ADDIS ABABA SCIENCE & TECHNOLOGY UNIVERSITY

SCHOOL OF CIVIL ENG & CONSTRUCTION TECHNOLOGY

RAILWAY & TUNNEL CONSTRUCTION

(CoTM4203)

CHAPTER- 5



Railway System Operation & Maintenance



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- *Train Flow Organization*
- *Carrying capacity*
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5.1 Introduction

Definition

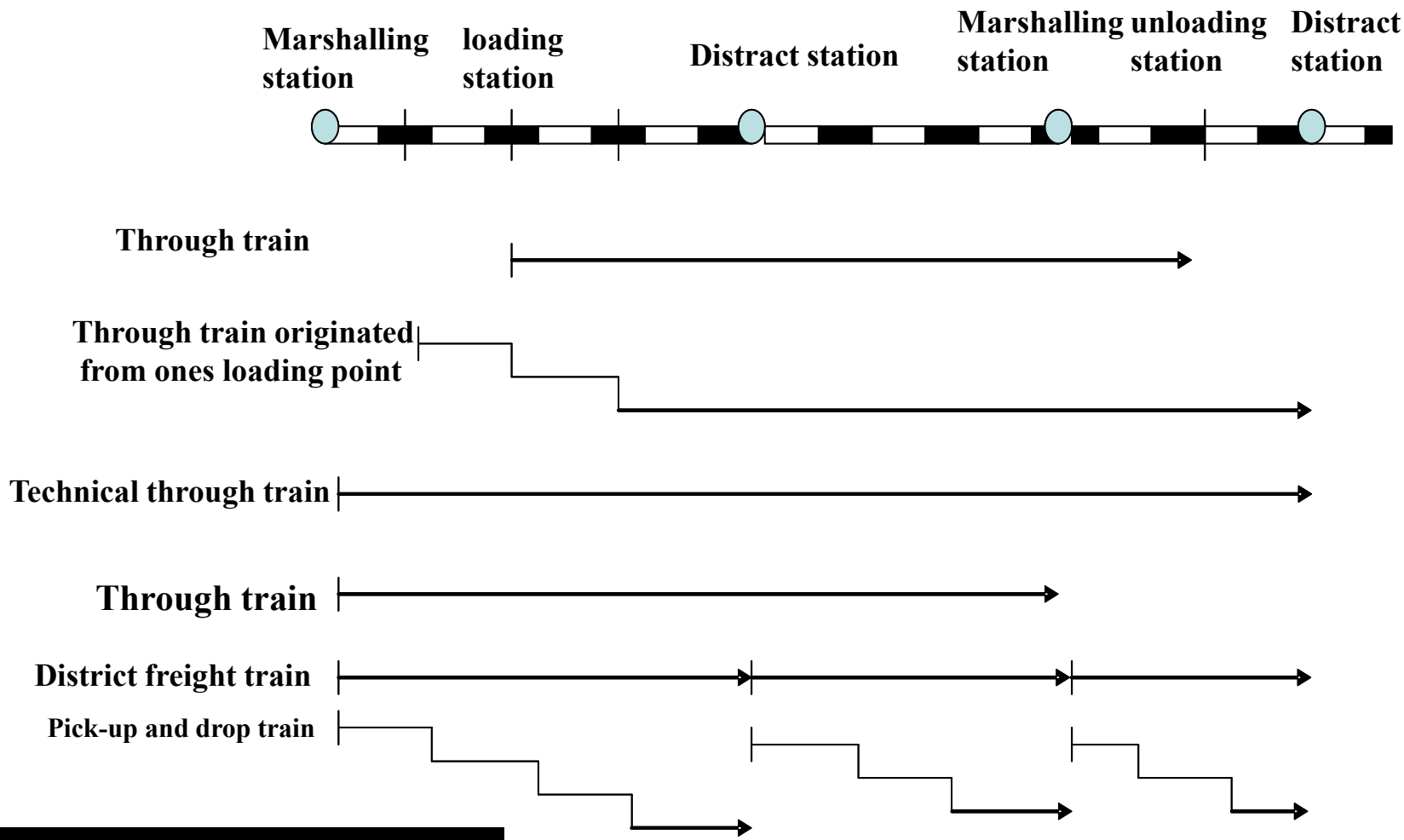
- The train refers to the marshalling train set with locomotive and prescriptive train signs.
- Trains are classified based on:

1. ***The nature of transportation***
   - Passenger train
   - Mail and parcel train
   - Troop train
   - Freight train

