Utah Railway Company

Report on General Physical Condition of -

Main Track Utah Railway Jct to Mohr.

Wattis Spur main track

Spring Canyon Branch main track

National Coal Railway main track

UTAH RAILWAY COMPANY

Office of Division Engineer
Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK AND STRUCTURES FROM UTAH RAILWAY JUNCTION TO MOHRLAND

Right of Way

Utah Railway Company owns sufficient land for present operations and there are no right of way problems.

Grading and Roadway

Construction began in 1912 and operations began in 1914.

The cuts are in fair operating condition. Many of the cuts have never been widened except for natural erosion and a considerable number of the cuts are so narrow in the bottom that cleaning with the D-4 traxcavator results in tie damage. It is necessary to clean out annually most of the deeper shale cuts particularly from MP 13 at Healy to MP 23 east of Hiawatha. The 1951 ditching program contemplates cleaning cuts aggregating about 48000 track feet long and totaling about 90000 feet of ditch.

The embankments in general have been widened during cut ditching operations with on track ditcher and dump cars. On most of the embankments the original grade line has been restored by dumping cinders and raising track from year to year. There are, however, a number of embankments where grade line has either not been restored or the restoration has left the subgrade too narrow to properly support the track. The most conspicuous deficiencies in embankments are listed in the following:

1 - 1200 foot long embankment (30 ft. maximum height) just east of MP 2 with track one to two feet maximum below the original grade line, which was the 2 percent stipulated maximum.

2 - 1500 foot long embankment (85 ft. maximum height) at MP 14½ with track probably two to four feet maximum below the original grade line which was the 1.68 percent stipulated maximum for the 8 degree track curvature through this location. It might be necessary to widen the embankment if the track grade line is restored to the original.

3 - Two embankments totaling 700 feet long (50 ft. maximum height) at MP 16-3/4 with track probably one to two feet maximum below the original grade line, which was the 1.68 percent stipulated maximum for the 8 degree track curvature through this location.

4 - 500 foot long embankment (80 ft. maximum height) ending at MP 19. Track has been restored to the original 2 percent stipulated maximum but embankment is now too narrow to properly support track and a large amount of embankment material will have to be placed to stabilize the track and embankment.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

There are also three or four embankments (50 to 75 ft. maximum height) between MP 20 and MO 21.6 (Hiawatha) over which the original track grade line has been maintained but which are now in need of bank widening or will be within the foreseeable future.

Tunnels

Tunnel 1 just west of MP 2 is 802 feet long and Tunnel 2 just east of MP 4 is 835 feet long. Both tunnels were concrete lined in 1923 and both provide standard overhead and side clearance. The track through each tunnel is on 8 degree (maximum) curve. Inside guard rails of 85 pound rail extend through each tunnel. Tracks are laid with RE 110 pound rail and 8x11½ tie plates. The track and side ditches through both tunnels are filled with stack cinders and dirt and will need to be cleaned in 1951 or 1952. Some patching of concrete in side wall near east end of tunnel 2 needs to be done. Alkali bearing water has disintegrated concrete in cracks.

The tunnels are dry and except for extra track cleaning will require little or no maintenance. Near the east portal of tunnel 2 a dry wash, which originally carried runoff water over the top of tunnel, has broken out and water now runs down over the east portal onto the track. The cut ditches leading away from the tunnel are practically on a level grade and when heavy runoffs occur part of the water runs back through the tunnel and over the track. Present gravel ballast is now fouled with mud from this source. This damage could be forestalled by the installation of a 24 inch pipe culvert to carry the water over the top of the ~~culvert.~~ tunnel.

Bridges, Trestles and Culverts

Originally there were five locations where track was carried by steel bridges. At two locations, MP 0.17 and 0.92, the original bridges have been replaced with longer spans and ballast decks have been installed. At MP 5.88 near Wild Cat the original 15 ft. steel bridge has been retired and was replaced by a culvert pipe.

The two span deck plate girder bridge 120 feet long at MP 2.52 near Jacobs is not in satisfactory operating condition. The timber deck was replaced in 1925 with ties framed to afford 3/4 inch elevation of outer rail to conform to the operating speed at that time of 12 miles per hour on the 6 degree curve over the bridge. When the operating speed was increased to 25 miles per hour in 1930 it was necessary to place a permanent speed restriction of 15 miles per hour over the bridge. The general tendency to disregard the speed restriction by westward trains of loads results in difficult track maintenance near ends and over the bridge. The west abutment was placed on the edge of a steeply sloping hard shale bank and the east abutment was placed on unstable loam which had been deposited by flood runoffs. As both abutments are wet masonry type with mortar of rather indifferent grade

both abutments have not only settled some but are now rapidly shaking apart under the impact of traffic. The thrust from the unstable embankments against the abutments combined with settlement have caused the abutments to tip toward the center of the bridge, and it has been necessary to slot the steel flanges of the bridge girders to avoid undesirable stresses in the steel and to cut out recesses in the masonry backwalls of the abutments to avoid pressure against the ends of the girders. There has been no apparent settlement in the concrete center pier which supports the steel H-frame on which the middle ends of the 60 foot deck plate girders are supported. That the abutments are tipping and settling is verified by the necessity of raising the track at the bridge ends at least once a year to preserve a satisfactory top of rail grade line. The concrete center pier was of a rather undesirable grade of concrete and is now rather badly cracked. When this disintegration has proceeded to the danger point, it will be necessary to cut off several feet of top of pier, wrap the remainder with reinforced concrete and replace the concrete taken off with air entrained concrete of the best possible grade. When this is done, the present abutments should be removed and replaced with best grade concrete abutments and bridge should be lengthened at each end using second hand 15 foot steel I beam bridges now in stock, these supported at the outer ends by concrete abutments on treated pile foundations driven to proper depths. This will remove the unbalanced embankment thrusts and protect against any settlement or future disturbances. The tentative sketch plan for the abutment replacement is shown on drawing MP 251 file UE 83 dated April 17, 1940. Considerable concrete channel protection has been made and is shown on plans file numbers UE 90, 106 and 183. When any future concrete work is done, the approach channel, above the center pier, which is now too narrowly restricted by the masonry walls (too low on one side) should be widened and the alignment improved by installing concrete walls of proper height together with any necessary additional concrete floor paving. The rehabilitation of this bridge is a major job and to avoid expensive temporary pile support during construction, arrangements should be made to discontinue operations over the bridge during the summer season for from two to four weeks as found necessary. It will be necessary to repaint steel in this bridge not later than 1952.

The fifth original bridge is at MP 9.56 between Wild Cat and Healy. This bridge is over Gordon Creek, the only major waterway requiring a long bridge. It consists of seven 80 ft. steel girder spans, and one 60 ft. steel girder span supported by concrete end abutments, four steel towers on concrete piers and one steel H frame on concrete piers with one forty foot steel girder in each tower to support the track. The towers range in height from 40 feet to 111 feet. The timber deck on this bridge was replaced in 1925 and ties were framed to afford an elevation in the outer rail of 3/4 inch to conform to 12 mile per hour operating speed in effect at that time. When the operating speed was increased to 25 miles per hour in 1930, a permanent 15 mile per hour speed restriction was placed on the bridge. In 1947 it became apparent, from the excessive wear on outer rail of the 6 degree curve over this bridge, that the actual operating speeds were in excess of 15 miles per hour and checks of operating speeds showed speeds up to 25 miles per

hour over the bridge. In 1948 by replacing tie plates and installing RE 112 pound rail in the outer rail only the superelevation was increased to approximately 1-5/8 inches permitting a balanced speed of 20 miles per hour. The 90 pound rail and tie plates remained in place for the inner rail over the bridge. As operating practices permit speeds of not over 5 miles per hour more than the rated speed, the 15 mile per hour speed restriction over the bridge was not changed. The lack of outer rail wear to date over the bridge indicates that in general speeds over the bridge conform to the 20 mile per hour balanced speed. The deterioration of the concrete in piers under tower B was so alarming that three of the piers were wrapped with reinforced concrete in 1925, under AFE-304. In 1930 creek bank erosion adjacent to tower B was such that it was found necessary to encase the ground adjacent to pier with a steel interlocking pile cylinder driven to bedrock and drive a steel interlocking pile cutoff wall from one side of cylinder to the rock wall or cliff on the opposite side of the creek. At the same time the piers under tower A were wrapped with concrete and ice breaker concrete noses were placed on the upstreamside of piers unit cast with the concrete wrapping. One of the piers in tower B was not concrete wrapped in 1925 due to fear of increasing weight beyond carrying capacity of the earth foundation. The exposed portion of this pier is continuing to deteriorate and it will be a matter of a very few years when it will be necessary to either replace the exposed concrete or wrap the pier with reinforced concrete. As the foundation material is now stabilized by the walls of the steel pile cylinder, there should be no objection to wrapping the pier with reinforced concrete. The concrete tops and sides of all piers under towers C and D (adjacent to Martin end of bridge) are disintegrating and spalling off on tops and sides. The bottom plates of the posts of towers C and D rest on steel rails embedded in concrete. The tops of these piers are only two to three feet above ground level. Original proposed plans show the concrete stepped out at two elevations below ground. If this construction is found in place, the wrapping of these piers would not be a large job. Necessary repairs should be made at the same time to the original pier under tower B. This work should not be postponed any longer.

The culverts installed on original construction were either masonry arches, masonry boxes or cast iron pipes. They were largely placed at the existing ground level at the time, with little consideration being given to proper foundations or to future erosion effects of stream runoffs. Most of the structures are in dry washes with no normal stream flow. Also the effective carrying capacity of most culverts does not take care of peak runoffs and water backs up behind embankments over most culverts during the period of the more violent runoffs. It has been necessary to replace masonry culverts at MP 13.84 and 15.27 with pipe type structures. It has also been necessary to make sizeable repairs to or install concrete protection at lower ends of culverts 2.42, 4.82, 6.49, 7.40, 8.39, 10.47, 10.68, 12.16, 12.69, 14.51, and 16.70 this list including some arch culverts. Due to failure of pipe under high embankments pipe culverts at MP 14.55 and 21.03 have been retired. The drainage at MP 14.55 now must pass through an arch culvert at MP 14.51 or filter through the embankment. The pipe at MP 21.03 was replaced by a pipe at higher elevation and this has never carried any

water. The runoff at this location backs up and filters through the embankment.

New additional pipe culverts have been installed at various times at MP 0.034, 4.38, 5.92, 11.91, 15.92, 16.11, 16.25, 16.34, 16.43, 16.93, 18.06, 19.13, 20.62 and 20.75 as experience from water damage to track showed the necessity for additional drainage structures. AFE-1075 now authorizes the installation of additional pipe culverts at MP 13.66, 14.34, 16.01 and 20.88. It is expected that these culverts will be installed during year 1951.

Annual culvert inspection reports have recommended the installation of additional pipe culverts at MP 2.13, 4.10, 11.22, 12.40, 13.40, 14.99, 15.17, 17.10, 18.34, 20.40, 20.50. 22.98 and 25.40 to either protect track from overflows during heavy runoffs or to handle water which must pass through long cuts to reach culverts which are already too small.

There are a considerable number of locations where no drainage culverts were installed but water was supposed to filter through loose rock placed in the original stream channel before embankment was placed. In all of these places mud has washed down against embankments to a considerable height above the original ground surface and the rock drains (called "French") have sealed up and water now slowly filters through the embankments leaching out soluble materials and causing more or less continuous settlement of the embankments, with resultant track maintenance problems. Annual bridge inspection reports recommend installation of tunnel liner pipe culverts at MP 18.65, 18.88 and 19.32. AT MP 19.99 a tunnel liner pipe is needed to replace the present broken down 2'x3'x128' stone box. At MP 21.07 a tunnel liner pipe is required to replace pipe at level too high to carry any runoff.

Some concrete protection work is now required at lower ends of culverts 3.34, 4.82, 13.19, 14.02, and 24.34. Considerable replacement of floor and part of side walls with concrete is required in 8 ft. masonry arch at MP 7.40.

