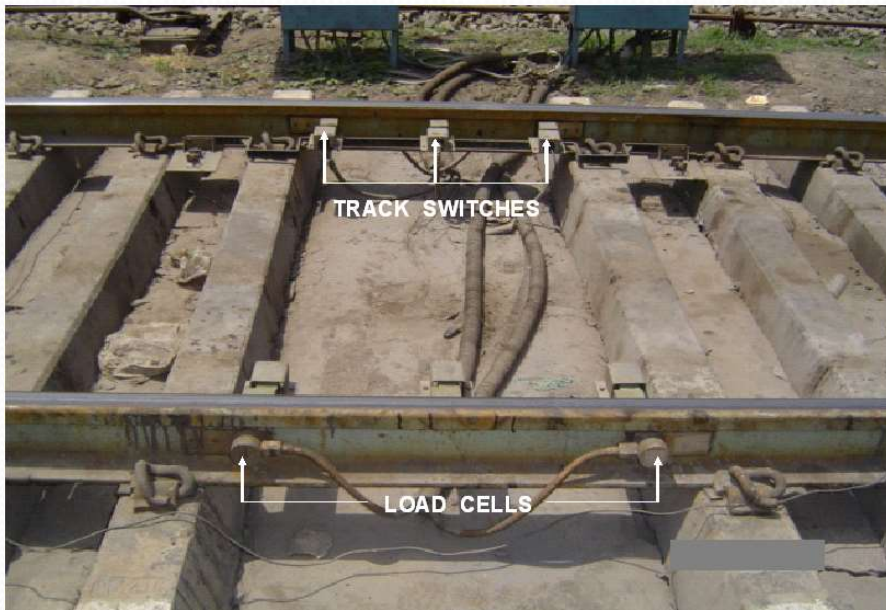


An Introduction to

**Electronic In-Motion
Weighment**



CONVENTIONAL WEIGHING SYSTEM

STATIC

- Each wagon has to be uncoupled from wagons adjacent to it
- Wagon has to be carefully positioned on to the weighbridge
- Then the weight is recorded
- Static Weigh Bridges – Installed below Loading Chutes

IN-MOTION Weigh Bridge

- Wagons Coupled
- Wagons in Motion
- Used in IR
- Rake Originating Points & intermediate Junctions

TYPES

Partial Weighing System

- Each Axle weighed at a time
- Gross weight found by summing up and displayed
- For Solid Commodities
- Mostly used in IR

Full Draft Weighing System

- All axles of wagon weighed at one time
- Gross Weight displayed
- For Liquids and Gaseous Commodities

LOAD CELLS

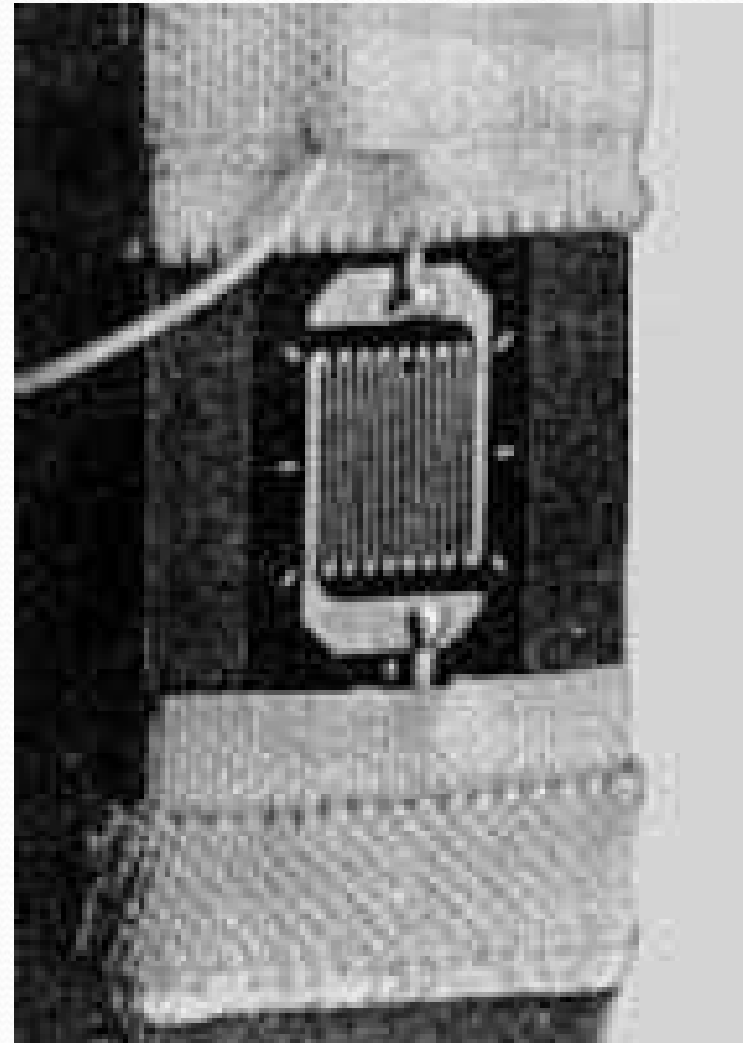
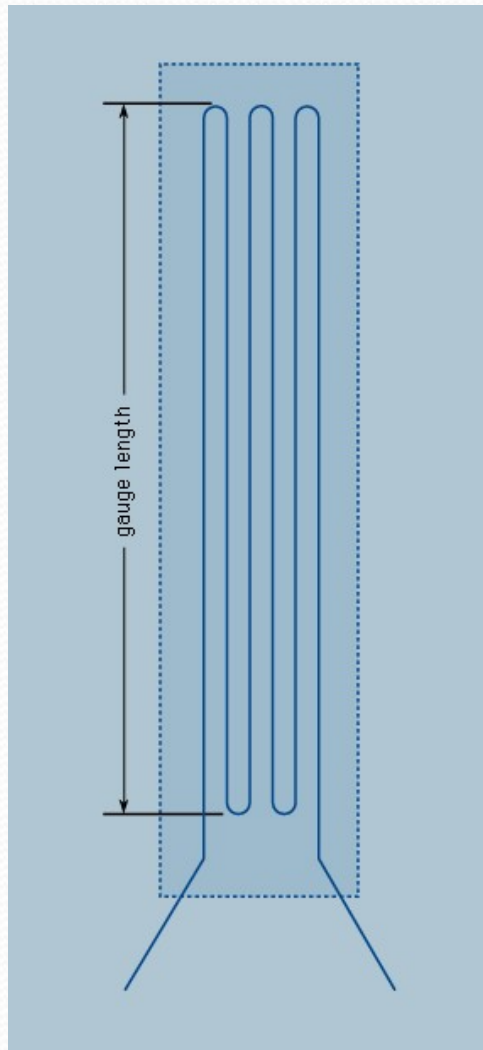
- A load cell is an electronic device and is classified as a force transducer. This device converts force or weight into an electrical signal
- There are certain inherent advantages of using a load cell