5.1 Introduction …

2. ***The driving***
   - Through train
   - Direct train
   - Pickup and drop train
   - Exchange train
   - Short-haul train

5.1 Introduction



5.1 Introduction …

Train number

- In order to identify the ***nature and grade of the train, and to facilitate the train organization and management***, each train is labeled particular number which is called **train number**.
- Trains are formed to serve the traffic flow
- Traffic flows organized to car flows then in to train flows
- This process known as train formulation (wagon flow organization)

5.1 Introduction …

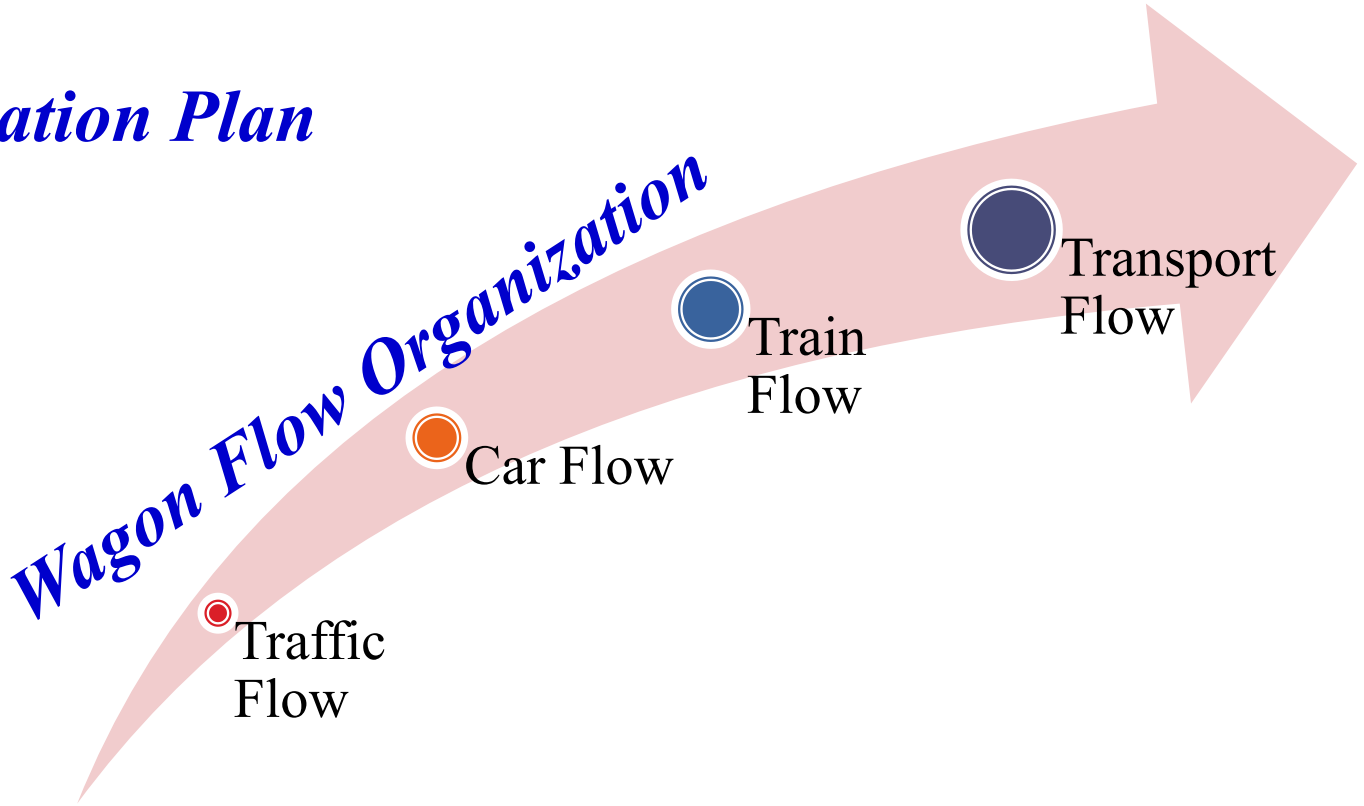
- ***Car flow***—the collections of passenger and /or freight traffic with some destination by railway transport.

- ***Train flow***—the collection of trains with some destination organized from car flow.