Ties

Untreated, sawed 7"x8"x8' Oregon fir ties were used throughout on original construction. The original bridge ties were also untreated Oregon fir of appropriate sizes.

Bridges 0.17 and 0.92 are now ballast deck with creosoted fir timber floors and creosoted fir track ties over the bridges. The decks on bridges 2.52 and 9.56 were installed in 1925 and ties are first grade Oregon fir and were cold sprayed with a preservative treatment. When sheet steel covering for fire protection was placed on ties on bridges 2.52 and 9.56 in 1945, the ties appeared to be in first class condition and will probably last for 15 or 20 years from now.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Untreated sawed Oregon fir ties were used for renewals in main track from 1919 to 1923 inclusive. Zinc chloride treated Oregon fir ties were used for main track renewals 1924 to 1927 inclusive from MP 0 to MP 23. Creosote petroleum treated Oregon fir ties have been used from 1928 to date MP 0 to MP 23. The treated ties have been 7"x9"x8' except that 7"x9"x9' have been used to some extent on curves and under joints since 1938. From MP 23 to MP 25.4 at Mohrland creosoted Oregon fir 7"x9"x8' ties were used from 1935 to 1946 inclusive. Since 1946 untreated pine renewal ties have been used between MP 23 and MP 25.4.

The five year average annual tie renewals in main track MP 0 to MP 25.4 for years 1946 to 1950 inclusive is 99 per mile, indicating a service life of almost 30 years per tie.

Untreated 7"x8"x8' Oregon fir ties were used for side track renewals from 1919 to 1924. From 1924 to 1932 inclusive untreated pine ties largely culls were used for side track renewals. In 1933 use of part creosote petroleum treated 7"x8"x8' ties was begun in side tracks with increased percentages of treated ties installed over the years until now the side tracks excluding a few yard tracks at Martin are rapidly approaching a 100 percent treated tie basis. The only treated side track ties removed to date have been account of splitting, spike cutting or mechanical wear. When a full treated tie basis is reached in main line side tracks, probably about 1952, the renewals will be very light for several years and then will probably level up to a 30 or more year life basis.

There is a considerable number of zinc chloride treated ties in some miles from about MP 6 to MP 23 and this will result in rather heavy renewals in these miles for perhaps 5 or more years particularly where it is necessary to raise track out of face for resurfacing. There also are a few untreated ties in track on some miles. Where rail is replaced with resultant resurfacing of track, more ties will be replaced than on ordinary renewals where track is disturbed. Also the program of installing large tie plates on sharper curves to replace present unsatisfactory tie plates will cause some tie replacements of ties with some splitting or other mechanical wear. Except for these special causes tie renewals in main track should seldom exceed 2500 per year from MP 0 to MP 25.4. Excluding switch ties in about 80 turnouts in main line and side tracks MP 0 to MP 25.4 the side tracks total about 10 track miles and renewals should not exceed an average total of 900 to 1000 ties per year. Partial use of treated renewal switch ties was begun in 1937 and increased over the years until turnout switch ties are now practically on a treated tie basis. Switch tie renewals in main line and side tracks will be very light from about 1952 to perhaps 1960 and with judicious culling should then not average over 3 or 4 sets per year totaling 10,000 to 15,000 feet board measure per year.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Rails

The original main track MP 0 to MP 20.68 was laid with new 90 pound RA rail 33 feet long and 4 hole Bonzano type angle bars. From MP 20 to MP 25.4 the main track was laid with ARA-A 75 pound rail with 4 hole continuous joints.

75 pound rail from MP 20.68 to MP 21.64 was replaced in 1924 with new 90 RA rail and 100% joint type 4 hole angle bars. In 1928, 1939 and 1942 the replacement of all 75 pound rail through the five main track turnouts at Hiawatha was effected using relay 90 RA rail. From 1928 to 1930 the 90 pound rail from MP 0 to MP 5.78 near Wild Cat was replaced with RE 110 pound rail 39 feet long and 100% 4 hole angle bars. In 1942 curve 15-A and in 1946 curve 9-B was relaid with RE 112 pound rail and 4 hole toeless angle bars replacing 90 pound rail totaling 0.73 track miles and in 1949 RE 112 pound rail was laid from MP 5.74 to MP 5.89 replacing part 110 and part 90 pound rail for use for emergency ordinary replacements. During 1924 and 1925 the original 90 pound rail on curves 9-A, 10-A, 13-A, 14-B, 16-B and 18-A was replaced with new 90 RA rail using 4 hole 100% type angle bars and in 1928 curves 14-A and 14-D were relaid in the same manner using relay 90 rail. At present rail in westward and single main track comprises 0.88 miles RE 112, 5.74 miles RE 110, 15.15 miles 90 RA and 3.76 miles ARA-A 75 pound rail except that from MP 9.42 to MP 9.68 RE 112 pound rail is in place on one side only replacing the 90 pound outer rail on curve 9-A over bridge 9.56 Gordon Creek.

In 1930 a second main track was constructed from Utah Railway Junction to the east end of Martin yard, a total of 1.54 track miles. 0.95 miles of this track was laid with new RE 110 pound rail and 100% type 4 hole angle bars and 0.59 miles was laid with relay 90 RA rail and 100% type 4 hole angle bars.

The overall general condition of main track rail is good and there is practically no surface or top wear from the rail. On a number of curves the outer rail shows considerable head wear on the gauge side, such as curves 9-A, 10-A, 14-A, 14-C and 16-B, this partly the result of not enough superelevation of the outer rail for a number of years. Practically all curves now have superelevation of outer rail for the time card speed of 25 miles per hour and excessive head wear on curves no longer takes place.

In 1935 the outer 90 pound RA rail on 8 degree curve 6-A showed excessive ball wear resulting largely from lack of superelevation. The track was resurfaced and relined and outer rail was elevated for time card speed of 25 miles per hour. Enough relay 90 RA rail was curved to 8 degree template and installed replacing the original outer rail of this curve. The replaced outer rail was then installed for the inner rail replacing the original inner rail. The rail on this curve has now carried traffic for 16 years without appreciable wear on outer rail and no objectionable surface distortion of the inner rail in spite of the fact that actual speed of trains in either direction exceeds the time card speed by from 5 to 10 miles per hour.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

There is now in stock about 2.4 track miles of new RE 112 pound rail purchased in 1937. It is planned to lay this rail from year to year as needed in main track from present end of 112 pound rail at MP 5.89 at Wild Cat and release 90 RA rail which has little wear or batter. This 90 RA rail will then be laid as the outer rail on curves where excessive head wear exists and this outer rail will be set over and replace the inner rail of the curve. Most of the inner rail replaced will be salvaged as second hand rail suitable for side tracks. This program will also assure a continuing supply of 90 RA rail for emergency replacement of main track rails which show visible defects, break under traffic or are marked for replacement by rail flaw detector car.

The condition of the ARA-A 75 pound rail in main track from MP 21.67 to MP 25.4 is generally excellent, except for the rail from MP 22.29 to MP 22.94 which is used by locomotives going to and from wye to turn and by switching operations bringing loads from Hiawatha mine. It will be necessary to replace this rail with relay 90 RA rail in a few years. This work would be justified now by the saving in replacement of treated ties now suffering excessive mechanical wear because tie plates do not afford proper protection.

Unless traffic increases by half or more it appears that it should not be necessary to buy any new 90 or 112 pound rail for perhaps ten or more years.

Angle Bars and Rail Joints

As angle bars go with rail nothing need be said about angle bars except that both the Bonzano 90 and continuous 75 angle bars are hard on ties. By proper application of tie plates on joint ties since about 1930, the tie damage from Bonzano angle bars has been very materially reduced. There are, however, a considerable number of joint ties under 90 pound rail which do not have tie plates. When ties are renewed or track is raised at such joints tie plates are being installed. The continuous joints were designed to eliminate the necessity for tie plates but actually the sharp edges of the base of these joints have proved to be about the most damaging tie destroyer. It has been found that Lundie single shoulder tie plates work very successfully under 75 pound continuous joints and when available these plates should be used under the 75 pound continuous joints when ties showing damage are being replaced.

Spikes

The spikes on original construction were drive spikes 9/16 inch square 5½ inches long. Use of 5/8 inch by 6 inch spikes was begun in the twenties and most of the original spikes have been replaced.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Tie Plates

Elyria 7x8½ 90 pound tie plates were installed on the sharper curves on original construction but the lighter curves and straight track were not tie plated. Use of 7-1/2 x 9-3/4 Sellers 90 tie plates was begun in 1919 and in a few years all curves were fully tie plated with Sellers tie plates except on joint ties and Elyria plates were transferred to straight track with enough Sellers 90 placed on straight track to take care of renewal ties.

In 1928 use of Lundie 7½ x 10½ tie plates was begun and these were installed on renewal ties when Sellers plates were not available. Later Lundie 8x10½ double shoulder tie plates were used for out of face replacements on a considerable number of curves with Sellers 90 plates released. Lundie 7½ x 10½ tie plates were installed under all the 110 pound rail laid between MP 0 and MP 5.78.

In 1940 8½ x 12 (so called Colorado) tie plates were purchased and have been installed on some of the 8 degree (maximum) curves replacing smaller tie plates.

In 1942 8 x 11½ (so called Rio Grande) tie plates were purchased and have been installed on curves 1-B, 4-A and other locations replacing 7½ x 10½ Lundie and other smaller tie plates. The 8½ x 12 and 8 x 11½ tie plates were poorly designed and base area was the only desirable feature about them. Both plates have ribs on bottoms which are very undesirable when used on treated ties. Both plates are for 5½ inch base rail.

Tests and studies by American Railway Engineering Association have indicated that tie plates should have a base area of 100 or more square inches and that distance from outer base of rail to outer edge of plate should be not less than 1 inch more than the distance from inner base of rail to the inner edge of tie plate, this difference being termed the eccentricity of the tie plate. The out to out dimension of a tie plate transverse to rail is termed the width. In the interest of uniformity and standardization the AREA has recommended tie plate designs 12, 13 and 14 inches wide and recently 15 inches wide, the latter for sharp curves. These are double shoulder plates for 5½ inch base and 6 inch base rail. RE 110, 112 and 115 are all 5½ inch base rail.

The long freight haul from other mills makes it necessary for the Utah Railway to confine tie plate purchases to the nearest mill namely CF&I mill at Pueblo, Colorado.

Rolls for 13 inch tie plate for 5½ inch base rail are now available at Pueblo and 3000 pieces 7-3/4 x 13 inch tie plates are now on order for 1951 work. One inside spike hole in these plates will be lengthened enough to fit 90 pound RA rail and the plates will be installed on 8 degree (maximum) curves 10-A, 14-A and 14-C when track is resurfaced and outer rail is replaced account of mechanical wear.

The plates will also be installed on other selected curves for out of face replacements of tie plates. The smaller tie plates replaced will be used for replacements on main track tie renewals and on side tracks if any available.

The 11½, 12 and 13 inch tie plates all have holes punched for spikes away from rail base. On the sharp curves it is now the practice to anchor spike the plate to the tie through the two holes on the inside of the plate and to drive one spike on each side of rail base for hold down spikes. Tests and observations have shown that much of the mechanical wear on ties has resulted from movement of tie plate and with the former methods of driving all spikes along base of rail the undulations of the rail under traffic loosened the spikes and permitted the tie plate to slip around on the tie. Most of the available tie plates also had ribs on the bottom which added to the tie damage after plates became loose, permitting water and often sand and gravel to get between the plate and the tie.

The 13 inch tie plates to be used have flat bottoms. This feature coupled with the practice of anchor spiking the plate to the tie should eliminate most of the mechanical wear now taking place under present tie plates.

Rolls for the 15 inch tie plates are not yet available at Pueblo. If these rolls do become available at Pueblo it would be advisable to specify 15 inch tie plates for future orders.

If Sellers and Lundie tie plates are replaced in large enough quantities to permit, it will probably be advisable to repunch for 75 pound rail and install them on curves 4 degrees or over between MP 23 and MP 25.4 replacing 7x8½ plates for side track tie renewals or shipment to Provo joint yard to replace broken plates.