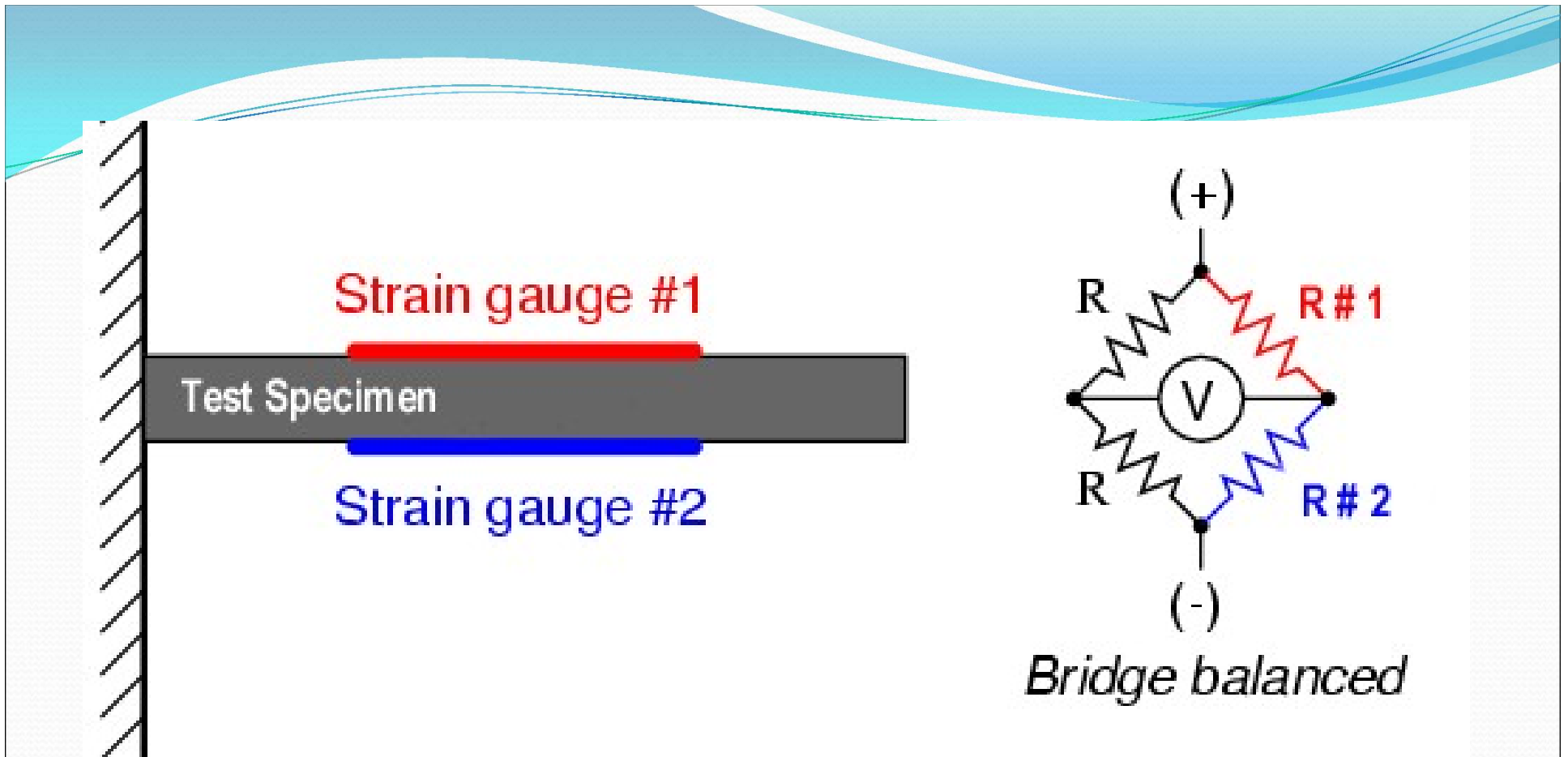
ADVANTGES OF LOAD CELLS

- Load cells are not mechanical
- Load cells also are able to offer measurement accuracy to within 0.03% to 0.25% full scale, which is suitable for almost all industrial applications
- The “strain gauge” is the heart of a load cell