Traffic flow and train flow are called transport flow totally

5.2 Train Flow Organization

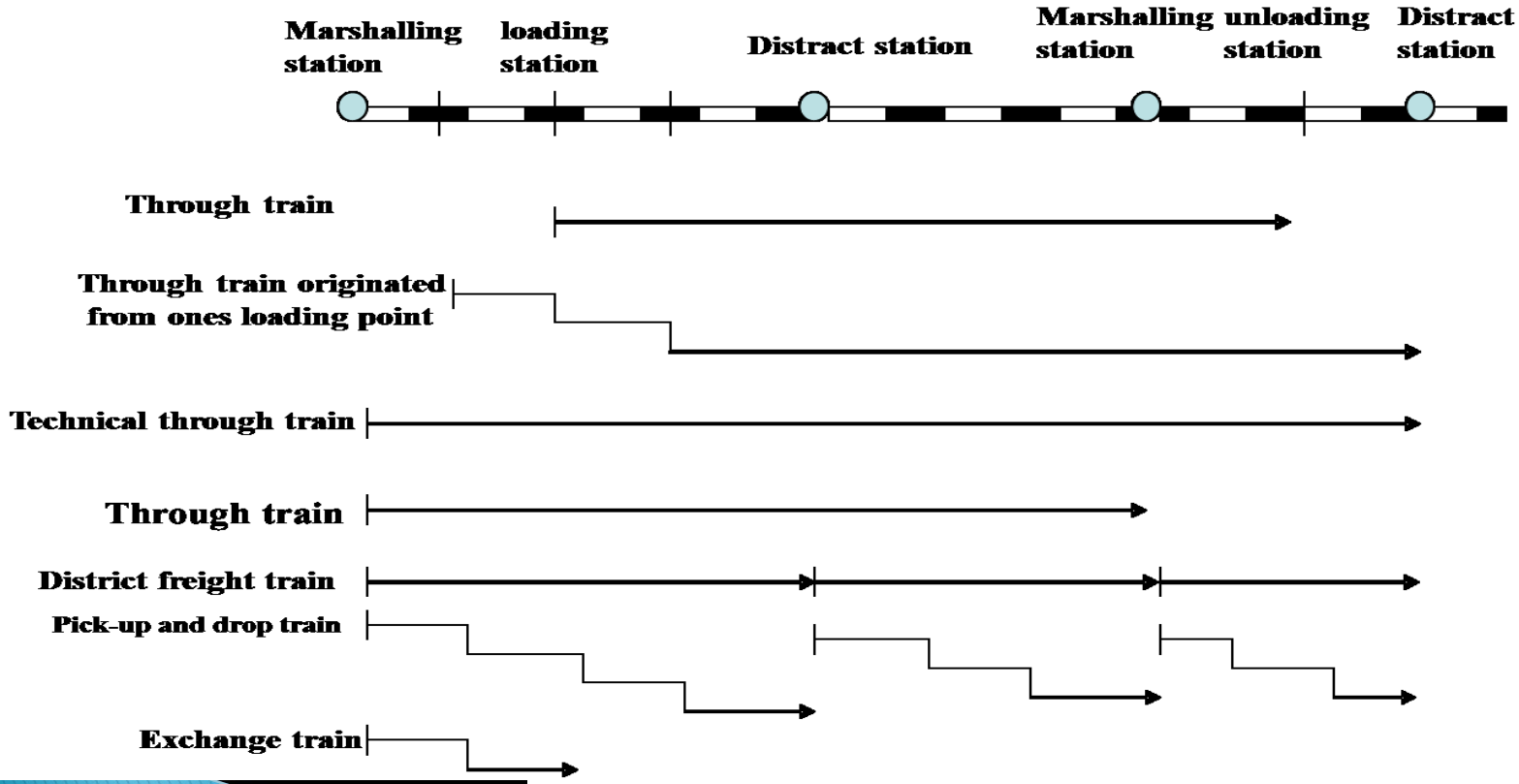
Train Formulation Plan



- **Wagon flow organization** mainly resolves two problems:
  - （1）how to marshal trains in every direction of road network
  - n flow absorbed by every branch

5.2 Train Flow Organization …

- The organization of train flow mainly depend on the train diagram.
- Train diagram shows the ***range of operating trains, the train in the run-time interval, the train stops at the station and the locomotive routing time, weight and length of trains*** etc



5.2 Train Flow Organization …

Example:

- A district town A is connected to minor town B by railway line of length 200km. the average operating speed of trains on this line is 100km/hr. if the normal working time the trains is 12hour how many train flow per day are require from town A to B. Assume 27000passenger flow per day on both directions, a maximum of 20 cars used during passenger train organization with a capacity of 50 passengers per car

5.3 Carrying Capacity of Line

Carrying Capacity of Line

1.Definition

In the conditions of using *certain types of rolling stock and certain train operation organizational methods, the maximum number of trains that can be passed by a variety of fixed equipment in railway section in unit time (usually peak hour) is called* ***Capacity***