Rail Anti Creepers

About 8500 two piece type 90 pound rail anti creepers were installed on original construction prior to valuation June 30, 1919. To anchor the rail fairly securely with 4 per 33 foot rail a total of 27,000 rail anti creepers would have been required. The combination of practically all loaded traffic going one direction and the descending grades in the same direction undoubtedly resulted in excessive rail creeping. This is verified by alternate stretches of track where rail end gap is 1/2 inch or more and where there is little or no rail end gap. It was apparently thought that slot spiking the Bonzano type angle bars would stop rail from creeping. The net result was apparently excessive damage to joint ties.

Beginning in 1922 and continuing to 1928 or later a program of installation of one piece type 90 pound rail anti creepers was in effect. This resulted in the fairly secure anchoring of the 90 pound rail.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

All of the new RE 110 and RE 112 rail laid since 1927 has had 6 or more one piece rail anti creepers per rail, depending on location and operating characteristics.

In 1936 four one piece rail anti creepers per 33 foot rail were installed on the 75 pound rail from MP 23 to MP 25 where rail creeping was beginning.

Since 1926 additional rail anti creepers have been installed on 90 pound rail between MP 6 and MP 21 where 4 anti creepers per rail were insufficient. Also the two piece anti creepers on original construction have nearly all failed and have been replaced with one piece anti creepers.

The matter of proper anchoring of track is one which needs continuing attention particularly if track is raised for resurfacing or if operating characteristics change materially.

Frogs and Switches

The frogs and switches installed on original construction were suitable with the exception of the plates under switches and most of the plates under the frogs and the guard rails. Most of the original frogs and switches have been replaced in connection with rail renewals. The frogs and switches purchased for additional side tracks in the twenties were also not sturdy enough, particularly the plates. From 1926 to date the frog and switch material used has followed AREA design and has proper plates and braces.

Most of the 110 pound frogs used from Martin to Wild Cat have been solid manganese type (not self guarded). Also most of the 90 pound frogs used in connection with side track rail renewal at Hiawatha have been solid manganese. Except for occasional building up by electric welding, these frogs have been entirely satisfactory and should serve for an indefinite period yet.

The open hearth steel rigid 90 pound frogs and the 90 pound used since 1927 have been from later designs and have proper plates. A considerable number of the earlier type frogs have been worn out and replaced with better frogs and heavier plates.

The emphasis for other track materials used has been on larger and better tie plates both under rail and switches and frogs for the express purpose of reducing mechanical wear on treated ties and resulting in reduction in the total requirements for renewal ties. The results to the present have apparently well justified any differences in original costs and in the reduction of the amount of labor required for ordinary maintenance.

Ballast

All of the main track was originally earth surfaced using native material as encountered. In 1921 and 1922 a total of 5.4 miles of track was raised on an average of 8 inches of pit run gravel ballast

hauled from Nash pit between Provo and Salt Lake City. Beginning in 1928 the main track has been raised on coal cinder ballast with from 4 to 13 inches under the tie. Due to gravel ballast becoming fouled with mud track has been raised on about 6 inches of cinder ballast over the gravel ballast placed in 1921 and 1922 in some locations particularly between MP 18 and MP 21.5. About 0.5 miles of track has been raised on gravel ballast in short locations between MP 0 and MP 6 since 1929.

At present all main track between MP 0 and MP 25.4 has been raised on either gravel or cinder ballast. The cost of gravel ballast before unloading is almost prohibitive as commercial freight from Nash pit to Provo is added to the cost on cars at pit. Where gravel ballast was placed on unstable embankments the subsequent settlement has resulted in covering the gravel with layers of cinders in some cases up to four or five feet deep. An illustration of this case is the embankment at MP 14½ where the top of rail grade line is more than two feet below the original and where there are now two or more feet of cinders over the top of the gravel ballast. If gravel ballast should be used in the future, a study should be made of the characteristics of the subgrade. The weight of gravel ballast contributes to the settlement of an embankment which is still unstable.

Track

The main track was constructed with 8 degree maximum curvature from MP 0 to MP 17, with 7 degree maximum MP 17 to MP 21.2 and 6 degree maximum MP 21.2 to MP 25.4. All curves 2 degrees and over had the so called Berry easement or spiral at each end. The ruling maximum grade was 2 percent and the grade was compensated 0.04 for each degree of curvature this resulting in a grade of 1.68 percent on an 8 degree maximum curve. The maximum grade ends at MP 20 and from MP 20 to MP 25 the maximum grade is 0.1 percent. The rearrangement resulting from construction of the eastward main track MP 0 to MP 1.54 made curve 0-A at Utah Railway Junction an 8 degree 42 minute curve without easement. The movement here is a yard movement through turnouts and the grade is 0.2 percent and the sharper curvature is not objectionable.

Under Grading and Roadway three locations are listed where the track grade line is below the original as constructed. The restoration just east of MP 2 and at MP 16½ can probably be taken care of by dumping enough cinders on embankments which have been widened by wasting dirt cleaned from nearby cuts. At MP 14½ it will be necessary to run profile and cross levels and make a study of actual conditions before working out the solution of the problem.

The operating difficulties resulting from the conditions at MP 14½ and MP 16½ are objectionable as the alignment for some distance upgrade from the locations is maximum 8 degree curvature and the grade is maximum 1.68 percent. The settlement has resulted in grades for short stretches of more than 2 percent on 8 degree curves and probably nearer 3 than 2 percent at MP 14½. When locomotives with maximum

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tonnage train get beyond the abnormal grade and it is necessary to lift a number of cars up the heavier grade the traction is not enough and the locomotives slip badly. If top of rail is wet or frosty, the locomotive slips down and it is necessary to double the train to Wattis Junction. The final result is driven burns and corrugations on a considerable number of rails, extra wear and tear on the locomotive and increased cost of fuel, water and labor.

Some stretches of track particularly on embankments and in light cuts between Wild Cat and Wattis Junction, the track is rather badly weed infested and weeds are cut by hand about once each year. If equipment for chemical spraying were available, the weeds could be controlled so that in most locations annual spraying would not be necessary. At present labor costs chemical control would result in substantial labor savings and improve track maintenance.

It is intended that the grade line restoration at MP 16½ will be made this year and that the restoration at MP 14½ will be made in 1952.

The general track conditions between MP 0 and MP 21.6 (Hiawatha) are fair except for a few locations. The year 1950 produced subnormal precipitation and with an 8 month cut cleaning program most cuts were kept dry with little or no track damage from moderate runoffs.

The track from MP 2.4 (Jacobs) to MP 3.5 needs to be raised on cinder ballast. Most of this track has not been raised out of face since 1928, and poor track surface will damage rail if not corrected in time.

The track from MP 5.7 to MP 6.5 will be raised on cinder ballast this year to provide proper conditions for new rail to be laid from MP 5.89 to MP 6.5. The track from MP 6.5 to MP 7.3 (Darrah) is rough but raising this track will be deferred to 1952.

The track from MP 9.15 to MP 9.44 needs to be resurfaced on cinder ballast but this work will be done probably in 1952 if new 112 pound rail is laid on this curve just west of Gordon Creek bridge.

The track through curve 10-A will be resurfaced this year on cinder ballast to prepare for rail renewal in kind with 90 pound rail.

The track through curve 13-A will be raised on cinder ballast this year. As far as is known, this track has not been raised out of face since 1921, although it may have been resurfaced when new rail was laid in 1924.

The track through curves 14-A and 14-C will be resurfaced this year in connection with rail renewal in kind.

The track through curve 16-B (horseshoe) will be raised and resurfaced this year in connection with rail renewal in kind.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

The track through curves 18-B and 18-C should be raised, relined and resurfaced in 1952.

If labor is available about 1000 feet of track through curves 19-A and 19-B will be slightly relocated and relined and resurfaced this year to permit ditching of shale cut, having narrow bottom, with off track machine.

Curves 19-C, 20-A, 20-B, 21-B and 21-C need to be resurfaced during 1951 but curtailment of labor and other work may make it necessary to defer some of this work until 1952.

It will probably be necessary to raise and resurface all or parts of curves 23-A, 24-B and 25-A during 1951. All of the curves between MP 23 and MP 25.4 will have to be resurfaced by the end of 1952.

In the earlier operations raising and resurfacing track out of face was done every 5 to 10 years. Between 1928 and 1936 most of the main track was raised and resurfaced on largely cinder ballast. Since 1937 the out of face surfacing has been largely for short rail renewal jobs and occasional resurfacing of some curves or to restore grade lines on short embankments.

With present speeds and with heavier axle loads from a considerable number of 70 ton cars, it is apparent that most track will have to be resurfaced and relined not less than every ten years on the average. This would mean raising and resurfacing an average of about 3 track miles of main track each season. During cycles of heavier than normal precipitation the amount of resurfacing would need to be increased. An average of about 80 cars of cinders are unloaded per year and this amount of cinders would provide for a 4 to 6 inch raise on about three miles of track.

Fences

On original construction barbed wire right of way fences were constructed on both sides of track from the east end of Martin yard to Healy, with cattle guards and wing fences at road crossings. Apparently no maintenance work was done on the fences. The adjacent land is open range for live stock only. As the amount of live stock killed by trains in this territory had been almost negligible the fence was considered abandoned and was financially retired from accounts in 1942, the cattle guards having been removed before.

When additional land was purchased at Martin in 1927, it was found necessary to construct fence on the southerly or easterly right of way line from Bryner lane to a point near east end of tunnel 1. This fence is still in place and the maintenance is the responsibility of the Utah Railway. Total length of this fence is about 3000 feet.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

At Hiawatha about 900 feet of barbed wire fence with steel posts was constructed on the northerly right of way line to prevent trespassers crossing yard tracks. This fence is still in place.

During the thirties a Federal agency constructed a barbed wire drift fence on the northerly right of way line from near MP 11 to near MP 13. There is no railroad responsibility in connection with this fence.

Crossings and Signs

On original construction highway cross buck signs were installed at public road crossings together with whistling post signs. Mile post signs, yard limit, derail, section marker and trespass warning signs were also installed on original construction. Speed restriction signs were also installed at tunnels one and two and bridge 9.56. At public highway crossings planking was placed in traffic lanes.

The various signs are still in place except the trespass warning signs which have not been generally maintained.

When second main track was constructed in 1930, the permit from Public Service Commission of Utah provided that the Railway would maintain the portion of the hard surfaced highway between the two tracks just east of Utah Railway Junction at MP 0.04. At that time the original main track and the new second main track were raised and surfaced on gravel ballast and planks at top of rail level were installed over the ties for the two lane highway which is transcontinental highway 50-6. In 1937 the concrete surface between tracks was breaking up. A new heavy reinforced concrete slab was installed between tracks in 1937. In 1939 at the cost of a Federal agency flashing light crossing signals were installed at the Utah Railway Junction road crossing. The maintenance and operation of these signals is a Utah Railway responsibility.

In 1932 the crossing on the public highway leading to Wattis was relocated and plank crossing for a two lane highway was installed at Utah Railway expense.

At Hiawatha the main highway leading to the town was relocated in the twenties. The Utah Railway installed plank crossings for four tracks for a two lane highway and in conjunction with the town of Hiawatha concrete slabs were installed approaching and between tracks. During the middle thirties the concrete slabs were breaking up and were replaced with heavy reinforced concrete slabs again in conjunction with the town of Hiawatha.

The original wooden cross buck signs at public highway crossings at MP 0.85, 5.85, 18.06 and at Hiawatha were replaced in 1939 with all metal signs with reflector button words. Advance warning signs were installed along the highways on each side of the track in 1932. The state road forces have since replaced these with reflectorized signs which they maintain at all crossings except at MP 0. 85 which is a Carbon County road.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Some of the various roadway signs have been replaced with all metal signs made up by B&B forces and it is expected that all signs will be all metal in a few years when replacements of wooden signs become necessary.

