps around the mast are required. This method is the most economical in that a post, box, padlock and terminals are not required. Also the appearance is improved, as the post, box and cable-drops are not in view. Maintenance cost is reduced because there are no terminals to corrode, no padlocks to freeze or stick, and no box to paint and renew.

Terminal Box Not Required

G. H. Caley

Electrical and Signal Engineer, New York, Ontario & Western, Middletown, N.Y.

In our opinion, an underground parkway cable, run to a light-signal mast, need not be terminated at the base of the mast. Such an arrangement would be an added expense and of no particular convenience for testing. It would also require additional terminals to maintain, where there would always be a possibility of interruption, due to loose nuts or connections.

Parkway Cables Terminated

A. Vallee

Supervisor of Signal Construction, Delaware & Hudson, Albany, N.Y.

We terminate the parkway cable in a terminal or relay box at the base of the signal mast or adjacent the mast. We find that this is the most satisfactory method.

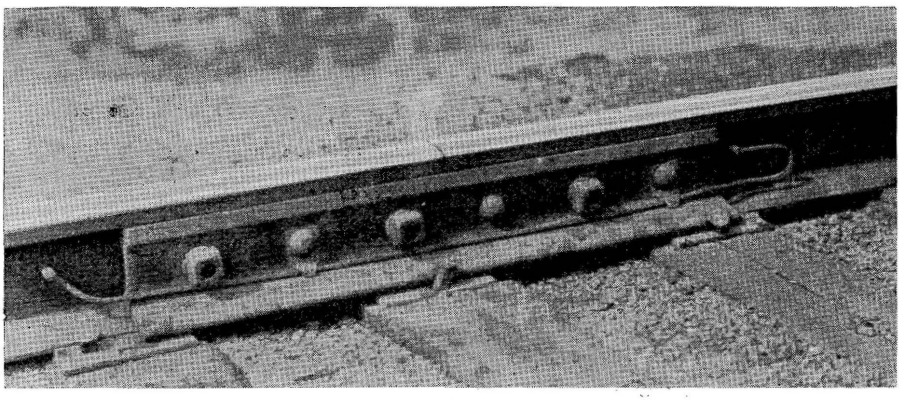
Cable Run Inside Signal Mast

C. H. Cameron

Signal Supervisor, Canadian Pacific, Toronto, Ont.

Some of the light-signal installations on the Canadian Pacific have been fitted with parkway cable connections without the use of a special terminal box. The expense of such a junction box was thus eliminated, and at the same time the installations have been satisfactory. Following is the method of arranging the cable connection. The jute and steel are removed from the cable to a point which will be immediately below the outlet hole nearest the signal unit, after the cable is pulled up inside the pole.

The cable enters the pole from the foundation, which is cast with a cable-entrance hole. The bend of the cable in emerging from the inside of the pole must be carefully made in order to avoid kinking the lead. The loop of unwrapped cable extending from the mast to the signal unit is protected by flexible metal conduit. At the point of entrance of the cable



Cable-type bond installed on the Kansas City Southern four years ago—Note the protectors