

# Lecture #10

- Seven main element for RR cross-section:

① Ballast: crushed stones, 38-44 mm grain size, uninform graded

- Primary functions: \* Transmit and distribute the wheel load

القطار ثقيل ولا Rail ثقيل، لذلك

لا يجب أن يحدث ضغط، لو كان

هناك تراب لحصل ضغط

\* Anchor rails

قضبان التثبيت

\* Drainage

تصريف المياه

\* Inhibit vegetation and minimize dust

منع العشب النباتي وتقليل البخار

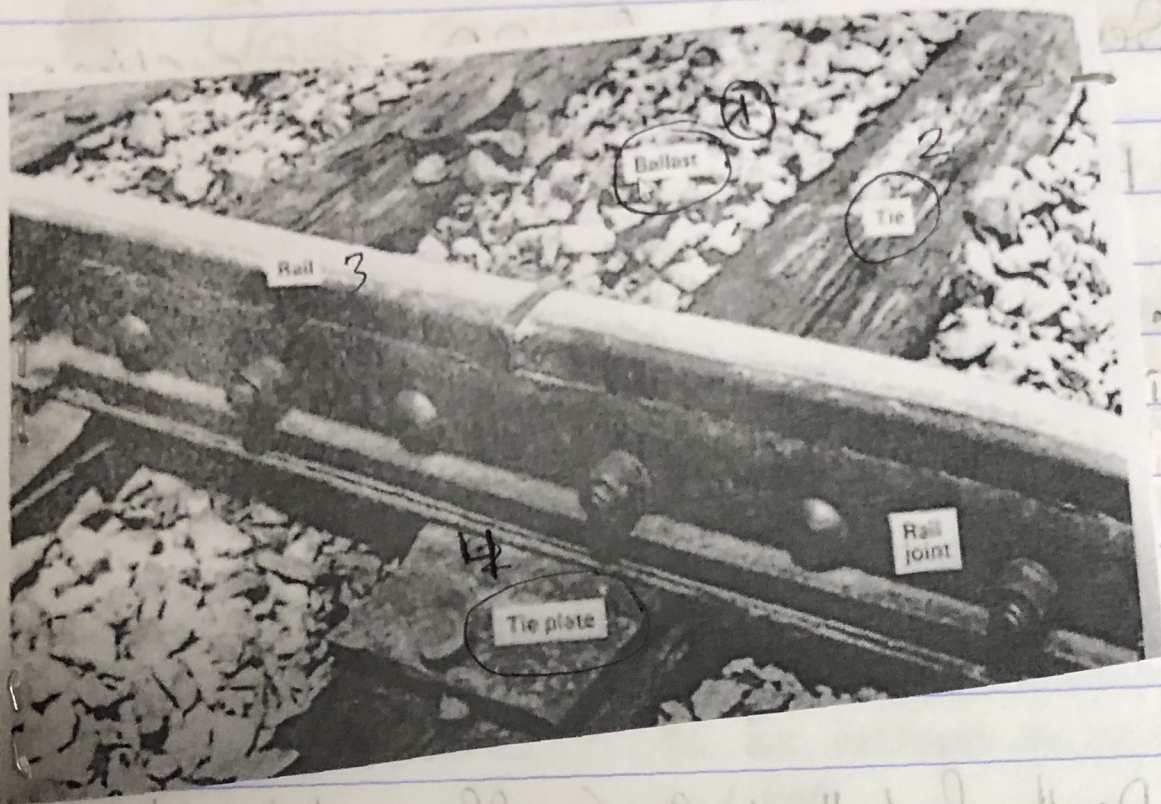
- Depth of ballast for (traffic and loads):

(150 - 750 mm) plus sub ballast where needed (~ 300 mm)

↳ depends on: ① Weight of traffic and loads

② number of traffic

\* Trams may not need ballast



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\* A rail joint

Depth of ballast for (traffic and loads)

150 - 350 mm

350 mm

rolled base for each rail

## ② Cross ties:

- Material:
  - \* Wood most common for intercity lines
  - \* Reinforced concrete - sleepers - fast increase use
  - \* Continuous concrete base for urban underground rail / Metro

### • Size of wood cross ties:

\* Grade 7: 7" thick, 9" wide, length 2.4-2.7m, spacing (traffic and loads): 0.4-1 m

\* Grade 6: 6" thick, 8" wide, same length (2.4-2.7 m)

- Functions:
  - \* Spreading vertical and horizontal loading to ballast

نشر الأحمال الأفقية والرأسية  
توزيع

ballast على \* Maintain correct gauge

الحفاظ على القياس الصحيح \* Anchoring

التثبيت \* Utilize elevation of outer rail at horiz.

الاستفادة من ارتفاع السكة الخارجية أفقياً

③ Rails: most common in USA in the Inverted T

- length: 11.9 m (39 ft) with rail joints or welds

- Gauge: distance between inside of rail heads

\* Standard gauge:  $4' 8\frac{1}{2}" = 1.435 \text{ m}$

(different gauge distances in east Europe, Spain, Ireland, Sudan and Urban metros)

\* اختلاف ال Rails من دولة لأخرى قد يكون لأسباب  
سببية تعرف بالمتوافق أثناء الصوب

④ Tie-plates: Rail are laid on tie plates which are secured to cross-tie by spikes and other type of fasteners

- Functions: \* Reduce change to cross-tie

- \* Hold proper gauge

- \* offset outward lateral thrust by tilting the rails slightly inward.