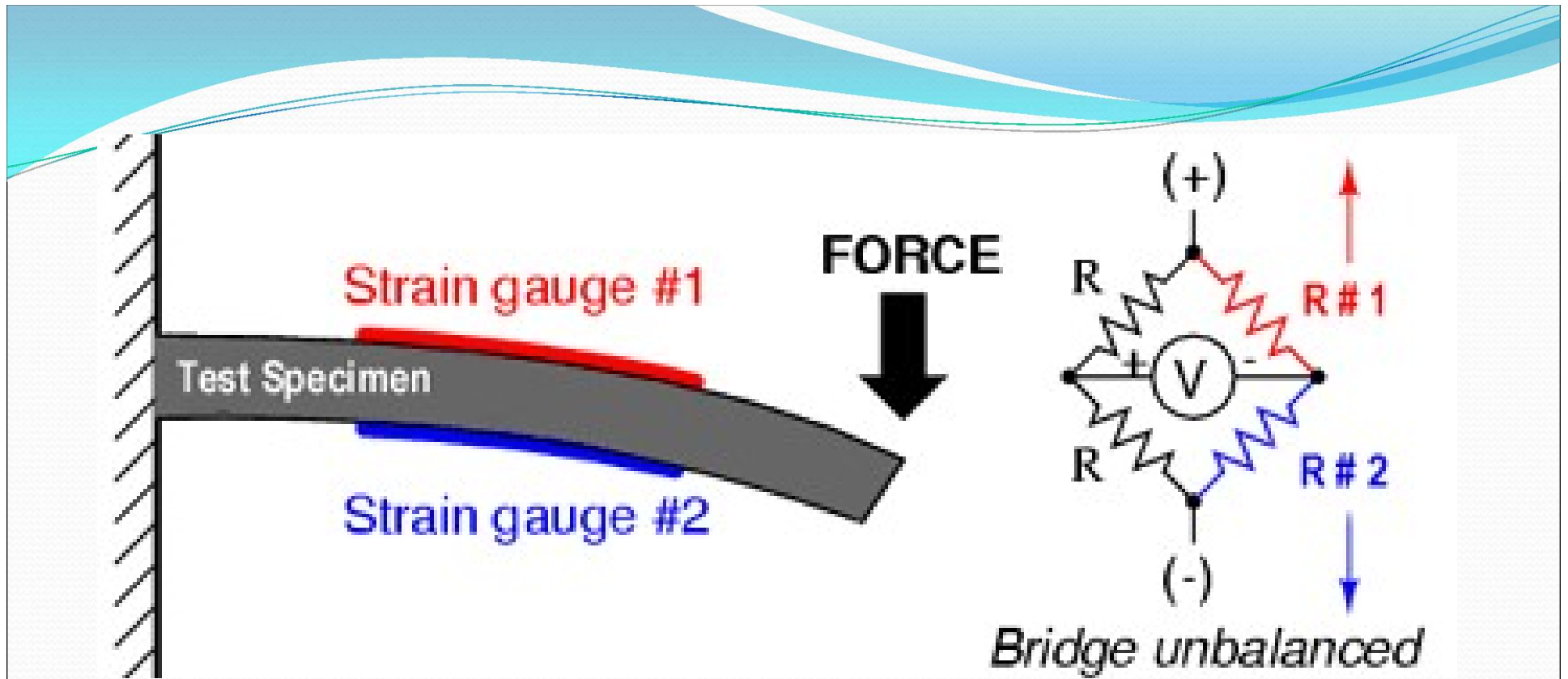


Components of Load Cell – Strain Gauges








With no force applied to the test specimen, both strain gauges have equal resistance and the bridge circuit is balanced

