corners of buildings or other places where workers may walk directly onto tracks in front of moving cars These locations may be safeguarded with fixed railings that force pedestrians to detour a short distance before stepping onto the track If a barrier railing is impractical, hinged bars or gates swinging horizontally through an angle of not more than 90 degrees are effective

Still another means is a convex mirror located at the intersection of the passageway and the track at a 45-degree angle, in which approaching railway equipment can be seen before the intersection is reached

Various methods are used to warn pedestrians at railway crossings inside plants Automatic wigwags, blinking lights, and gongs are more effective than signs Heavily traveled roadways can be safeguarded effectively by gates equipped with red lights and by watchmen, who should be provided with a whistle and a shielded red lantern

The visibility of gates is increased by painting them with alternate yellow and black stripes at an angle of about 45 degrees

Another means of protection is the warning system shown in Fig 19-14

Track

All track, fittings, and structure should be installed in accordance with AREA specifications (see footnote on page 19-24) for the service required

[illegible] of narrow gauge, be substantial and level The roadbed should have a stable foundation and be well drained through the use of gravel or crushed stone, with ties imbedded in ballast that is well tamped about and under them To prevent rot and to make the ties accessible for inspection, their top surface should not be covered

The size of ties and the types of wood that are suitable vary according to the size and weight of rails Specifications used by railroads are a good guide in purchasing ties for a plant railway. The specifications may be modified in buying ties for narrow gauge tracks

The size of rails varies according to the speeds and loads, but standard gauge plant railways generally use rails weighing 80 to 100 pounds per yard Narrow gauge tracks may have rail varying in weight from 40 to 60 pounds The principal factor in determining rail size is the weight of the equipment

Regardless of the size of the rails, they should be securely fastened to the ties by tie-plates and track spikes Just because a rail is light doesn't mean that it should be unsubstantially fastened If electric locomotives are used, joints should be electrically bonded

In addition to meeting standard specifications, rails and fittings should be inspected

ances and with standard automatic couplers and air brakes, as required of common carrier railroads by federal law All equipment and appliances should be maintained in sound, safe operating condition

The type of motive power for a plant railway is important from the standpoint of accident and fire prevention Explosive gases are easily ignited by flames or sparks from fuel-fired locomotives Where such gases may be present, electric, compressed air, or storage battery locomotives should be used

Where ventilation is insufficient to keep the concentration of noxious and even toxic exhaust gases at a safe level, as in mines, the use of fuel-fired locomotives should be prohibited However, since diesel engines can be equipped with devices to eliminate toxic gases from the exhaust, these type locomotives are being used in some adequately ventilated mines (other than coal)

A major hazard with electric locomotives, [illegible] tion Safety provisions for battery charging rooms are in Chapter 20, "Power Trucks"

Tools and appliances

Devices, tools, and appliances are important in safe operation of a plant railway

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°See the ASME *Boiler and Pressure Vessel Code*, Section III, "Boilers of Locomotives" (American Society of Mechanical Engineers) and *Laws, Rules and Instructions for Inspection and Testing in Steam Locomotives and Tenders and Their Appurtenances* (Interstate Commerce Commission)

°°American Society of Mechanical Engineers, 345 East 47th St, New York City *ASME Boiler and Pressure Vessel Code*, Section VIII, "Unfired Pressure Vessels" Also see Chapter 16, "Boilers and Unfired Pressure Vessels"