

# Unit 1 Normal knowledge

## *Text 1 Rail transport*

Rail transport (Fig.1.1) is a means of conveyance of passengers and goods on wheeled vehicles running on rails, also known as tracks. It is also commonly referred to as train transport. In contrast to road transport, where vehicles run on a prepared flat surface, rail vehicles (rolling stock) are directionally guided by the tracks on which they run. Tracks usually consist of steel rails, installed on ties (sleepers) and ballast, on which the rolling stock, usually fitted with metal wheels, moves. Other variations are also possible, such as slab track, where the rails are fastened to a concrete foundation resting on a prepared subsurface.



Fig.1.1 Rail transport

Rolling stock in a rail transport system generally encounters lower frictional resistance than road vehicles, so passenger and freight cars (carriages and wagons) can be coupled into longer trains. The operation is carried out by a railway company, providing transport between train stations or freight customer facilities. Power is provided by locomotives which either draw electric power from a railway electrification system or produce their own power, usually by diesel engines. Most tracks are accompanied by a signalling system. Railways are a safe land transport system when compared to other forms of transport. Railway transport is capable of high levels of passenger and cargo utilization and energy efficiency, but is often less flexible and more

capital-intensive than road transport, when lower traffic levels are considered.

### Right of way

Railway tracks (Fig.1.2) are laid upon land owned or leased by the railway company. Owing to the desirability of maintaining modest grades, rails will often be laid in circuitous routes in hilly or mountainous terrain. Route length and grade requirements can be reduced by the use of alternating cuttings, bridges and tunnels—all of which can greatly increase the capital expenditures required to develop a right of way, while significantly reducing operating costs and allowing higher speeds on longer radius curves. In densely urbanized areas, railways are sometimes laid in tunnels to minimize the effects on existing properties.



Fig.1.2 Railway track

### Motive power

Steam locomotives are locomotives with a steam engine that provides adhesion. Coal, petroleum, or wood is burned in a firebox, boiling water in the boiler to create pressurized steam. The steam travels through the smokebox before leaving via the chimney or smoke stack. In the process, it powers a piston that transmits power directly through a connecting rod and a crankpin on the driving wheel or to a crank on a driving axle. Steam locomotives have been phased out in most parts of the world for economical and safety reasons, although many are preserved in working order by heritage railways.

Electric locomotives draw power from a stationary source via an overhead wire or third rail. Some also or instead use a battery. In locomotives that are powered by high voltage alternating current, a transformer in the locomotive converts the high voltage, low current power to low voltage, high current used in the traction motors that power the wheels. Modern locomotives may use three-phase AC induction motors or direct current motors. Under certain conditions, electric locomotives are the most powerful traction. They are also the cheapest to run and provide less

noise and no local air pollution. However, they require high capital investments both for the overhead lines and the supporting infrastructure, as well as the generating station that is needed to produce electricity. Accordingly, electric traction is used on urban systems, lines with high traffic and for high-speed rail.

Diesel locomotives use a diesel engine as the prime mover. The energy transmission may be either diesel-electric, diesel-mechanical or diesel-hydraulic but diesel-electric is dominant. Electro-diesel locomotives are built to run as diesel-electric on unelectrified sections and as electric locomotives on electrified sections.

Alternative methods of motive power include magnetic levitation, horse-drawn, cable, gravity, pneumatics and gas turbine.

## New Words

track	<i>n.</i> 轨道
vehicle	<i>n.</i> 车辆
ballast	<i>n.</i> 道砟
frictional	<i>adj.</i> 摩擦的
signal	<i>n.</i> 信号
smokebox	<i>n.</i> 锅炉
axle	<i>n.</i> 轴
AC=alternating current	<i>n.</i> 交流电

## Technical Phrases

rail transport	铁路运输
means of conveyance	运输工具, 运输资料
referred to as	被称为.....
In contrast to	相比之下
road transport	汽车运输
flat surface	平面, 平整表面, 平直表面
rolling stock	全部车辆
steel rails	钢轨
concrete foundation	混凝土基础
frictional resistance	摩擦阻力
electric power	电力, 电功率
railway electrification	铁道电气化, 铁路电气化
diesel engines	柴油机(diesel engine 的名词复数)

signalling system	信号系统
energy efficiency	能量系数，能量效率，能源效应
steam engine	蒸汽机
connecting rod	[机]连杆
driving wheel	驱动轮，主动轮
in working order	能正常发挥功能，处于正常运转状态
stationary source	固定污染源
overhead wire	高架线

## Text 2 Train

In rail transport, a train is made up of a single or several connected rail vehicles that can be moved together along a guideway to transport freight or passengers from one place to another along a planned route. The guideway (permanent way) generally consists of conventional rail tracks, but might also be monorail or maglev. Propulsion for the train is typically provided by a separate locomotive, or from individual motors in self-propelled multiple units. Power is usually derived from diesel engines or from electricity supplied by trackside systems. Historically the steam engine was the dominant form of locomotive power, and other sources of power (such as horses, pneumatics, or gas turbines) are possible as well.

In railway terminology, consist is used to describe the group of rail vehicles which make up a train.

### Types of Trains

There are various types of trains designed for particular purposes:

A train can be made up of a locomotive and attached railroad cars, or a self-propelled multiple unit. Trains can also be hauled by horses, pulled by a cable, or run downhill by gravity.