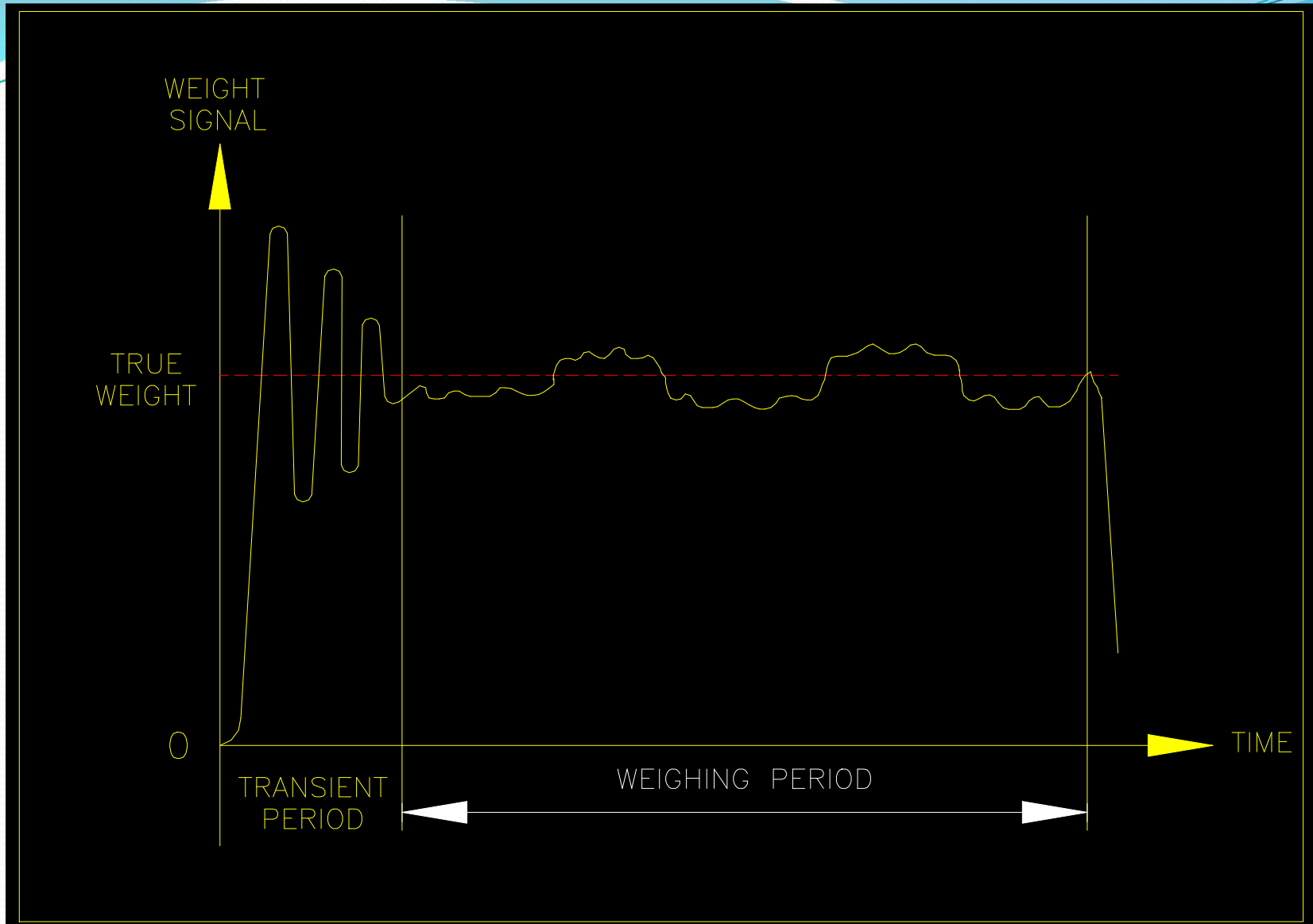


However, when a force is applied to the free end of the specimen, it will bend stretching gauge #1 and compressing gauge #2 at the same time

- 
- Strain gauge bridges are rated in millivolts of imbalance produced per volt of excitation, per unit measure of force
 - Quarter-bridge and half-bridge circuits provide an output (imbalance) signal that is only approximately proportional to applied strain gauge force

- 
- Linearity, or proportionality, of these bridge circuits is best when the amount of resistance change due to applied force is very small compared to the nominal resistance of the gauge(s)
 - With a full-bridge, however, the output voltage is directly proportional to applied force, with no approximation

- 
- Another advantage of full-bridge is that it is unaffected by temperature
 - For Railways application we use strain gauges to measure the shear strain
 - Shear stresses by definition are equal only to the load carried by the member and the area of the member, **independent of the point of loading**

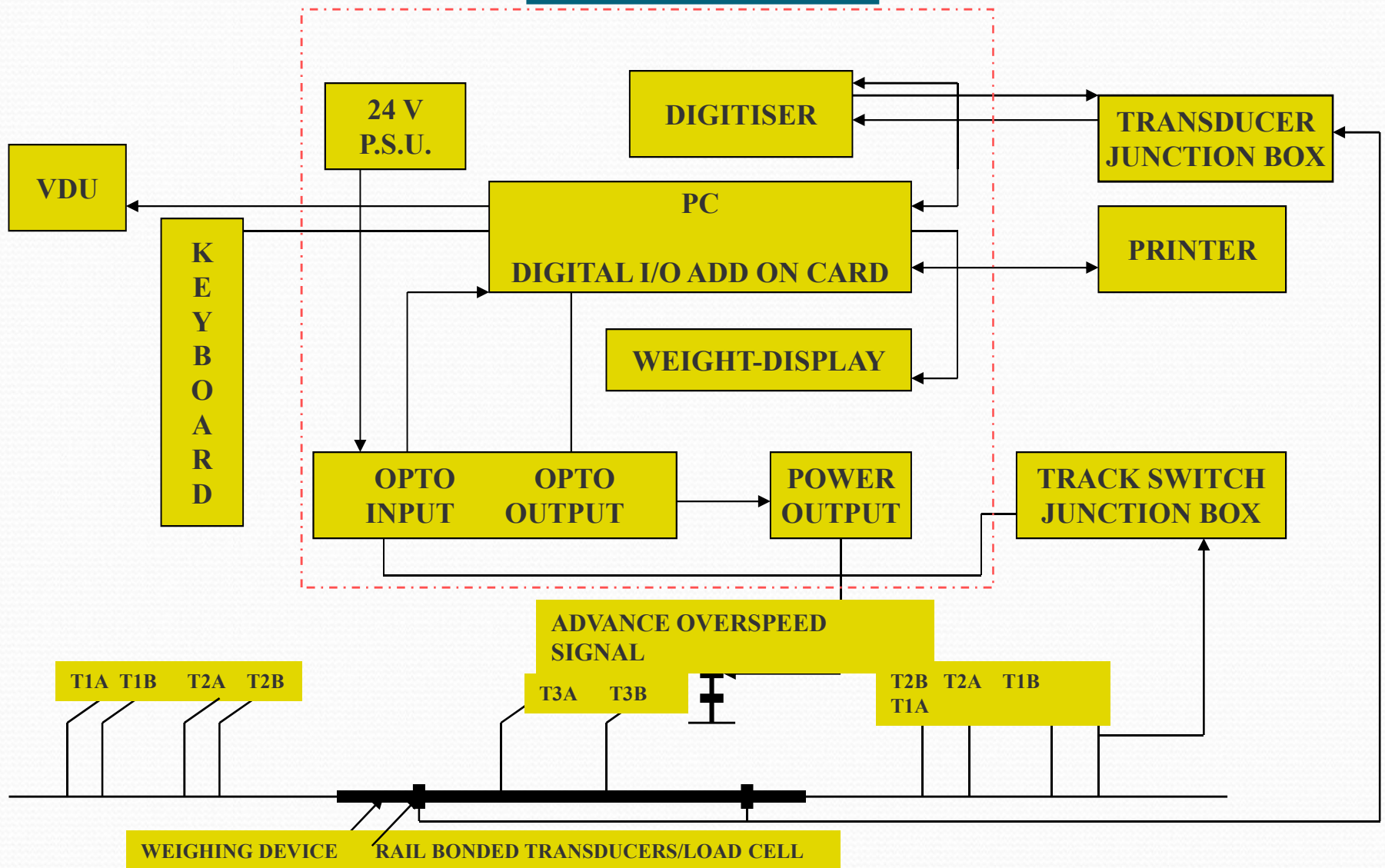


Load Cell Signal

EIMW

- Based on weighing axles & summing through Computer.
- Based on strain Gauge bonded Rail.
- Calibrated rails fitted directly on sleepers
- Weighing accuracy :-
 - +/- 0.5 % for wagon.
 - +/- 0.25 % for rake.