→ تقويض الدفع الجانبي الخارج عن طريق إمالة القضبان بشكل واضح إلى الداخل

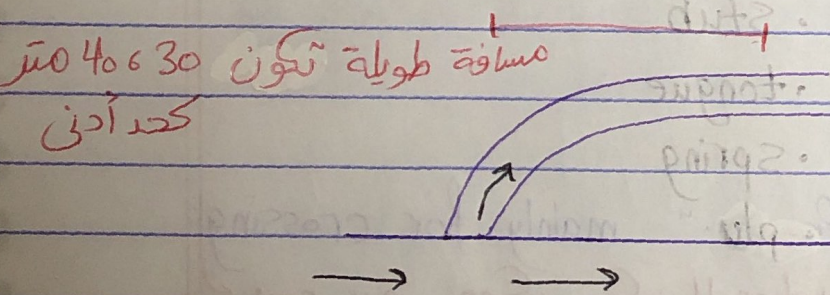
⑤ fastening: To tie cross-tie to tie-plate

⑥ Rail Anchors: to reduce longitudinal movement of rail due to traffic and temperature expansion

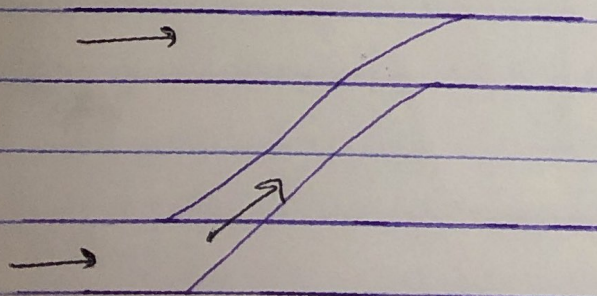
⑦ Rail joint: connect rail sections, to provide smooth continuity of alignment

### \* Railroad intersections:

① Turnouts:



② Crossover:



مسافة 30 متر كحد أدنى، تصل 600 متر

③ crossing: sit-cross-sit to tie-cross-tie

④ Rail Anchores: to reduce longitudinal movement of rail due to traffic and temperature expansion

No turning

just crossing

⑤ Rail Joint: connect rail sections to provide smooth continuity of alignment

\* Switches: types:

- split
- stub
- tongue
- spring

← التي يتقل الكبار  
من سكة أخرى

plus "frogs" mainly for crossing

← بس برضو ممكن يكون لل switches

\* Switch plates are moved manually, electrically via train operator or control station

← بس برضو ممكن يكون لل switches

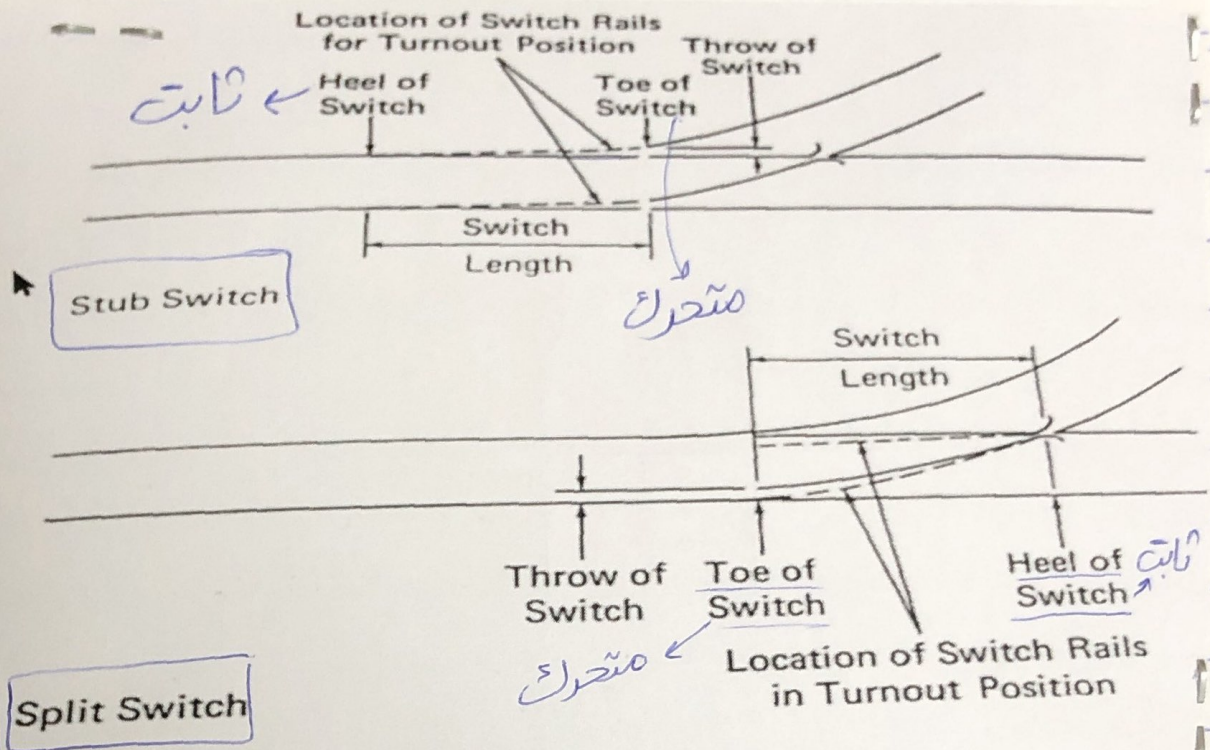
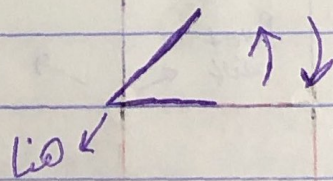