Special kinds of trains running on corresponding special “railways” are atmospheric railways, monorails, high-speed railways, Dinky Trains, maglev, rubber-tired underground, funicular and cog railways.

A passenger train may be made up of one or several locomotives, and one or more coaches. Alternatively, a train may consist entirely of passenger carrying coaches, some or all of which are powered as a “multiple unit”. In many parts of the world, especially Japan and Europe, high-speed rail is used extensively for passenger travel.

Freight trains comprise wagons or trucks instead of carriages, although some parcel and mail trains (especially Travelling Post Offices) are apparently more like passenger trains.

In the United Kingdom, a train hauled by two locomotives is said to be “double-headed”, but in Canada and the United States, it is quite usual for a long freight train to be headed by three, four, or even five locomotives.

Trains can also be mixed, hauling both passengers and freight. Such mixed trains became rare in many countries, but were ordinary on the first 19th century railroads.

Special trains are also used for track maintenance; in some places, this is called maintenance of way.

A single uncoupled rail vehicle is not technically a train, but is generally referred to as such for signaling reasons.

## Passenger Trains

Passenger trains (Fig.1.3) have passenger cars. Passenger trains travel between stations; the distance between stations may vary from under 1 km to much more. Long-distance trains, sometimes crossing several countries, may have a dining or restaurant car; they may also have sleeping cars, but not in the case of high-speed rail; these arrive at their destination before the night falls and are in competition with airplanes in speed. Very long distance trains such as those on the Trans-Siberian railway are generally not high-speed.



Fig.1.3 Passenger train

For trains connecting cities, we can distinguish inter-city trains, which do not halt at small stations, and trains that serve all stations, usually known as local trains or “stoppers”.

Very fast trains sometimes tilt, like the Pendolino or Talgo. Tilting is a system where the passenger cars automatically lean into curves, reducing the centrifugal forces acting on passengers and permitting higher speeds on curves in the track with greater passenger comfort.

For shorter distances many cities have networks of commuter trains, serving the city and its suburbs. Some carriages may be arranged to have more standing room than seats, or to facilitate the carrying of prams, cycles or wheelchairs. Some countries have some double-decked passenger trains for use in conurbations. Double deck high speed and becoming more common in Europe.

Passenger trains generally have emergency brake handles (or a “communication cord”) that the public can operate. Abuse is punished by a fine.

Large cities often have a metro system, also called underground, subway or tube. The trains are electrically powered, normally by third rail, and their railroads are separate from other traffic, without level crossings. Generally they run in tunnels in the city center and sometimes on elevated structures in the outer parts of the city. They can accelerate and decelerate faster than heavier, long-distance trains.

A light one- or two-car rail vehicle running through the streets is not called a train but a tram, trolley, or streetcar, but the distinction is not strict.

The term light rail is sometimes used for a modern tram, but it may also mean an intermediate form between a tram and a train, similar to metro except that it may have level crossings. These are often protected with crossing gates. They may also be called a trolley.

Maglev trains and monorails represent minor technologies in the train field.

The term rapid transit is used for public transport such as commuter trains, metro and light-rail. Nevertheless, in New York City, lines on the New York City Subway have been referred to as “trains”.

## Freight trains

Freight trains (Fig.1.4) have freight cars.



Fig.1.4 Freight train

Much of the world’s freight is transported by train. In the USA the rail system is used mostly for transporting freight (or cargo).

Under the right circumstances, transporting freight by train is highly economic, and also more energy efficient than transporting freight by road. Rail freight is most economic, and also more energy efficient than transporting freight by road. rail freight is most economic when freight is being carried in bulk and over long distances, but is less suited to short distances and small loads.

The main disadvantage of rail freight is its lack of flexibility. For this reason, rail has lost much of the freight business to road competition. Many governments are now trying to encourage more freight onto trains, on account of the environmental benefits that it would bring. There are



many different types of freight train, which are used to carry many different kinds of freight, with many different types of wagon. One of the most usual types on modern railways are container trains, by which the containers can be lifted on and off the train by cranes and loaded off or onto trucks or ships.

This type of freight train has largely superseded the traditional “box wagon” type of freight train, by which the cargo had to be loaded or unloaded manually.

There are also many other types of wagon, such as “low loader” wagons for transporting road vehicles. There are refrigerator wagons for transporting food. There are simple types of open-topped wagons for transporting minerals and bulk material such as coal and tankers (Fig.1.5) for transporting liquids and gases.



Fig.1.5 Tanker car

Freight trains are sometimes illegally boarded by passengers who do not wish, or do not have the money, to travel by common means. This is referred to as “hopping” and is considered by some communities to be a viable form of transport. Most hoppers sneak into train yards and stow away in boxcars. More daring hoppers will catch a train “on the fly”, that is, as it is moving, leading to occasional fatalities, some of which go unrecorded.

## New Words

guideway

*n.* 轨道

pneumatics

*adj.* 气动的

dinky

*adj.* 小巧的，精巧的

funicular

*n.* 缆索

uncouple

*v.* 解体

crane	<i>n.</i> 起重机
flexibility	<i>n.</i> 可伸缩的，有弹性的
supersede	<i>v.</i> 替换，替代

## Technical Phrases

diesel engine	内燃机
gas turbine	燃气轮机
tilting coach	摆式客车
centrifugal force	离心力
inter-city train	城际列车
local train/stopper	铁路局管内列车
commuter train	通勤车
emergency brake	紧急制动
cog railway	齿轨铁路
stow away	偷乘