EIMW – SYSTEM BLOCK DIAGRAM



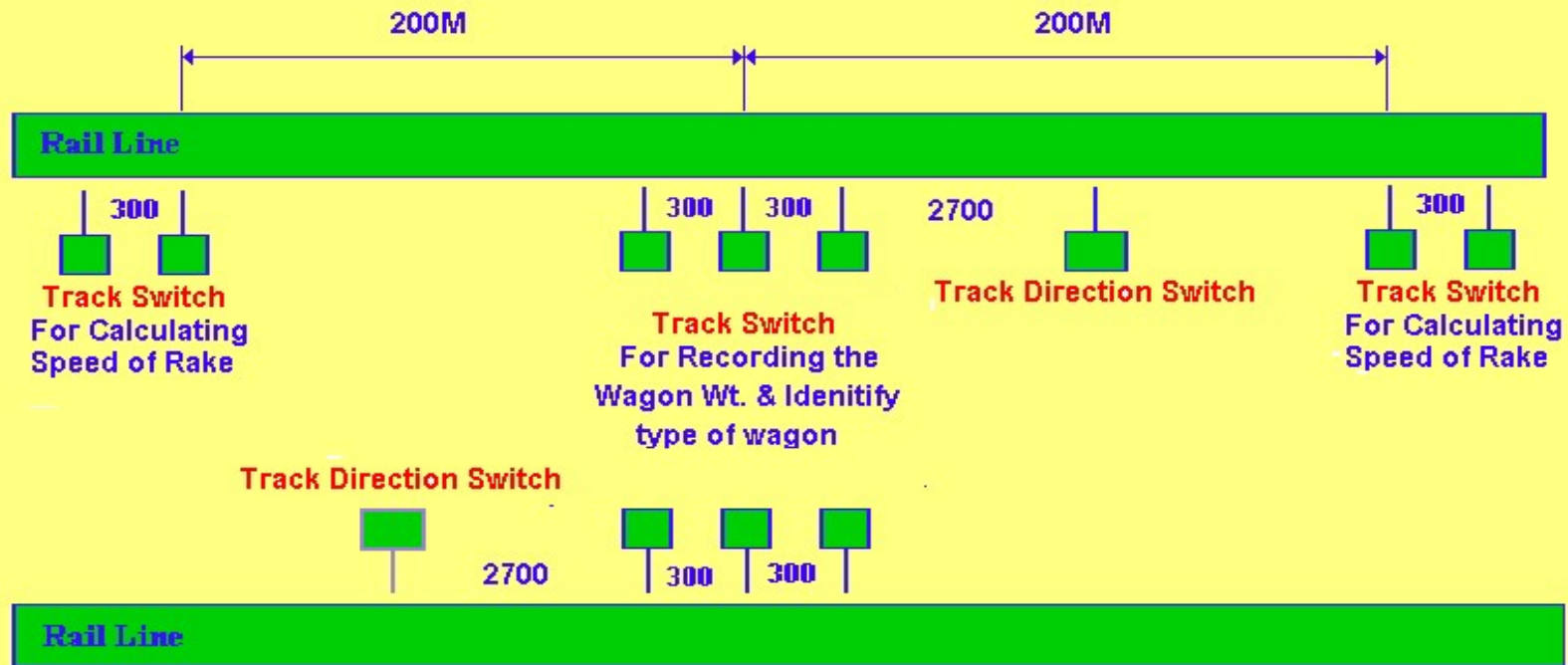
TRACK SWITCH LAYOUT



TRACK SWITCH LAYOUT



TRACK SWITCH LAYOUT



Rake Speed should be constant & Less than 15 K.m/hr.

EIMW

FUNCTION OF TRACK SWITCHES

- Monitor the Rake speed.
- Identify type of Loco Motive / Wagon.
- Calculate the speed of Rake.
- Detect Roll Back.

LOAD CELLS LAYOUT



EIMW

LAMP POST SIGNAL'S

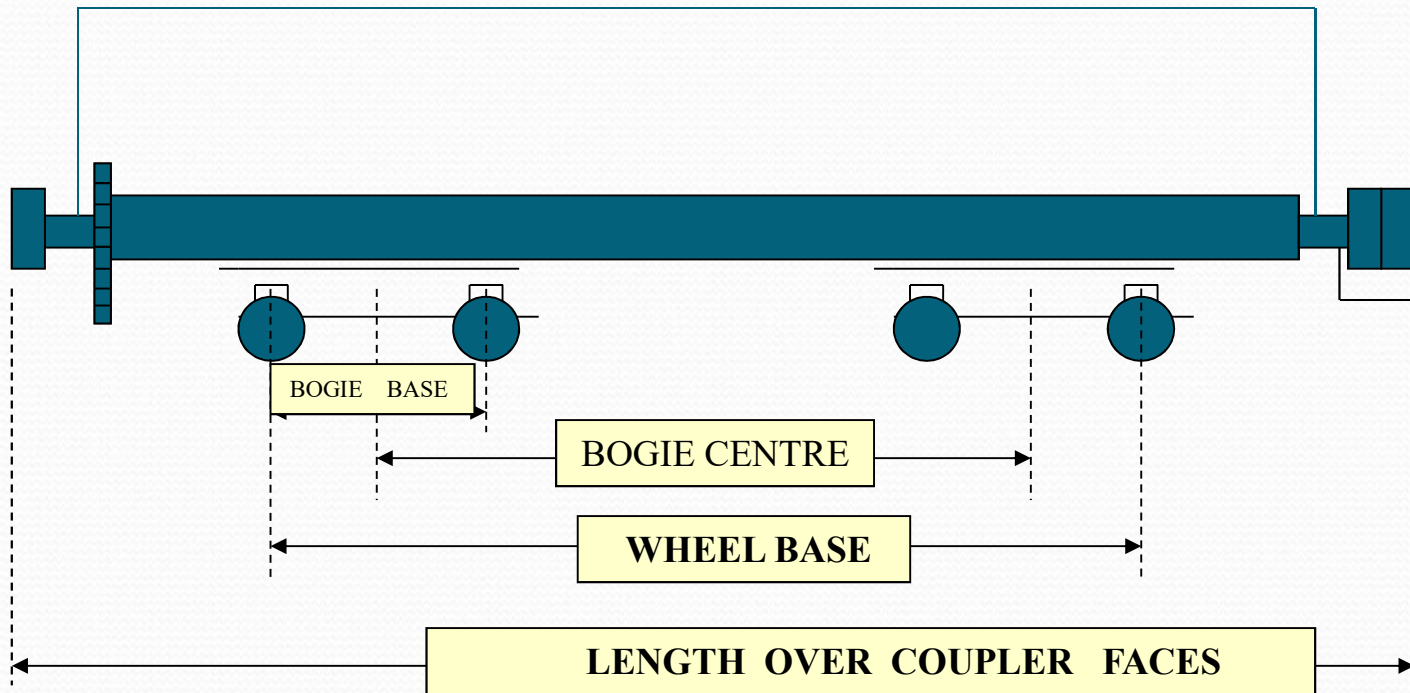
- **Red** to indicate the speed of the Rake is higher than allowed maximum Speed.
- **Amber** to Indicate the Speed higher than 0.8 X allowed maximum Speed.
- **Green** to indicate speed with in Limits (Below 0.8 times The maximum allowed speed).