Figure 13-21 Schematics of stub and split switches.

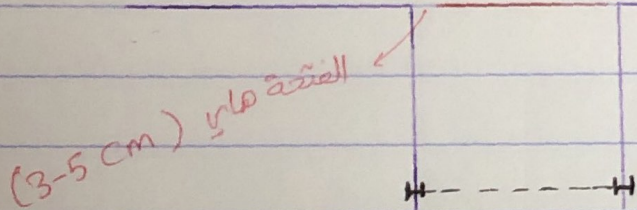
\* Split switch is more advance and used for fast trains.

\* فرج وضع frog

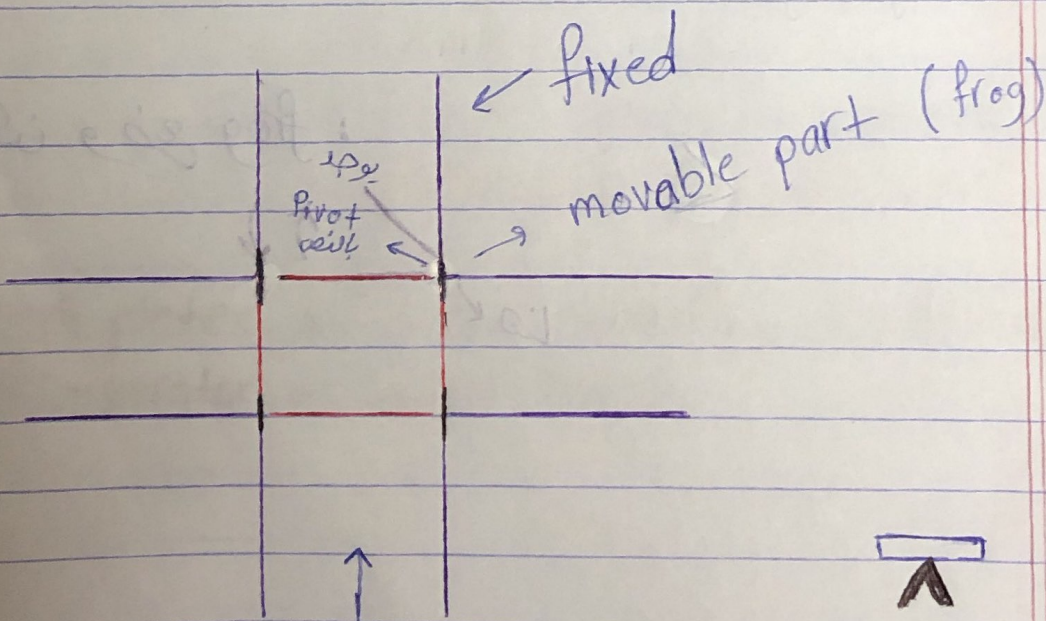


\* for crossing:

قطر العجل كبير يصل لـ 25 cm  
فلا يقع لو يوجد فراغ صغير



في حالة إنه القطار سريع بنستخدم ال frogs (باللون الأسود):



بهاد الاتجاه سالفة  
ولما يعبر القطار ال frog يقفز  
ويغير اتجاهه للسكة التالية



\* At grade crossing ROW for trains: warning and protection features:

• Regulations only : الأولوية للقطار دائماً الوضوح  
اشارات أو اشارات ضوئية  
تظير

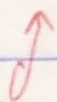
- Warning signs
- Red flasher
- Ringing bells
- Boom gates
- All of the above

\* RR - Hwy Grade crossing or Grade separation:

Decision function of: ① Highway and railroad traffic  
② Delays / queuing theory  
③ safety

\* هناك قطارات طويلة جداً تحتاج لمرورها أكثر من خمس دقائق ، وهذا  
يسبب التأخير والمشاكل للعديد من الناس

فوق الشارع



\* Grade separation: Two options: ① RR overpass  
② RR underpass

تحت الشارع

→ function of topography, cost drainage and clearance

\* Height and width clearances:

الارتفاع والعرض المناسبين

	RR	HWY
Height clearance	23' (7 m)	16' (~5 m)
Width clearance	3 per track	2-lanes: 7-12 m 4-lanes: 20-30 m

(6.5-7 m) for tracks