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Steel Passenger and Freight Car Shop, Angus Shops, Canadian Pacific Railway, Montreal.

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The steel passenger and freight car shop which the C. P. R. built last year as an addition to its Angus Shops, Montreal, was placed in service late in the year, and since then, while not working to its full capacity owing to the lessened demand for new rolling stock, it has demonstrated the value of a carefully planned shop, in the facility with which the work passes through, and in the expeditious manner in which the work can be fabricated and the parts assembled by the use of the routing system and the shop facilities provided in the layout. A brief preliminary description of the shop appeared in Canadian Railway and Marine World for Aug., 1913.

While the shop is completed to the full size contemplated for present requirements, 10 passenger cars per month and 8 freight cars per day, the interior arrangement, including the location of the machinery and the process of manufacturing the cars is subject to rearrangement, and even in the short time in which the shop has been in operation, the routing of the work has been materially altered in several instances to reduce the amount of handling and for correlated reasons. The operation of the shop will develop improvements, and it was so planned that any improvement might be introduced as developed. The plans were prepared with a view to future enlargement to about double the present capacity as required.

Preparatory to the building of this shop, when the C. P. R. was making its step from all wood to steel underframe, steel frame, and all steel constructions, a complete study was made of the subject, with the idea of building a shop for handling this new work, that would embody only the latest practice. As building the new steel equipment was still in a more or less infant stage, even in the United States, where the building of this class of rolling stock has been going on for the last few years, especial care had to be exercised in the matter of shop planning. With this in view, L. C. Ord, Assistant Master Car Builder, Eastern Lines, then General Car Inspector, made a tour of the principal car shops in this country and the United States, with a view to determining the best practice of all the different makers. The good points in all these shops were observed, which, combined with the original ideas developed by C. P. R. officials, produced the excellent layout to be found in this new shop. At the time of its erection, it probably represented the best practice on this continent, and with the improvements that have been introduced from time to time since it has been in operation, as practice showed where such changes could be made to improve the process, it will no doubt continue to represent the best practice for some time to come.

In designing the shop, 2,750 sq. ft. of floor area per car per day was taken as the average for existing shops, but to prevent overcrowding common in most steel freight car shops, and to allow for the greater amount of room necessitated by the design of the spacing punches, a larger amount of machine room was provided. The final floor area for the freight shop was made 41,785 sq. ft., the area of the machine shop being 22,069 sq. ft., less 7,265 sq. ft., which was set apart for the machinery and assembling of steel centre sills for repair work, giving a total area of 14,795 sq. ft. available for machines. The area of the assembling portion of the freight shop was 9,170 sq. ft., while the erecting area was 17,820 sq. ft.

The shop is located on the west side of the midway which runs through the shop grounds, and is the northernmost shop in the group. It adjoins the old wooden freight car shop and on that side there is no room for any future expansion, but to the north, there is ample room for extension, as contemplated in the layout of the shop as initially planned. This extension may be made without in any way affecting the present arrangement.

There are three main divisions to the shop. The front one may be called the fabricating shop, containing all machinery for working the steel members, and to the rear of this section, is the freight car erecting section on the south, and the passenger car erecting section on the north. The shop is a steel framed structure, with the steel columns carried on concrete piers, resting on bed rock, which at no point in the shop area is more than 4 ft. below the surface, in places coming to the surface. The lower part of the wall is of concrete, 24 ins. thick from the rock surface to the ground level, and 20 ins. thick to a height of 2¾ ft., above which the wall is of red brick, 16 ins. thick, with steel sash. The floor is a 4 in. bed of concrete, with a ⅝ in. mastic surfacing, of a slightly harder constituency than usual, as dictated by experience with other buildings in the plant. The roof is carried on steel trusses, with ample skylight areas. Over the higher sections, the roof consists of 2 by 3 in. planking on edge, separated from a layer of ⅞ in. tongued and grooved boarding by a tar paper, the whole being covered with tar paper, tarred and gravelled. The lower sections of the shop differ in the under layer of the roof, which consists of 2 in. tongued and grooved planking. The skylights are glazed with wired glass, while the side windows have plain glass. The window sills are of concrete. The area of light to the total wall space is apparently 30%.

The fabricating shop consists of two parallel 100 ft. bays, parallel to the midway, the one adjoining the midway being 209½ ft. long, consisting of three 24 ft. sections and five 27½ ft. sections, while the inner bay is one 27½ ft. section shorter on the north end, giving a length of 182 ft. The 24 ft. sections are on the south end of the building, and combined give a 72 ft. width, corresponding to that of the freight car erection section of the shop. Each of the bays is spanned by a steel truss, giving a clear height at the sides of 36 ft. the lower chord of the truss having a rise at the centre of 1 ft. 11 ins. The details of the structural steel work are shown in the cross sectional view of these bays. The columns consist of 24 in. 100 lb. I beams, on each side of which, there is a 15 in. 45 lb. channel and 15 in. 45 lb. I beam for the crane runway support. The roof trusses have a side depth of 9 ft., and a central depth of 11 ft. 2 ins., and are built up of angle iron sections. The crane runway girders in each bay are identical, with a height to base of rail of 28½ ft. These girders are built up of a 36 by ⅜ in. web and six 6 by 11-16 in. flange angles with a crane rail on top. Each bay has a crane span of 96¼ ft., and in each bay there is a 10 ton electrically operated crane of the open lattice type. The parallel 100 ft. bays make an ideal arrangement, the front bay crane handling the material as it comes in, and the other bay, the finished material.

The freight car section consists of a 72 ft. wide extension along the south side of the shop from the far side of the two 100 ft. spans, and comprises two 202½ ft. lengths, the first of which opens along the side into the passenger car shop, the west end being closed along that north side. The full shop length is divided into 18 sections of 22½ ft. by 72 ft. steel spans. This section of the shop is not as high as in the front two bays, having a clear height under the bottom chord of the roof truss of 34½ ft. The trusses have a central depth of 8½ ft., and a side depth of 6 ft. The height to the base of the crane girder rail is 27 ft., the crane span being 67 ft. 7 ins. This bay has a 10 ton electric travelling crane, as in the front bays, only of smaller span.

The passenger car erection section is to the north of the freight car section, and to the west of the north end of the fabricating shop, and consists of four 27½ ft. bays, corresponding to the four 27½ ft. sections of the front bays, these four bays with that of the freight car shops completing the full width of the back of the fabrication bay. This section of the shop is much shallower than either of the other two sections mentioned, and on account of the narrowness of the four bays, a trussed roof is not required, the roof sloping from the central row of columns to each side with a slope of 1 in 12. The clear height under the centre of this section, in the central row of columns, is 30½ ft., and 26 ft. at the sides. Each bay of this section has a separate 2 ton crane, with a 24 ft. 10 in. span, the height to the base of the crane rail being 21 ft. The columns in this section are 8⅝ by 8⅝ in. I beams, at 22½ ft. centres. The crane girders extend into the front section of the shop for 11 ft., the front ends of the crane girders are carried on a column similar to that in the passenger section. These four cranes are controlled through ropes from the floor below.

To maintain the orderly handling of the material through the shop, painted lines are used to define the boundaries of the several piles, and mark the passage ways, which must be kept free of material. These boundary lines are repainted at the end of