(Maximum allowed Speed = 15 k.m /hr. Speed should be uniform during Weighment).

Track Requirements

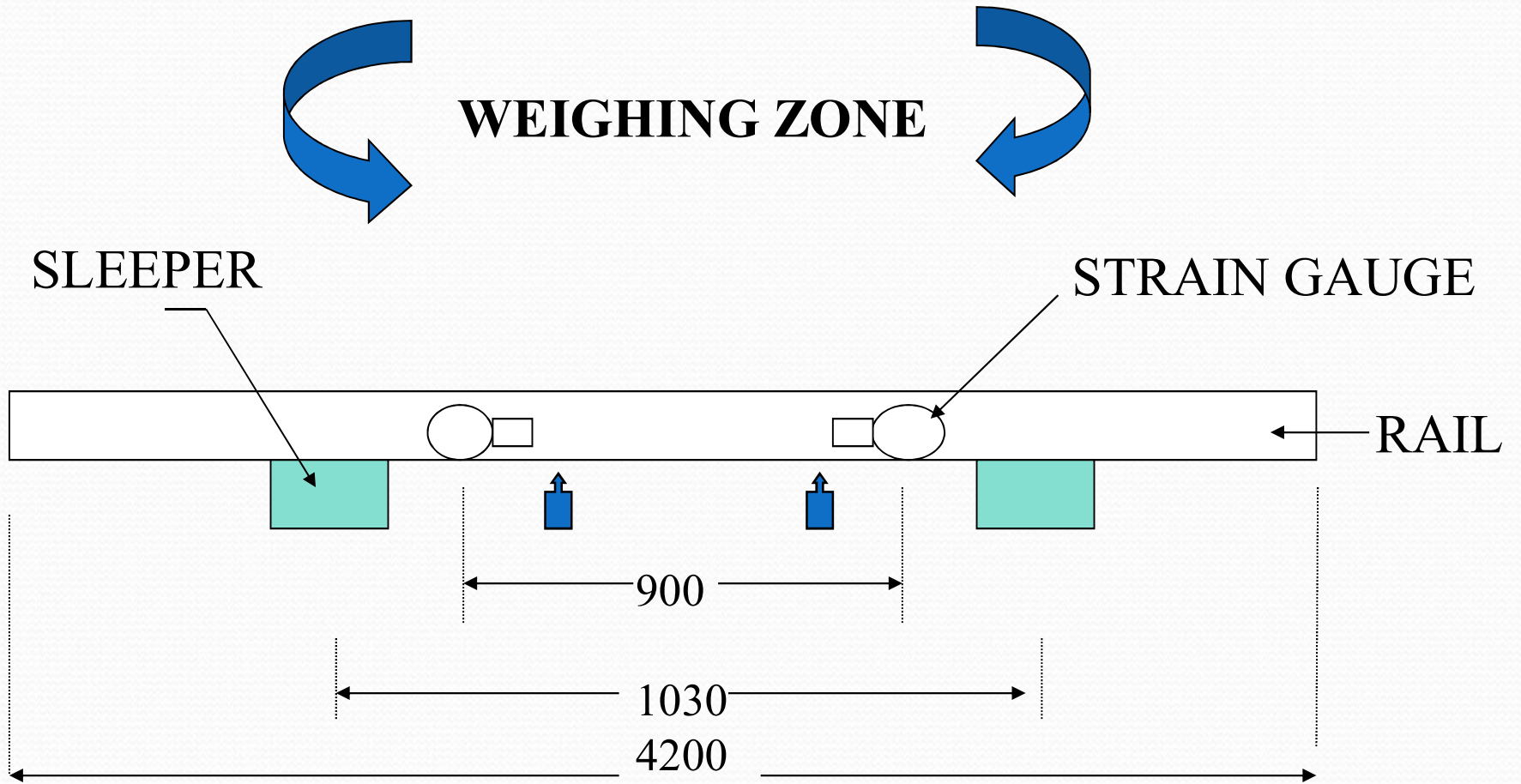
- Straight Track 100 – 150m on either side (min. 5 – 8 wagon length)
- Uniform Gradient, better than 1:400
- Gauge tolerance 100m from approach CANNOT be tight
- Rail level in weigh zone to be within +/- 5 mm
- PSC ballasted track with packing to mainline standards
- Rubber pads between Rail and Concrete sleepers
- Rail creep arresting provision
- Electrical isolation of weighrails
- No crossings, turnouts or points within measuring zone
- Earthing of Weighrails if required as per manufacturer's design