Station and Office Buildings

The present frame stucco covered depot building was constructed at Hiawatha in 1919 and was used for both passenger and freight service until passenger train operation was discontinued in 1926. When the preparation plant was built by United States Fuel Company at Hiawatha in 1938, the practice of furnishing steam from U. S. Fuel boilers for heating the depot was discontinued. From 1938 to 1947 coal stoves were used for heating purposes. In 1947 the present oil heating stove was installed.

The 8 room frame dwelling numbered 8 at Martin was constructed in 1928 and has been used as a boarding house and dormitory for train and enginemen not residing at Martin. In 1922 sleeping rooms were fitted up in the semi-basement of this building and changes and additions to these rooms were made in 1930.

In 1918 three five room dwellings numbered 1 to 3 and one 3 apartment building, all frame, were constructed at Martin for use of enginehouse forces. These four buildings were all moved to the so called Martin townsite in 1928 and placed on concrete foundations.

In 1919 two frame 4 room dwellings numbered 6 and 7 were constructed near the boarding house at Martin for use of enginehouse forces.

In 1927 additional land was purchased at Martin and three 5 room and two 4 room frame dwellings were constructed on the site known as Martin townsite, but which has no legal status.

In 1927 a brick, concrete and steel office building 2 stories high was constructed at Martin for use of train dispatchers, agent and Superintendent's operating organization. The first floor is used largely for storehouse for miscellaneous maintenance of way material and the second floor for offices.

In 1927 a brick and concrete one story building was constructed at Martin and fitted up as a wash and locker building for use of all employees other than office at Martin.

In 1927 a septic tank was constructed with sewer line connections from all buildings at Martin and with filter bed and outfall sewer emptying into Price river.

In 1927 cast iron pipe and steel pipe water service lines were installed to office building, wash house and all dwellings at Martin with connection from water tank at an elevation affording gravity supply.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

In 1947 a third floor was constructed on the Martin office building and fitted up with 13 sleeping rooms, lounge, and wash and toilet room for use principally of train and enginemen not residing at Martin.

With the exception of replacement of asbestos roofing on the Hiawatha depot in 1951, the general condition of all station and office buildings is good. The frame dwellings at Martin were repainted in 1948 and 1949. Repainting of frame coal sheds serving these dwellings will be done in 1951.

There is a timber ramp structure at Martin which was built for loading truck hauled coal. There are some 13 timber ramp structures at the outer end of the railroad at Mohrland MP 25.4 some built by coal haulers and some built by Utah Railway Company. The maintenance of these ramps has largely devolved on to the Utah Railway Company.

Roadway Buildings

In 1918 a frame building at Martin was converted to a section bunkhouse. In 1919 a section bunkhouse was constructed at Healy near MP 13. In 1918 some car bodies were purchased and used as section bunkhouses at Martin and Hiawatha.

In 1928 two frame bunkhouses were constructed at Martin and the 1918 bunkhouse was retired. In 1943 and in 1946 one frame bunkhouse in each year was moved to Martin from the Spring Canyon branch.

In 1941 the section bunkhouse at Healy was retired. In 1928 the car body bunkhouses at Hiawatha are retired.

At Hiawatha the section foreman is housed in a dwelling rented from United States Fuel Company. One frame dwelling is rented from U. S. Fuel Company for section laborers and 6 apartments 3 to 4 rooms each are rented from a Federal Housing Agency for section laborers.

The four section bunkhouses at Martin are in generally fair condition except for exterior repainting which will be done in 1951.

The Utah Railway furnishes section buildings rent free to section forces at Hiawatha where all housing is owned either by U. S. Fuel Company or Federal Housing Agency.

At Martin the section foreman occupies 5 room dwelling No. 11 rent free and no rent is charged for the bunkhouses occupied by section laborers.

Water Stations

On original construction locomotive watering facilities were installed at Martin, Cordon Creek (MP 9) and at Hiawatha.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Facilities at Gordon Creek were little used as the creek water was not suitable for locomotive purposes. The pipe line was taken up and the 50,000 gal. steel storage tank was moved to National Coal Railway branch line in 1926.

At Hiawatha on original construction a 50,000 gallon capacity steel storage tank was built with a 2 inch diameter steel pipe intake about 1200 feet long connecting to a water distribution line of United States Fuel Company. An 8 inch cast iron discharge line about 200 feet long was installed from the storage tank to a 10 inch (U.S. Wind Engine and Pump Company) standpipe on main track near west switch. The supply pipe line was replaced in 1924 with 2½ inch galvanized steel pipe. The water supply is purchased from United States Fuel Company at a flat monthly rate.

Other distribution pipe lines installed on original construction to the enginehouse and for fire protection were abandoned and retired after enginehouse was removed in 1939. One outside hydrant tap was connected to the tank supply line, this for use of section gang.

On original construction a 50,000 gallon wooden storage tank was installed and supplied by an iron pipe line through which water was pumped from nearby Price River or from an irrigation ditch. In 1918 a so called filtration plant was installed alongside the pump house. The water was not suitable for locomotive purposes and in 1919 a pipe line connection from near by gravity supply line of Price City to the pump-house was installed. By use of bypass pressure valve water could be delivered to the wooden storage tank near enginehouse and pumping was discontinued.

In 1929 a 250,000 gallon steel storage tank was constructed supplied by a 6 inch cast iron gravity supply line connected to Price City pipe line near Utah Railway Junction the supply line being about 3500 feet long all on Utah Railway right of way. An 8 inch cast iron pipe discharge line was installed from the new storage tank to the locomotive standpipe and suitable 4 inch pipe line was installed between the 8 inch line and the water distribution lines to various buildings and to the Martin townsite.

On original construction a 10 inch (U. S. Wind Engine and Pump Company) standpipe was installed between main track and the adjacent track which leads to cinder pit and the enginehouse.

In 1930 another 10 inch standpipe (same type) was installed on the eastward main track and connected to the 8 inch discharge line from steel tank.

In 1938 the wooden storage tank was retired together with the 8 inch discharge line from tank to standpipe and which was installed on original construction.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

During and subsequent to construction a total of six fire hydrants were installed near various buildings and three small buildings housing hand drawn hose carts were placed for fire protection purposes.

In 1940 the supply pipe line from Price City pipe line was connected by a 6 inch supply pipe line to the pressure pump in the engine-house and also to the standpipe supply line with proper valves which if desired permit the standpipe and pump to be supplied direct when or if the storage tank is empty.

The condition of the steel sheets in the water storage tanks at Hiawatha and National is questionable. At Hiawatha the conical bottom tank which is now 37 years old has shown considerable evidence of seepage at some of the seams. At National the ellipsoidal bottom tank is also 37 years old and since 1938 water from an open creek has been piped into the tank. This water at times was very muddy and the tank bottom has been coated with mud except after an occasional cleaning. Nothing is known about the interior repainting of these tanks prior to 1928. Since then repainting has been done about every 5 years.

The ellipsoidal bottom tank at Martin is now 22 years old. The interior of this tank has been repainted with red lead paint at three year intervals 1929 to 1941, then in 1945 and not since 1945.

The Martin tank must be repainted inside during 1951. The type of the water at both Hiawatha and National is such that it attacks paint and steel and induces undesirable corrosion. To insure proper maintenance, the interiors of the tanks at National and Hiawatha should be repainted during 1951.

Fuel Stations

In 1917 an Ogle frame 200 ton capacity coaling station was constructed with 2 supply aprons on main track only at Martin together with hopper track for handling railroad cars by gravity and a separate house for motor driven cable hoist.

In 1930 an additional bin of 50 ton capacity with apron on eastward main track was constructed.

In 1924 an elevated structure was built at Hiawatha to hold one car of coal. Coal was dumped on a platform and shoveled by hand onto locomotive tenders. This structure was abandoned and retired in 1938.

In 1939 when U. S. Fuel Company preparation plant was constructed at Hiawatha, a bin and an apron for coaling locomotives was built by Fuel Company on main track of branch line owned by Fuel Company. Locomotives now get coal from this supply facility.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

The timber supports of the Martin coaling station were cut off above ground and concrete foundation was installed under them in the early thirties. The bins have been relined about twice and the timber supports and bracing have been replaced or reinforced. This structure is in a fair state of preservation and few difficulties are experienced with its operation.

Shops and Enginehouses

Steam locomotive servicing facilities were built at both Martin and Hiawatha on original construction.

The enginehouse at Hiawatha burned down in 1920 and was replaced in kind. The second structure was demolished and retired in 1939 and not replaced. The cinder pit on original construction at Hiawatha was retired in 1939. Sand house, oil house &c. constructed at Hiawatha were retired in 1939 and 1942. No shop facilities now exist at Hiawatha.

The original enginehouse at Martin burned in 1922 and was replaced by a brick, concrete and steel structure which has two tracks through and one stub track and will house six locomotives, and had a small annex for a 60 H.P. steam boiler.

In 1923 an air pipe line was installed from enginehouse to coal chute, elevated dry sand bin was attached to the coal chute and a frame building for housing sand drying stove and screening bin was built. Sand is elevated by air through a pipe line to the dry storage bin for gravity delivery to locomotive.

In 1927 an addition to the Martin enginehouse was constructed and an additional 100 H.P. steam boiler was installed. The addition also provided space for lathe, drill press, air compressor, shop office and a small storeroom for small engine parts. The boilers are used for supplying hot water for boiler washing and for low pressure steam for heating enginehouse and addition, oil house, wash house and office building including dormitory constructed in 1947.

A small concrete oil storage house was built in 1918 near enginehouse and extended in 1920. This houses in barrels enough oils for locomotive, car and other used at Martin. An underground gasoline storage tank with pump was installed about 1942.

A motor driven water pump in the enginehouse addition furnishes water for boiler washing and filling and is a standby for water needed for fighting fires. Wooden tanks at ground level were installed near enginehouse in 1922 for boiler washout purposes.

An automatic motor driven air compressor is in place in the enginehouse addition and furnishes compressed air for various enginehouse purposes, for elevating dry sand at coal chute and through pipe lines to certain yard tracks for testing car air brakes.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

After abandonment of enginehouse at Hiawatha a sheet iron covered frame store warehouse was taken down at Hiawatha and re-erected at Martin on concrete piers and is used for storage of locomotive and car material repair stocks.

An old steel coach body was installed near the enginehouse in 1939 and is used as workshop by the General Electrician and as a locker building by carmen.

The main portion of Martin enginehouse is now 29 years old. The superstructure supports and roof supports were steel. No repainting or maintenance work has been done on this steel and its actual physical condition may be very poor, particularly the roof support channels, as a result of being exposed to steam and coal gases (at high temperature) from locomotives. It is entirely possible that an extensive steel replacement of roof parts may have to be done in a few years. The windows are Truscon steel with ordinary glass and replacement of glass is an increasing burden. For economical maintenance it would probably pay to replace most of present windows with glass block type over a period of several years as salvaged ordinary glass is used up for maintenance replacements.

Except for possible roof renewals the shop buildings other than enginehouse are in a fair state of preservation and will require little or no maintenance in the next few years.

Telegraph and Telephone Lines

On original construction a pole and wire line was constructed from Utah Railway Junction to Hiawatha, and connecting to D&RGW telegraph line from Provo and Salt Lake. In 1920 the line from Martin to Hiawatha was simplexed for combination telephone and telegraph service. After dispatchers office was moved to Martin in 1927, the Provo-Martin portion was used as a telegraph line and the Martin-Hiawatha portion for both telegraph-telephone. In 1935 the present Edison trickle charged storage batteries were installed in the basement of Martin office building and furnish power for both Martin-Provo and Martin-Hiawatha circuits. Between 1920 and 1924 frame telephone booths were placed at Jacobs, Tunnel 2, Darrah, Healy, Wattis Junction and Hiawatha with telephones connected to the simplexed circuit. A telephone booth was also installed adjacent to Martin yard about 1943 with telephone connected to simplexed circuit. Such telephones are also in place in the Agent's office in depot at Hiawatha and in the General Foreman's office in Martin enginehouse. In 1947 the Lion Coal Corporation constructed a telephone line from its mine office at Wattis to the Utah Railway line near MP 18½ and telephone at Wattis is now connected to simplexed circuit.