2.Classification :

- *Required passing capacity (determined by estimated demand)*
- *Designed carrying capacity (determined based on road, traffic and control condition*
- *Existing carrying capacity*

5.3 Carrying Capacity of Line

Ways of strengthening carrying capacity

To meet the demand, railways Authority should take measures to strengthen the railway carrying capacity mainly by:

-Expanding the railway network length

-Improving the weight of the train

-Increasing the traffic density

5.4 Organization of Station Operation

The operations includes：

（1） Carry on section block；

（2） Open and close home signal or starting signal；

（3） Ready train route for receiving-departure；

(4） Receive or send trains and instruct train departure

- *Train route: The path in a station occupied by the train when it arrives, departure or passing through the station is called train route*

5.4 Organization of Station Operation

Shunting operation of stations

- Shunting operation refers the action of sorting or switching items of rolling stock in to complete train set.
- Shunting operation should be done based on the shunting operation plan

5.4 Organization of Station Operation

1.Classified by the purpose

- Break-up shunting
- Marshalling shunting
- Pick-up and drop shunting
- Receive or send vehicles shunting

2.classified by the devices

- lead track shunting
- hump shunting

5.5 Track maintenance

- Railway tracks can be maintained either conventionally by ***manual labor or by the application of modern methods of track maintenance*** such as mechanical tamping or measured shovel packing

- The railway track should be maintained properly in order ***to enable trains to run safely at the highest permissible speeds*** and ***to provide passengers a reasonable level of comfort during the ride.***

5.5 Track maintenance

- Track maintenance becomes a necessity due to following reasons.

(a) Due to the constant movement of heavy and high-speed trains,

- ✓ ***The packing under the sleepers becomes loose and track geometry gets disturbed.***
- ✓ ***The gauge, alignment, and longitudinal as well as cross levels of the track thus get affected adversely and***
- ✓ ***the safety of the track is jeopardized.***

5.5 Track maintenance

b. Due to the ***vibrations and impact of high-speed trains***, the fittings of the track come undone and there is heavy wear and tear of the track and its components.

c. The track and its components get worn out as a result of the weathering effect of rain, sun, and sand.

5.5 Track maintenance

Advantages of track maintenance

- ***If the track is suitably maintained, the life of the track as well as that of the rolling stock increases since there is lesser wear and tear of their components.***
- ***Regular track maintenance helps in reducing operating costs and fuel consumption.***

5.5 Track maintenance

- *Small maintenance jobs done at the appropriate time such as tightening a bolt helps in avoiding loss of the concerned fitting and thus saving on the associated expenditure.*

- *When track maintenance is neglected for a long time, it may render the track beyond repair, calling for heavy track renewals that entail huge expenses.*

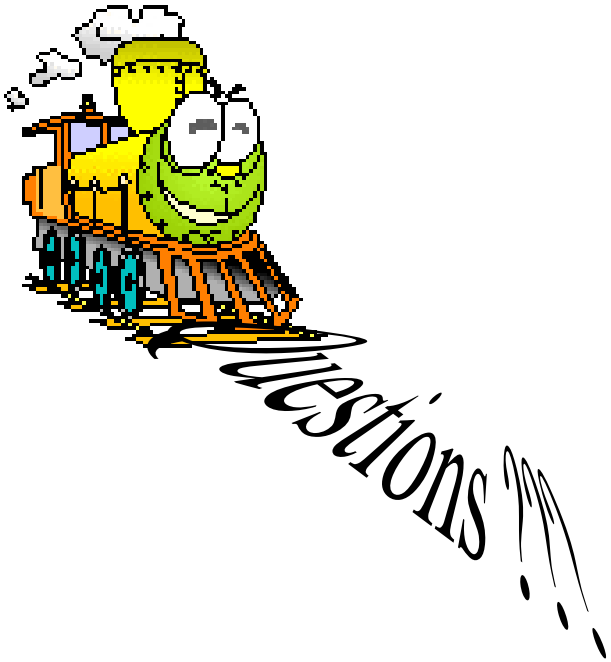
5.6 Types of track maintenance

Critical Review Assignment on Types of track maintenance from the following literatures.

- SATISH CHANDRA "**RAILWAY ENGINEERING**" chapter 18 Track maintenance
- COENRAAD ESVLED "MODERN RAILWAY TRACK" chapter 12 Track maintenance and Renewal

Due on Final Exam Day

5.6Types of track maintenance



THANK YOU!