WAGON DETAILS

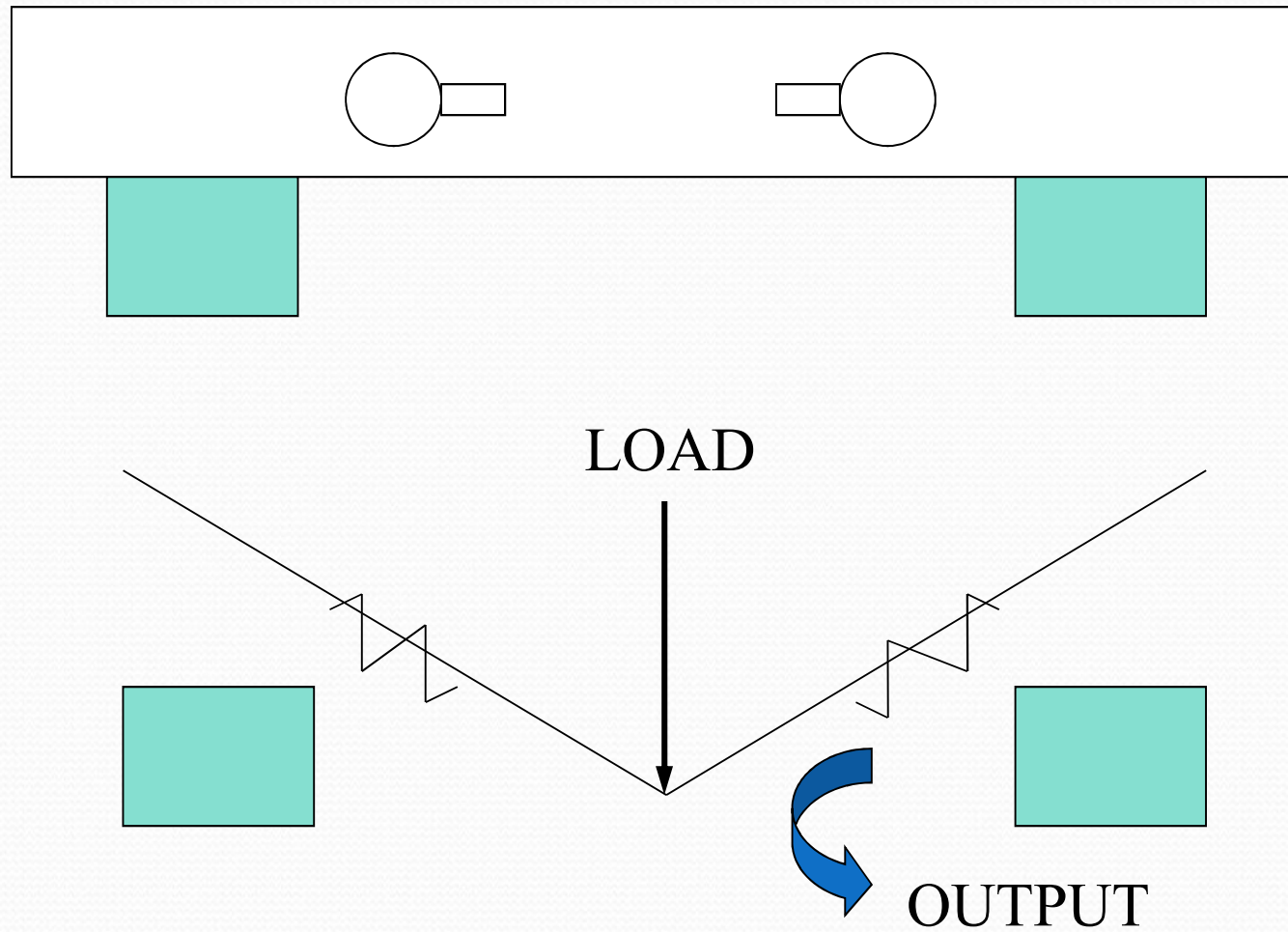


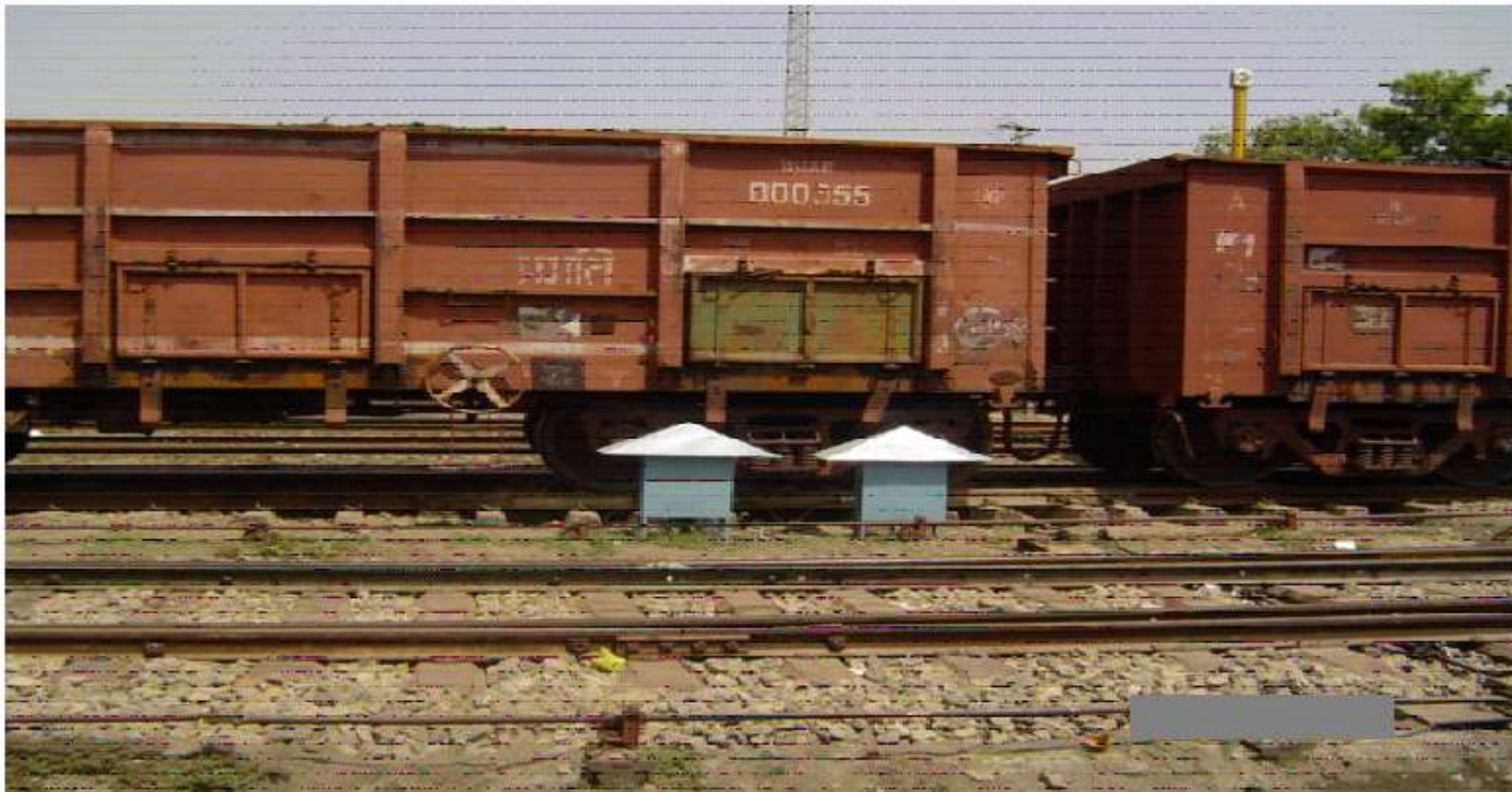
WEIGH ZONE

WEIGHING ZONE