The original pole and wire line had a four pin cross arm and carried two wires of a telephone circuit of the U. S. Fuel Company from the former Panther mine office to U. S. Fuel office at Hiawatha. When the Panther mine operation was abandoned in 1937, the telephone line was abandoned without salvage. Since 1937 when cross arms fail or become

too weak, they are removed and the two Utah Railway wires are attached to the poles by bracket pins.

To accomodate track requirements and changes the pole and wire line from Martin to Jacobs has been relocated and reconstructed.

In general the pole and wire line from Utah Railway Junction to Hiawatha is in fair condition and requires little maintenance other than cross arm retirement and stubbing poles for which creosoted fir ties are now used.

Automatic Block Signals

In 1923 an automatic block signal was installed near each end of tunnels 1 and 2 with approach circuits. In 1924 automatic block signals were installed for single track operation from Utah Railway Junction to Martin and from Martin to the signal just east of tunnel 2. When second main track was constructed from Utah Railway Junction to Martin in 1930 each track was signaled for normal direction operation but not for reverse operation from Utah Railway Junction to Martin. From a point just east of east end of second track at Martin to signal 43 east of tunnel 2 single track automatic block signals are operated. All of the signals are color light type with stop and go indications only and no permissive type. Signals and apparatus were all furnished by Union Switch and Signal Company.

The signal wire lines are carried by cross arms attached to telegraph line poles. Signals 14 and 16 at east end of Martin yard are normally lighted. The other signals are all approach lighted.

To afford proper spacing of opposing signals it will be necessary to move signal 21 in 1951 and to either move or retire signal 42. Replacement of worn insulation in insulated track joints will be made in a number of locations and replacement of underground wiring at two or three locations will be made in 1951.

Other than battery renewals, bond wire maintenance and wire line inspection, the signals should require little attention after 1951 for a number of years.

Power Transmission Systems

At Martin electric current for power and light is purchased from Utah Power and Light Company. Current is taken from Power Company line near wye at 6600 volts and transformed by Utah Railway owned transformers to 220-440 volt in transformers on a high platform attached to poles. In 1940 the entire distribution system of transformers, platform and wire lines was reconstructed and wire lines of proper size were installed from the transformers to the various buildings housing motors and smaller transformer was placed on pole near boarding house to furnish 110 volt current for lights in various buildings. When the new third floor dormitory was built in 1947, a new wire line from transformers to the office building was installed. The Utah Railway power distribution

lines serve the roadway bunkhouses, the boarding house, office, wash house and shop buildings. Rented dwellings 6 and 7 and all the rented dwellings in Martin townsite are served by the commercial department of Utah Power and Light Company, which owns the wire lines to the buildings.

The power transmission system will require only ordinary minor maintenance for a considerable number of years. There are no Utah Railway power lines or transformers at Hiawatha.

Miscellaneous Structures

In 1922 a frame building was constructed at Martin for use as a shop bunkhouse. The building was little used for that purpose and in 1927 the B&B gang began using it as a storehouse and shop. About 1943 a motor driven circular saw was installed and later a small drill press and a woodworking machine were put in. Later a motor driven transformer was released from Martin enginehouse and is now in place in the B&B shop, and is used for electric welding.

Roadway Machines

Motor cars for section forces consist of three Northwestern extra gang cars with Ford V-8 motors 85 H.P. Two are kept at Martin and one at Hiawatha. A Northwestern car with 6 cylinder International motor is kept at Martin for official use. A Fairmont light section car is kept at Martin and is used by traxcavator gang and other light duty. A Fairmont 2 man motor car is kept at Martin for use of General Electrician on signal and telegraph work. Four track push cars are kept at Martin and two at Hiawatha for section and other use.

In 1941 an Ingersoll-Rand crawlair compressor was purchased together with 8 tie tampers, power wrench etc. A track car was built for transporting the machine behind motor car. The air compressor was little used for track work and is kept at Martin and used largely for B&B work.

In 1942 a Norberg gasoline engine driven rail grinder was purchased. Machine is kept at Martin and used for cross grinding rail ends, grinding rail ends after building up and grinding frogs and switch points after building up.

In 1945 a D-4 caterpillar tractor with traxcavator front end was purchased. Machine is kept at Martin and during ditching season is used by traxcavator operator and two laborers largely for cleaning cuts. The machine has a Winch and rear boom attachment for light lifting. A suitable flat top track car was constructed for transporting the traxcavator.

The Northwestern motor cars used by sections are overpowered and have 21 inch wheels and are not the best type for the 2 and 4 percent grades on Utah Railway. They are both expensive to maintain and operate. Replacement with Fairmont cars with 4 cylinder motors and 16 inch wheels would effect substantial economies in maintenance and operating costs.

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

Some replacements and repairs were made in 1950 to the crawlair compressor and this machine should go for several years as past use has been comparatively light and actual use will not increase in the foreseeable future.

Some replacements and repairs are being made to the Nordberg grinder and this machine should take care of all requirements for several years.

The D-4 tractor has noticeably lost power and slowed up during the past season. It will be possible to continue full seasonal operation of this machine at the expense of efficiency and with constantly increasing cost of repairs and more time out of operation for repairs. It is recommended that a new D-6 tractor, with traxcavator and Hystaway boom and dragline bucket and clam shell bucket, be purchased. This would be an all purpose machine which would insure efficient ditching. The D-4 traxcavator would be kept as an auxiliary for use on ditching cuts or parts of cuts with bottoms too narrow for use of D-6 machine, and for emergencies when the D-6 machine is out of operation awaiting repair parts. This combination of machines would take care of all types of work which will be required from experience with past and present operations.

Roadway Small Tools

The section gangs at Martin and Hiawatha are well equipped with all types of track tools including tamping bars and rail benders. Tools at Martin will take care of 20 to 25 men and at Hiawatha 15 to 20 men. A small stock of tools is kept at office storehouse to take care of ordinary replacements.

Public Improvements

The concrete slab between main tracks and the flashing light crossing signals at Utah Railway Junction are maintained by Utah Railway.

The concrete slabs between and adjacent to tracks at the main highway crossing at Hiawatha were a joint installation by Utah Railway and the town of Hiawatha and out of face replacements should be on the same basis.

The maintenance of the planked portion of public road crossings at Utah Railway Junction, Martin, Wild Cat, near Wattis Junction and at Hiawatha are the responsibility of the Utah Railway as these roads were apparently in operation when the Utah Railway was originally constructed. Other than occasional replacements of worn, split or broken planks (4 inches thick) these road crossings require little attention except cleaning of flangeways, largely during winter season.

When the final location of highway U. S. 50-6 between Helper and Castle Gate is made under Federal Aid program, a separation of grades will be made. None of this work should be at the expense of the Utah Railway as during the thirties Utah State Road Commission allocated Federal funds for grade separations to the various railroads in Utah

PHYSICAL CONDITION OF UTAH RAILWAY MAIN TRACK-CONT.

on a mileage basis and used the funds to eliminate crossings over various railroads on a hazard basis. When this program was discontinued at the beginning of World War II, the back log credited to Utah Railway was a very substantial amount.

At Hiawatha a grade separation would be very desirable from a Utah Railway standpoint as all switching operations of cars to and from the United States Fuel Company mine are carried on over the crossing and all cars go over the crossing at least four times each. Such a grade separation would be the responsibility of the Utah State Road Commission and the town of Hiawatha with possibly some participation by the Utah Railway and the United States Fuel Company which owns two of the four tracks in the crossing.

Work Equipment

Rail bound work equipment owned by Utah Railway consist of one tool car (converted box car), two outfit cars on wheels, one 5/8 cubic yard capacity Erie steam ditcher mounted on short flat car and 10 air operated 25 cubic yard capacity dump cars, and one Jordan spreader car with rigid type long wings. Also one 200 class Utah Railway coal car was converted to a flat bottom car for handling material.

The two outfit cars are spurred out on a temporary disconnected track at Hiawatha and are used for housing section laborers. All other work equipment is kept at Martin and part of No. 8 yard track is assigned for storing this equipment.

The Jordan spreader now has a cab housing and this car is the only track equipment available for use for snow removal, and is capable of handling all snow removal from main track. The machine can also handle all work of plowing dirt or rubbish from tracks and has been used in connection with ditching work using Erie steam ditcher.

The converted coal car number 0215 has been little used and is no longer needed. If reconverted to full dump coal car using parts from three or four similar cars (now worn out) it would serve as a cinder car and company coal car for a number of years.

The Erie steam ditcher was purchased in 1921 and is pretty well worn out. Cost of complete overhaul with necessary replacements would be prohibitive and the present cost of operation using work train with five men in crew is so high that the machine is now obsolete. The ditcher machine should be retired and disposed of.

When the ditcher machine is retired about five or six of the 25 yard dump cars should be retired and disposed of. The remaining dump cars would be kept for a few years for use in widening certain fills

All Retired Prior To 7/2/52 Except Tool Car & Jordan Spreader

with dirt loaded from nearby cuts with off track power dragline. When it is decided that no further work of this type is required, the remaining dump cars should be retired and disposed of.

Report Written by

C. E. Beveridge

Division Engineer

Office of Division Engineer
Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON WATTIS SPUR, OWNED BY UTAH RAILWAY COMPANY

Right of Way

A right of way 200 feet wide from main track right of way line at Wattis Junction to station 105 plus 50 near Wattis is owned by virtue of land grant perfected by Chief Engineer's filing map dated January 19, 1922 and approved by Dept. of Interior April 8, 1922 under number 031007. From station 105 plus 50 to end of Utah Railway ownedship of Wattis spur at station 128 plus 96 the right of way line on left is 100 feet from center line of track. On the right the right of way line is 30 feet from center line of track from station 105 plus 50 to station 116 plus 42.8. On the right the right of way line is 7.5 feet from center line of original track from station 116 plus 42.8 to end of track at station 128 plus 96. Title to right of way beyond station 105 plus 50 is perfected either by the filing map previously mentioned or by transfer of title from Lion Coal Corporation when the purchase of Wattis spur by Utah Railway was completed November 1, 1921.

When final track changes, resulting from construction of new preparation plant and increase in 24 hour loading capacity by Lion Coal Corporation, have been completed the right of way actually required for the operation of main spur from station 116 plus 42.8 to end near station 128 plus 96 should be retained by Utah Railway by deeding to Lion Coal Corporation the right of way no longer required. The new Utah Railway ownership should end at the point where the center line main spur is 13 feet from the center line of the empty scale track owned by Lion Coal Corporation.

Grading and Roadway

The cuts are in fair operating condition but few of the cuts have been sufficiently widened to prevent erosion and sluffing from making it necessary to clean cuts annually or not less than bienally. Except for the second cut east of MP 1 all cuts may be cleaned by the D-4 traxcavator but tie damage results in some of the cuts with narrow bottoms. The second cut east of MP 1 is about 1000 feet long through clay and boulders approaching a cemented gravel hardness. Part of this cut particularly on right may be cleaned by D-4 traxcavator by making undesirably long hauls to waste but with considerable tie damage. The only desirable and effective cleaning of this cut would be by off track power dragline from top of bank with bulldozer to level and push back the spoil.

Office of Division Engineer
Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON WATTIS SPUR, OWNED BY UTAH RAILWAY COMPANY

With the exception of probably two or three locations, the embankments have now stabilized fairly well. The first embankment east of MP 2 (about 400 feet long) is still subject to considerable settlement partly due to occasional back up of flood runoffs too large for the culvert under the embankment. The second embankment east of MP 1 (about 500 feet long) is unstable due largely to lack of culvert under the embankment resulting in water filtering through the lower part of the embankment. The third embankment east of MP 1 is unstable in the same way for lack of culvert.

