

13 • What important factors must be considered in the determination of resistance for an exhaust system?

The maintained resistance of an exhaust system is composed of three factors, namely, (1) loss through the hoods, (2) friction drop through the pipe system, and (3) collector drop.

14 • What special materials may be used to resist chemical corrosion in a system exhausting gases and fumes?

Various protective materials are available for exhaust systems depending largely upon the type of fumes conveyed. Nickel-chrome alloys, aluminum coated metals and rubber linings are extensively used. Also protective rubberized paints are available which may be applied for conveying chlorine and hydrochloric acid fumes.

Chapter 22

RAILWAY AIR CONDITIONING

Passenger Car Ventilation, Steam or Vapor Heating, Cooling Equipment, Calculation of Car Cooling Load, Humidity Control, Temperature Control, Electric Power Supply, Comparative System Costs

THE general principles of air conditioning as applied to buildings also apply to railway cars, but due to space and weight limitations and the severity of the service, equipment designed for stationary work in buildings is seldom suitable for car installations. Equipment for railway use must be safe, reliable, compact, light in weight, accessible for inspection and repairs, as nearly automatic in operation as possible, and have low initial, operating, and maintenance costs. To properly air condition a car, ventilating, filtering, heating, cooling, humidifying, and control equipment must be provided together with an adequate power supply. Air from the interior of the car is mixed with air from the outside and passed through the air conditioning unit where it is heated or cooled, humidified or dehumidified and delivered to the interior of the car through suitable ducts and grilles.

PASSENGER CAR VENTILATION

One of the important problems in connection with air conditioning of cars is that of ventilation. In non-air conditioned cars, ventilation is accomplished by exhaust fans, roof ventilators and open doors and windows. This provides an ample supply of outside air and in addition a large amount of smoke and dirt which may be excluded in an air conditioned car.

An average car contains approximately 5000 cu ft of air which is being contaminated by the occupants who are continually liberating heat, carbon dioxide, moisture, odors, and some organic matter from the breath, skin and clothing. The heat and moisture can be removed by cooling and dehumidifying, but the others can be handled only by proper ventilation. In the average car from 2000 to 2500 cfm of air should be delivered by the air conditioning unit. Some of this air may be re-circulated, but a portion of it should be brought in from the outside. The amount of outside air required depends upon the type of car (dining, club, cafe), number of passengers, air temperature, humidity, smoke, and odors, and will vary from 15 to 90 per cent. This percentage of outside air should be kept as low as possible to still maintain the air in the proper condition in order to minimize the heating or cooling load.

In equipping old cars, the air is often distributed to the car from the conditioning unit through one or two side ducts, built on the outside of