Bridges and Culverts

Wattis spur was constructed by or for the Lion Coal Corporation in 1913 and later sold to Utah Railway Company. There are no open bridges under the track. The only waterway of any size is provided for by a 6'x6'x207' box culvert, with rubble masonry floor, masonry side walls and top of native juniper trees not sawed or hewed to square. The other culverts on construction were either short 18 inch diameter galvanized corrugated steel pipes or short wood boxes with 24"x18" opening and made from sawed untreated track ties. All of the wood boxes have been replaced by galvanized corrugated steel pipes largely 18 inch diameter.

None of the culverts on original construction were large enough to currently carry runoffs from flash floods. Latest culvert inspection report recommends replacing present 18 inch pipes with 24 inch at MP 0.2, 0.62, 1.97 and 2.15. The report also recommends installation of proper size pipe culverts at MP 1.52 and MP 1.70 where no provision is now made for drainage with resultant trapping of water and resultant instability of embankments. The total expense of the enlargements and additions will not exceed one thousand dollars. The labor saving from present track damage by one flash flood would probably exceed the total cost of culverts recommended.

Ties

Ties on original construction were 7"x8"x8' untreated sawed Douglas fir. Prior to 1937 renewal ties were largely cull pine ties of rather poor size and quality. Use of creosote treated fir ties was begun in 1937 and in 1937 and 1938 part treated and part untreated ties were installed. From 1940 to date all renewal ties installed have been creosote treated. Also in 1940 use of 9 feet long ties was begun on curves between MP 1 and MP 2.2 at Wattis and on most of these curves, which are 12 to 13 degree, more than half of the ties are 9 feet long. Over 90 percent of ties now in track are creosote treated, the untreated ties being largely between MP 0 and MP 1 where curvature is light. Probably by the end of 1952 all of the main track of Wattis spur will have treated ties.

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Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON WATTIS SPUR, OWNED BY UTAH RAILWAY COMPANY

Rails

Rail used in main track on construction was rather poor grade ASCE section 75 pound rail all second hand. This rail was retired in 1937 from Wattis Junction to heel of frog of crossover to load tracks at Wattis and relay 85 pound rails 33 feet long were installed. This rail was salvaged from rail renewal made in 1930 by D&RGW on Utah Railway owned eastward main track between Provo and Moark. This rail had little head wear when installed in 1937. Rail for the curves 6 degrees or over was bent or curved before placed. This rail is giving very satisfactory service and there have been very few failed rails removed.

From the end of 85 pound rail at frog of load crossover to end of Utah Railway ownership near empty scales (about 900 feet) the original 75 pound rail is worn out and battered and kinked to such an extent that it should be replaced with relay 90 RA rail and suitable tie plates not later than 1952. The destructive effect of the present 6" x8½" tie plates on the creosote treated ties alone is enough to justify this work.

When head flattening of inside rails or flange wear of outside rails on the sharper curves becomes objectionable, the rails may be transposed (that is, outside rail moved to inside and inside rail moved to outside) and the rail will then give service for 15 or 20 years more. There is no probability that vertical headwear will necessitate removal of this rail short of 100 years. If, after transposition of rails on curves, flange wear or other causes necessitate rail replacement on curves this could be effected at minimum capital account cost by using relay 90 RA rail replaced in Utah Railway main track with heavier rail probably RE 115. It is, however, very probable that with proper timing of rail transposition on curves and a fair current track maintenance program, the 85 pound rail may outlast the Wattis mine which will not have an unlimited life.

Other Track Material

The 85 pound joints are 4 hole 26 inches long angle bar type. Little breakage has been experienced and the joints will probably serve as long as the rail.

The tie plates are 8" x 11½" double shoulder tie plates (Boyce or Railroad Supply type) for 110 pound rail with an extra spike hole for spiking gauge side of the base of 85 pound rail except under the angle bars. Under the angle bars the tie plates are either 7-1/2 x 9-3/4 Sellers 90 or 7½ x 10½ Lundie 110 tie plates punched for 90 pound rail. The Boyce tie plates are canted 1 in 40, the Sellers tie plates 1 in 80 and the Lundie tie plates 1 in 20. The difference in

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cant together with the smaller size of the joint tie plates has resulted in some tendency to gauge widen on the 12 to 13 degree curves. In general, however, the tie plates have been satisfactory, except that the bottom ribs of the Boyce plates cause some damage to the treated ties and may shorten the life of these ties some on the sharp curves.

The spikes are 5/8" x 6" cut spikes with in general on curve 2 hold down spikes at inside rail base.

Six two piece second hand P&M type rail anti creepers were installed per 33 foot rail when rail was laid in 1937. Some of these have failed when being removed or replaced in connection with tie renewals and have been replaced with Improved Fair type. Also some additional rail anti creepers (Improved Fair type) have been installed where needed to anchor track bringing total of 8 or 12 per rail.

New 7/8" x 4-3/4" track bolts and new 15/16" Hycrome type lock-washers were installed in 1937 on the 85 pound rail.

Other than for replacement of failed 2 piece rail anti creepers and occasional replacements of broken angle bars and bolts (few angle bars and no bolts to date) the other track material for the 85 pound rail will probably serve as long as the rail.

The 75 pound other track material near the end of the spur needs to be changed out with the rail not later than in 1952.

Ballast

1923 valuation report by Consulting Engineers McGonagle and Ullrich showed 45 cu. yds. rock and 51 cubic yards cinder ballast. The original ballast was no doubt native earth surfacing. Some cinders have been dumped from time to time under operations and considerable stretches of track from about MP 1½ to MP 2.2 have been raised on cinders with probably from four to 6 inches of cinders under the ties.

It would be desirable to dump cinders on other stretches of track between MP 1 and Wattis, particularly through cuts, and raise track on cinders to improve drainage and longthen tie life.

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REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON [redacted] SPUR, OWNED BY UTAH RAILWAY COMPANY

Track

Wattis spur main track was constructed with 13 degree maximum curvature using easements at the ends of curves known as Talbot spirals. These easement curves are short and on curves 8 degrees or over show a change of 1 degree in 10 feet. The ruling maximum grade was apparently four percent without compensation for curvature. Actually the maximum grade is 3.9 percent on 13 degree curve.

Under Grading and Roadway mention is made of two or three embankments which have not yet stabilized. With the exception of one embankment at MP 1.35 all embankments can probably be quickly stabilized by installing culverts for waterways and not permitting them to become partially saturated with drainage water. The embankment of MP 1.35 will probably continue to be unstable as long as runoff water backs up behind it during maximum runoffs.

It will be necessary to raise and resurface track over embankment at MP 1.35 during 1951 and it would be desirable to raise all on curve 1-B through this location. It may be necessary to raise and resurface curve 0-A in 1951. Due to sharp curvature and heavy grade it will be necessary to raise and resurface all of Wattis spur every 5 to 7 years.

Most of the main track Wattis spur is badly weed infested and hand cutting of weeds has been done nearly every year. With equipment for chemical spraying it would be possible to control weeds and effect substantial labor savings and improve track maintenance.

The Utah Railway section gang with headquarters at Hiawatha handles the track maintenance work on the Wattis spur. The Wattis spur switch in main track of Utah Railway is 4.5 miles from the section tool house at Hiawatha and Wattis mine office is 6.9 miles by rail from the same tool house. All of the empty storage, tipple and load storage tracks at Wattis are owned by Lion Coal Corporation. The Utah Railway Company maintains at its expense the storage and tipple tracks including cross and switch ties but does not maintain any other parts of the general track structure including culverts.

Fences

There are no fences on Wattis spur. The land is open range and is grazed by cattle and sheep for limited periods in the spring and fall of each year.

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REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON WATTIS SPUR, OWNED BY UTAH RAILWAY COMPANY

Crossings and Signs

The only road crossings over the Wattis spur are two or three plant crossings at Wattis and these are maintained by Lion Coal Corporation.

Station and Office Buildings

There are none on Wattis spur.

Roadway Buildings

The only roadway building is a 12'x18' frame bunkhouse owned by Utah Railway at Wattis with a pipe line connection to Lion Coal Corporation water supply and electric service from Lion Coal Corporation lines.

Water Stations

There are no locomotive water cranes on Wattis spur but water may be taken at Wattis through a hose connection to Lion Coal Corporation facilities.

Fuel Stations and Shops

There are none on the Wattis spur.

Telegraph and Telephone Lines

The Utah Railway has no such lines on Wattis spur. In 1947 the Lion Coal Corporation constructed a 2 wire telephone line from the Wattis mine office to a connection with Utah Railway telegraph telephone line near MP 18½ main track and dispatcher now has telephone connection with the Wattis mine office.

Automatic Block Signals

There are none such on Wattis spur.

Other Structures

There are no other structures or physical improvements owned by Utah Railway on Wattis spur.

FORM UR 108

UTAH RAILWAY COMPANY Sheet No. 7

Office of Division Engineer
Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON WATTIS SPUR, OWNED BY UTAH RAILWAY COMPANY

General

The Lion Coal Corporation expanded production facilities about 100 percent in 1947 and paid for the construction of necessary additional storage and tipple tracks to take care of the increased production capacity. Since a cleaning plant has been constructed. The available coal reserves will probably take care of maximum production for 25 or more years. With current and satisfactory track maintenance the present track structure should take care of all requirements except that replacement of the remaining original 75 pound rail should be made as soon as possible.

Report Written by

C.E. Beveridge

Division Engineer

Martin, Utah
January 1, 1951

REPORT ON GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON SPRING CANYON BRANCH OWNED BY UTAH RAILWAY COMPANY

General

The Spring Canyon branch was constructed by Utah Terminal Railway Company owned by three coal producers in 1920-1921. Utah Railway Company began operation of the branch in 1921 to serve joint with D&RGW the coal producing mines at Peerless, Spring Canyon and Standardville, Utah, under agreement to purchase the branch track and connecting tracks to the tipple and storage tracks at these mines, on a payment plan based on coal shipped via Utah Railway. Final payment on the purchase was made October 10, 1927, after satisfactory deed of conveyance was furnished by Utah Terminal Railway Company. The length of main track is 3.64 track miles from a junction with Utah Railway main track at MP 2.4 Jacobs, a distance of 1.6 miles east by rail of Martin office. Standardville is about 3 miles directly west of Martin.

Right of Way

The Utah Railway Company owns a right of way of varying width from main track right of way line at Jacobs to the end of main track ownership at Standardville MP 3.64, this comprising about 37.5 acres of land, none agricultural.

Grading and Roadway

The track is located on the side hill of Spring Canyon Creek at elevations of 40 feet or more above the creek channel and in general 200 feet or more from the creek except at MP 3.37 the creek crosses under the track and then crosses back at MP 3.54. The cuts are all side hill cuts and in general the embankments are short and do not exceed 25 feet in height. The cuts are through shale overlaid by clay and loose rock which approach cemented gravel immediately over the shale. The embankments have become pretty well stabilized but the cuts sluff during wet seasons and require cleaning probably every two or three years.

At timesduring flash floods mud and rocks are washed down against and over tracks from about MP 1.5 to about MP 2.8 near Spring Canyon. The latest serious damage from this source was in 1943 and the side hill cut for about one-half mile below Peerless has not been properly cleaned out yet.

Bridges and Culverts

The only bridge on the branch is at MP 2.74 at Spring Canyon. This is in effect a masonry box about 8 feet wide and 10 feet deep without a top. The track is carried by a 12 foot timber stringer bridge supported on the side walls of the masonry box. When the wood stringers deteriorate to the danger point, it would be possible to

replace them with one of the second hand 15 ft. steel I beam bridges taken out of main track Utah Railway and held for emergencies. By revising the masonry side wall supports it will be possible to install the steel bridge at an elevation which will permit the use of a ballast deck.

All the other waterways are culvert pipes, dry wall stone boxes, masonry boxes or combination masonry and concrete arches. Considerable repair work was done on the floors of some culverts about 1929 and 1930 and a concrete floor was installed in the 10' X 14' arch at MP 3.37.

The waterway structures on this branch are in generally fair condition and, except for damage from exceptionally heavy runoffs, will require little or no maintenance except annual inspection and minor repairs for a considerable number of years. The absence of culverts or other drainage provisions from MP 1.79 below Peerless to MP 2.74 at Spring Canyon leaves the track very vulnerable to damage from runoffs from the precipitous slopes to the right of track. The relative elevation of the tipple and storage tracks immediately to the left of main track would make a proper solution of this undesirable drainage problem a very difficult one.

Ties

Ties on original construction in 1921 were all untreated 7"x8"x8' Douglas (Oregon) sawed fir. Some replacements were made as early as 1924 using 7"x9" sawed zinc chloride treated fir. Between 1926 to 1931 practically all the original untreated ties were replaced apparently principally from splitting and mechanical wear resulting from largely from use of tie plates too small on sharp curves. Use of 7"x9" sawed creosote treated fir ties began in 1928. From 1932 to 1940 renewals were spasmodic and generally moderate with no renewals in a few years, the ties replaced being largely zinc chloride treated which had been installed between 1924 and 1926, these being removed either for mechanical wear or shattering of wood fibres in top of tie resulting from lack of moisture. Since 1940 the annual renewals have averaged 73 per mile for ten years indicating a life of 40 years for the creosote treated fir ties. Use of 7"x9"x9' ties, on most curves 8 degrees and over, was begun in 1946 and these should reduce tie replacements account of splitting.

Tie renewals in main track of this branch should remain at a low level as long as creosote treated ties are used.

Rails

The main track of this branch was laid with new 33 feet long 90 RA with conventional 4 hole angle bar type joints 24 inches long. In 1928 rail through the initial turnout at Jacobs was replaced using RE 110 rail to a point about two rail lengths from the frog. None of the other 90 pound rail has been replaced, the rail now being 30 years old.

PHYSICAL CONDITION OF SPRING CANYON BRANCH-CONT.

Other than for a little short batter at ends in some locations, the rail is in good condition and may outlast the mines served. There is some head wear of outside rail on a few curves. When the head wear reaches an objectionable condition or the inside rail has flattened on top, the rails may be transposed (outside rail to inside and inside rail to outside). There is little likelihood that the surface head wear from traffic will make it necessary to replace this rail.

Other Track Material

There has been practically no breakage of the 4 hole angle bar type joint bars and these should last as long as the rails. Bolts are 15/16" X 4-3/4" and in 1929 hyerome lock washers were installed, there being no lock washers on original construction.

Spikes on original construction were 9/16" X 5-1/2" drive spikes. These have been largely replaced on tie renewals with 5/8" X 6" drive spikes. Spikes in the zinc chloride treated ties corroded rather badly making spike replacements necessary.

On original construction 6"x8½" Wohlhaupter tie plates were installed on curves. When tie renewals were made, all new ties were plated with 7½" X 9-3/4" Sellers wrought iron tie plates and the Wohlhaupter tie plates were retired. Since 1940 some of the curves in the vicinity of MP 1 have been plated with 8½" X 12" Colorado double shoulder RE 110 tie plates with an added hole for spiking gauge side of base of 90 pound rail.

From a tie protection standpoint and to eliminate some occasional regauging it would be desirable to replace all Sellers plates on curves 8 degrees or over with suitable 13 inch or 15 inch tie plates if available from the closest steel rolling mill.

No rail anti creepers were installed on original construction. Fair type rail anti creepers were installed in 1922, 1924 and 1925 at the rate of four per rail. These appear to be holding rail in place satisfactorily. If changes in traffic or operating conditions make it necessary, additional rail anti creepers should be installed as needed to prevent undesirable rail movement.

Switches on original construction were 16'6" reinforced 90 RA rail and are still largely in place and with proper maintenance should last as long as the rail.

Frogs are 16'6" No. 9 RA 90 with suitable plates and are still largely in place. With proper maintenance they should last as long as the rail.

At about MP 3.45, Standardville, the main track crosses the track leading from tipple to D&RGW load storage tracks. Special crossing frog with plates (angle 12° 55') of 90 RA rail was installed. With proper maintenance this frog will last as long as main track rail.

PHYSICAL CONDITION OF SPRING CANYON BRANCH-CONT.

Guard rails are 8'3" RA 90 clamp type guard rails with plates. With proper maintenance they should last as long as the rail.

The ground throw switch stands on original construction were replaced in 1924 with high Star type standsand 6 foot long connecting rods and switch lamps were installed on these switch stands.

There appear to be no out of the ordinary maintenance problems for any of the other track material on the Spring Canyon branch except tie plates. As previously noted it would be desirable to have larger tie plates on all the sharper curves which now have Sellers plates.

Ballast

The track on original construction was raised and surfaced on earth ballast. No change has been made except that in a very few locations some cinders have been dumped and used for restoring track to original grade line where embankments had settled.

Based on experience to date there appears to be no necessity for installing any ballast other than earth on this track.

Track

Spring Canyon branch main track was constructed with 12 degree maximum curvature without spirals or easements. The ruling maximum grade is 4 percent compensated 0.04 for each degree of curvature. The maximum grade is not reached, however, between beginning of track at Jacobs and MP 2 at Peerless.

In general the track has been maintained to the original grade line. If cuts are kept dry and track is kept clean where washins occur, there are no out of the ordinary track maintenance problems on this branch.

Track was resurfaced throughout between 1924 and 1931 and again between 1948 and 1950 except for about the last half mile. If operations are resumed at Standardville mine, the last half mile should be resurfaced. After that general resurfacing will probably be required about every 10 to 15 years.

Track is rather badly weed infested throughout and hand cutting has been done in most years. If equipment for chemical spraying were available, the weed problem could be controlled in a few years with substantial saving in labor.

From about 1924 until 1931 a section gang was stationed at Standardville and Spring Canyon and took care of all branch line ordinary maintenance. This gang was abolished in 1931 and section forces stationed at Martin have taken care of the necessary maintenance work since 1931. The distance by rail from Martin to end of Spring Canyon branch at Standardville is about five miles.

PHYSICAL CONDITION OF SPRING CANYON BRANCH-CONT.

Fences

There are no fences on the Spring Canyon branch and there is no abutting agricultural land.

Crossings and Signs

On original construction planked crossings were installed at all public road crossings. In 1925 Utah Railway had necessary grading done to relocate about 800 feet of public highway between Peerless and Spring Canyon and two public grade crossings over the main track were eliminated. In 1930 Utah Railway contributed to the cost of a public road relocation near Standardville and two more public grade crossings over the main track were eliminated.

At present there are two public highway crossings at grade over the Spring Canyon Branch main track, one at Peerless and one at Spring Canyon. These are both planked crossings in good condition and other than for periodic replacement of worn planks and annual cleaning of dirt from flangeways these crossings present no maintenance problems.

In 1922 mile marker signs, station signs and whistling posts were installed. The mile marked signs at miles 1, 2 and 3 were replaced in 1950 with signs made from steel and attached to the nearest telephone line pole. The station signs were not replaced after posts rotted off and were not needed after abandonment of passenger train operation in 1926. Most of the whistling posts signs were abandoned when road crossings were eliminated in 1925 and 1930.

AREA standard type metal reflectorized cross buck signs on steel posts were installed in 1939 at the two public highway crossings replacing the previous wooden signs presumably installed about 1922.

Station and Office Buildings

There are none such on Spring Canyon branch.

Roadway Buildings

Two frame section bunkhouses were constructed at Spring Canyon in 1926 and a section tool house was installed in 1928. Tool house was removed and retired in 1939 and the bunkhouses were removed and retired in 1943 and 1947.

Water and Fuel Stations and Shops

There were never any of such constructed on Spring Canyon branch.

Telegraph and Telephone Lines

In 1926 a two wire telephone line was constructed from Martin to Standardville. From Martin to Jacobs the wires were attached to cross arms on the telegraph telephone line along main track. From Jacobs to Standardville poles were installed and cross arms attached to carry

PHYSICAL CONDITION OF SPRING CANYON BRANCH-CONT.

the wires. Telephones were installed in the mine offices at Peerless and Standardville, and in the load scale weigh house at Spring Canyon. Later line was extended to mine office at Spring Canyon and telephone was installed there.

This telephone installation includes a telephone in the Dispatcher's and Agent's offices at Martin and provides quick communication between these offices and the mine offices on the Spring Canyon branch for handling mine reports and car billing.

The 1926 construction included the installation of three telephone booths, one each at Peerless, Spring Canyon and Standardville with telephones for communication between trainmen and roadway employees and dispatcher. The telephone at Peerless was little used and was moved to Hiawatha in 1938. Due to non-user the telephone both at Standardville was moved to Martin in 1946.

Automatic Block Signals

In 1924 when automatic block signals were installed on the Utah Railway main track through Jacobs, an automatic block signal was installed on Spring Canyon branch about 900 feet from junction switch on main track. This signal was interconnected to the signals on main track to stop movements from branch to main track when main track signal sections in either direction were occupied by main line trains. In 1939 after the derail spur on Spring Canyon branch at Jacobs was removed and abandoned the branch line signal was moved to a point 220 feet from the junction switch in main track in order to speed up operation of trains moving from the Spring Canyon branch to the main track. Under the present installation there is actually no automatic block signal protection on the Spring Canyon branch other than the one signal to stop train movements from the branch to main track if the adjacent main track signal circuits are occupied by main line trains.

Power Transmission Systems and Miscellaneous Structures

There are none such on the Spring Canyon branch.

Roadway Machines and Roadway Small Tools

There are none such on the Spring Canyon branch. The small tools from Spring Canyon section were moved to section 2 at Martin in 1931.

Public Improvements

The planked public highway crossings at Peerless and Spring Canyon are the only public improvements on this branch. These were described under the heading "Crossings and Signs."

PHYSICAL CONDITION OF SPRING CANYON BRANCH-CONT.

General

The volume of coal shipped from the Spring Canyon branch via Utah Railway has steadily declined on the average since about 1932. At Peerless for the past fifteen or more years a very substantial portion of the decreased production has been sold to auto trucks and is moved by public highway. Production has declined at Spring Canyon. At Standardville average production has been cut in half or more and this mine has been out of operation a number of times for considerable periods. Unless Spring Canyon Coal Company puts in a preparation plant, it is probable that Utah Railway tonnage from Spring Canyon branch will continue to decline.

Report Written By

C. E. Beveridge

Division Engineer

Office of Division Engineer
Martin, Utah, Jan. 1, 1951

REPORT OF GENERAL PHYSICAL CONDITION OF TRACK AND STRUCTURES ON NATIONAL COAL RAILWAY BRANCH OWNED BY UTAH RAILWAY COMPANY

General

The so called National Coal Railway is a single track branch line extending from Darrah (MP 7.3 main track) to end of track about MP 8.9 on north fork of Gordon Creek at a point about 10 miles directly west of Jacobs (MP 2.4 main track). The railroad was constructed over a period of years between 1922 and 1926 by the National Coal Railway Company which was owned and organized by five companies preparing to produce coal in the so called Gordon Creek mining area. In 1926 the Utah Railway purchased the assets of the National Coal Railway Company and completed the unfinished part of construction work including widening of some cuts and the final surfacing of main track. The Utah Railway operates the National Coal Railway by lease, but all facilities constructed subsequent to the purchase by Utah Railway were paid for by Utah Railway Company. There is no outstanding stock of the National Coal Railway not in possession of Utah Railway Company.

Right of Way

Deed to a right of way of varying width was included with the sale contract in 1926 and there have been no subsequent claims to any of the right of way since. The right of way has been adequate to take care of all construction and transportation requirements to date. Right of way totals about 131 acres of which about 14 acres was agricultural.

Grading and Roadway

Most of the cuts were excavated to the minimum possible widths and with slopes of steeper pitch than ordinarily used for railroad construction. Embankments were in general adequate to support traffic, and there were few embankments over 15 to 20 feet high. Also few cuts were over 15 to 20 feet deep. In general the cuts and the embankments of any height are short.

The cuts were largely through clay and boulders but a few cuts are through sandstone rock and some have hard shale in the bottoms. While weathering in cuts has been moderate and slow, there has been little cut cleaning and ditching work done except in a few cuts. The result is that in most cuts the ditches are full of spoil to or above top of rail. The majority of the cuts are side hill type and cleaning with proper machine by overcasting would be relatively cheap.

The only single long cut is at MP 4½ and is a clay cut about 1300 feet long with maximum depth of about 15 feet and an average depth of 10 feet or less. The land abutting this cut is agricultural and is practically bare during the winter season. The prevailing wind blows at almost right angles to the track. The result is that this cut at times fills almost completely with snow. A considerable amount of ditching, for widening this cut, has been done. Also when irrigation

water has been permitted to waste over the face of the cut a considerable amount of widening has resulted from washing the dirt away and down to track level.

To prevent track damage in cuts from heavy rains in some years, all cuts with cut ditches filled up should be thoroughly cleaned.

It has been necessary to dump cinders on some embankments and raise track to restore grade line. Such work will have to be done from year to year as required.

Tunnels

There are none such on this branch.

Bridges and Culverts

The only bridge on this branch is at MP 5.83. On original construction this was a 5 span timber bridge on mudsills 40 feet long with about 12 foot long center span about 12 feet high. The main access highway to the Gordon Creek mines passed through the center span of this bridge. The timber was all untreated and deteriorated rapidly. In 1936 a short line change was made and a new 4 span timber bridge 59 feet long at a higher level was constructed. The timber bents of this bridge were supported by concrete foundations. All the timber in this bridge is untreated but the construction is such that none of the timber except the outside of the end bulkheads is touched by dirt. Deck of bridge is completely covered with galvanized sheet steel to protect from fire hazard. Bolts of this bridge were tightened in 1950. All exposed timber in 1950 was cleaned and was sprayed with light creosote oil with good penetration. Bridge is in good condition and should meet requirements for an indefinite period (perhaps 15 to 20 years) with a minimum amount of maintenance.

The culverts under National Coal Railway on original construction were largely stone masonry boxes or combination concrete and masonry boxes and galvanized steel culvert pipes.

In August 1929 the 6'x6' masonry box culvert at MP 0.53 failed during a flood runoff causing embankment to wash out and leave a section of track hanging in the air. This box culvert had been set on ordinary loam and had no floor except dirt which washed away quickly. To secure proper foundation for water way structure a line change was made and a 12 foot concrete arch was installed on rock foundation. The overall cost of the grading, track work, concrete arch and restoring operations was about $30,000.

Some concrete paving and rip rap was installed at the lower end of box culverts at MP 0.16 and 3.82 in 1930 to arrest washing down of channels at outlet ends.

PHYSICAL CONDITION OF NATIONAL COAL RAILWAY-CONT.

In 1936 the double 36 inch pipe culvert at MP 4.62 was extended to arrest washing at lower end. At the same time an 18 inch pipe was installed at MP 4.61 to carry irrigation ditch water which previously passed through culvert 4.62 with complaints about ditch washing out at lower end of culvert 4.62.

In 1936 the 18 inch pipe culvert and flume which carried an irrigation ditch across right of way at MP 6.20 was replaced with a continuous 36 inch culvert pipe with concrete clean out boxes and washout pipes, to eliminate complaint of ditch operators that the original structure would not carry the full irrigation ditch flow.

In 1940 a 42 inch culvert pipe was installed at MP 8.22 replacing a 36 inch pipe which had plugged up a number of times.

A number of culverts and pipes are resting on alluvial soil which is washing away below culverts and during long continued runoffs in dry washes there is danger of cutting back and washing out embankments. The worst example of this is the double 36 inch pipe at MP 5.80.

In general the waterway structures on National Coal Railway are in satisfactory condition. However, the conditions at lower ends of a few culverts makes it necessary, during periods of heavy rainfalls, to patrol track immediately ahead of trains to forestall track failure resulting from washouts.

Ties

Cross ties on original construction were 7"x8"x8' untreated sawed Douglas fir. Some tie renewals were made from 1929 to 1934 using 7"x9"x8' creosote treated Douglas (Oregon) fir. From 1935 to 1937 renewal ties were about 82 percent treated and 18 percent untreated native sawed fir. Renewals from 1930 to 1939 averaged about 200 per mile per year. The average renewals from 1940 to 1950 were 72 per mile per year. From 1946 to 1950 renewal ties have all been 7"x9" sawed untreated native fir or pine. There is still a considerable number of ties from original construction in the track on some tangents with solid treated ties on each side. These ties will all be replaced probably by the end of 1952.

The general tie condition in this branch is satisfactory for the present light traffic. Renewals will continue to be comparatively light for several years until replacements of the earlier 7"x9" treated ties begins which may not be before 1955 or later.

Rails

Track on original construction was laid with new 90 RA rail with angle bar type joints. Part of the rails were 33 feet long and part were 39 feet long. The total tonnage over this rail to date has been small and the rail has practically no head surface wear and very little head wear on gauge side of outside rails on curves. The rail will

PHYSICAL CONDITION OF NATIONAL COAL RAILWAY-CONT.

undoubtedly outlast the coal mines on this branch and if these mines cease to operate and the track needs to be taken up, the rails will furnish a reserve stock of rail for replacement of worn curve rail on main track and Wattis spur.

Other Track Material

The angle bars and 15/16 X 4-3/4 track bolts and lock washers were all new on original construction and with reasonable track maintenance will last as long as the rail.

Sellers 7-1/2" X 9-3/4" wrought iron tie plates were installed on curves on original construction, with no tie plates on tangents. Both Sellers and Elyria 7" X 8½" tie plates have been used on renewal ties and all ties are now plated except a few of the original ties still in track on tangents. A very limited number of larger plates have been installed on renewal ties on some curves. The tie plates appear to be satisfactory for the light traffic over the track and will last as long as needed.

Spikes on original construction were 5/8" X 6" drive spikes and the same size spikes have been used on maintenance work.

Rail Anti Creepers

On original construction two modified Fair rail anti creepers were installed per rail opposite slot spiked angle bars. In 1928 additional modified Fair rail anti creepers were installed to make four per rail on the entire branch track. This application of rail anti creepers appears to be sufficient for requirements to date.

Frogs and Switches

Switches on and subsequent to original construction have all been 16'6" reinforced 90 RA points with slide and switch plates and heel filler blocks. Frogs have been No. 9 rigid open hearth bolted type largely 12 feet long with plates. Guard rails have been 8'3" 90 RA clamp type with filler blocks. Switch stands have been high Star single headblock type with 6 foot long connecting rods. This material is adequate for the service required and with reasonable maintenance should last as long as the rail.

Ballast

On original construction track was raised and surfaced on native earth ballast largely clay and small rocks. On the line change 6 inches of coal cinder ballast was placed under the ties on 0.4 miles of track. The ballast is satisfactory for the service required.

PHYSICAL CONDITION OF NATIONAL COAL RAILWAY-CONT.

Track

The main track was constructed with 12 degree maximum curvature. The ruling grade was 4 percent compensated 0.03 per degree of curvature. No spirals or easements were used on the curves.

The track was raised and resurfaced in 1926 after operations began. From 1927 to 1937 inclusive a section gang was kept at National near MP 8. This gang took care of tie renewals and necessary maintenance. Track was maintained in good operating condition and cut ditches were kept clean. Since 1937 track maintenance has been handled by section gang stationed at Martin. It is 15 miles by rail from Martin tool house to end of track on National Coal Railway. The track maintenance since 1937 has been spotty and confined to resurfacing and relining short stretches of rough track and spasmodic tie renewals. Some cinders have been unloaded on embankments when necessary to raise track to restore grade line. While the overall condition of the main track National Coal Railway is safe for present operation of two or three small trains per week about 75 percent or more of the track needs to be resurfaced and relined to keep it in what is considered normal satisfactory condition based on Utah Railway practices.

The track is badly weed infested except in a few isolated locations and present more or less casual weed cutting does nothing to eliminate this problem. If equipment were available, chemical spraying would control and perhaps practically eliminate the weed problem and save some hand labor cost.

Fences

There are no right of way fences on National Coal Railway and experience to date has not indicated the necessity for fencing. There is some agricultural land (mostly for hay production) on each side between MP 4 and 5. Some cattle and horses are fed on this land at times but little expense has been incurred from trains killing livestock.

Crossings and Signs

There are five or six planked road crossings over the main track and other tracks but the maintenance expense for these has been periodic and light.

Wooden painted cross buck signs were installed at public highway crossings and wooden painted mile marker signs were installed by Utah Railway Company some time after beginning of operations, as well as a few metal whistling signs on approaches to road crossings. Also some metal car length marker signs were installed just above the junction switch at Darrah. These signs have been replaced or repainted as needed and are in satisfactory operating condition.

Station and Office Buildings

There are none such on National Coal Railway.

PHYSICAL CONDITION OF NATIONAL COAL RAILWAY-CONT.

Roadway Buildings

In 1927 a frame (sheet steel covered) section tool house was moved from Healy on main track and installed near MP 8 at National. This building has not been used or needed and may be retired or removed to other location if desired.

In 1928 four car bodies bunkhouses were moved from Martin to National near MP 8 and fitted up for use of section foreman and laborers. In 1937 an old caboose body was installed at Union near MP 8.7 and fitted up for section laborers who at that time prepared cars for coal loading. The car bodies at National are no longer used or needed and will be sold and removed and retired as soon as possible. The caboose body bunkhouse at Union will be maintained for use as needed in winter months by section laborers stationed there for cleaning snow from tracks and switches.

Water Stations

In 1926 a 50,000 gallon capacity steel water storage tank was moved from Gordon Creek on main track to National and installed with a tank spout serving main track at MP 8.2. A 4 inch cast iron gravity water supply line was installed from the tank to an intake at Consumers connected to pipe line used for pumping water from Blue Blaze Coal Company mine at Consumers. An overflow pipe line from tank to creek near National took care of surplus water after tank was full. After Blue Blaze Coal Company failed in 1938, the connection to mine pumping line was cut off when the new operator abandoned the old mine and stopped pumping. The 4 inch supply line was then extended to a point just beyond end of Consumers empty storage tracks using second hand steel pipe and a wooden intake box with screen was installed to divert water from Bryner Creek to the pipe line and thence by gravity to the storage tank at National. After heavy rains or fast melting snow runoffs the water carries considerable mud which settles in bottom of storage tank. It is necessary to clean this tank nearly every year and keep the interior repainted. Later when pumping from another mine at Consumers was begun, the water was wasted in an open ditch which passed directly over the gravity supply pipe near the empty scales. A pipe intake with screen was installed in the ditch at this location and passes some water to the intake line and storage tank. The normal creek flow is generally sufficient to furnish water for two or three trains a week and the added supply from pumping keeps tank full. During periods of protracted drought the supply might not meet requirements as the pumping from mine during the low coal production period during the summer months is irregular. During such periods trains of empties are rarely full tonnage and it is generally possible to make the round trip from Martin by taking little or no water at National.

Fuel Stations and Shops

There are none such on National Coal Railway.

PHYSICAL CONDITION OF NATIONAL COAL RAILWAY-CONT.

Telegraph and Telephone Lines and Automatic Signals

There are none such on National Coal Railway. Dispatcher communicates with mine offices by toll commercial telephones.

Power Transmission Systems and Miscellaneous Structures

There are none such on National Coal Railway.

Roadway Machines and Small Tools

There are none such on National Coal Railway. The tools for section gang were moved to section gang at Martin in 1937 when section gang at National was abolished.

Public Improvements

There are none such on National Coal Railway except five or six planked road crossings and the underpass bridge at MP 5.83 which also acts as an auxiliary waterway structure during flood runoffs.

Work Equipment

There is none such on National Coal Railway.

General

This branch line now serves about three coal producing mines operated with very small production. At times two of the mines are out of operation for considerable periods. As a result operations are no longer at a break even point and it would be desirable from a Utah Railway standpoint to discontinue operations and salvage the track material. To do this would require a certificate of necessity from Interstate Commerce Commission. It would be practically impossible to secure such a certificate. The result is that maintenance and operations must be continued on as limited basis as possible consistent with freedom from derailments.

Report Written by

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