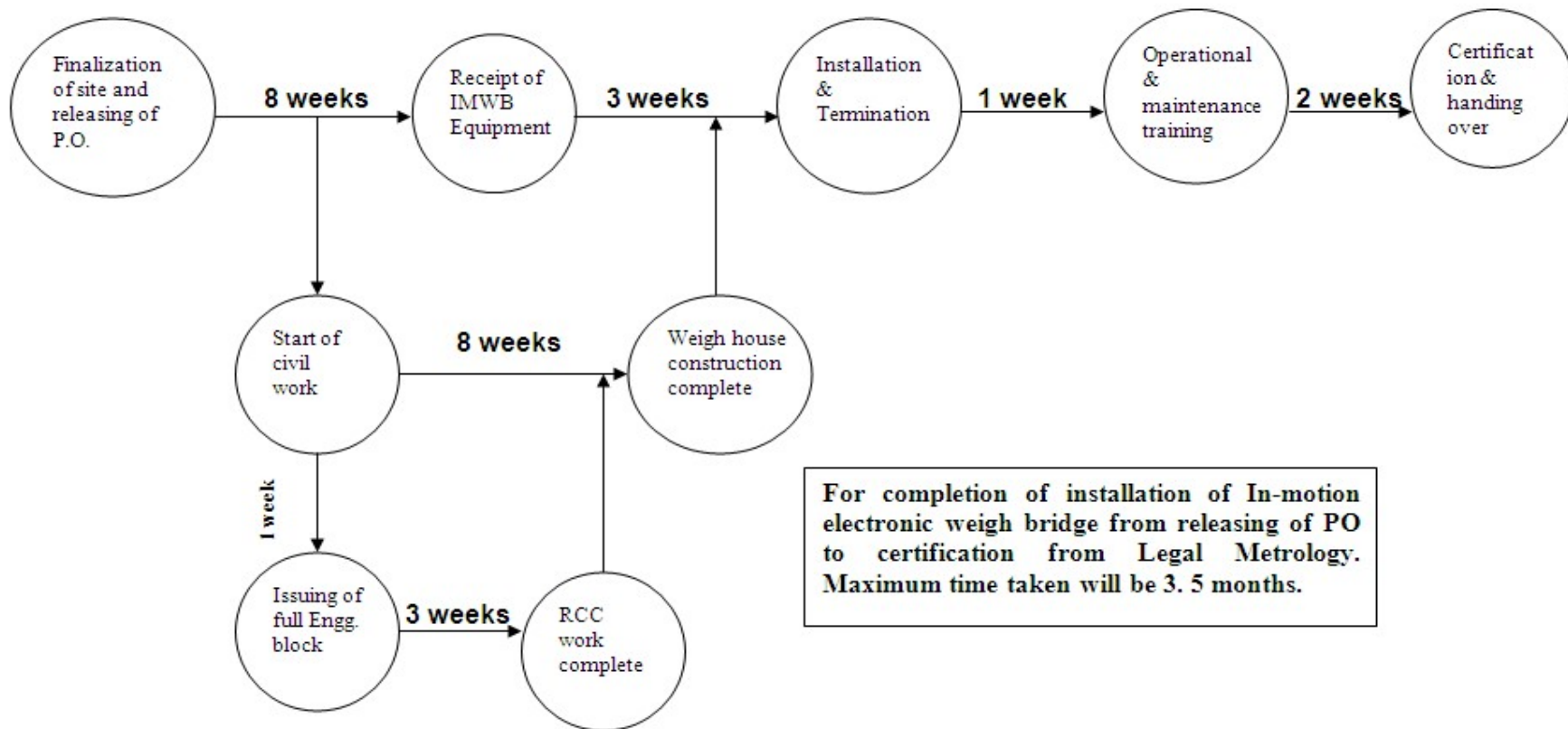
WEIGH PLATFORM






Rake wagon passing over the track mounted with Electronic weigh bridge system

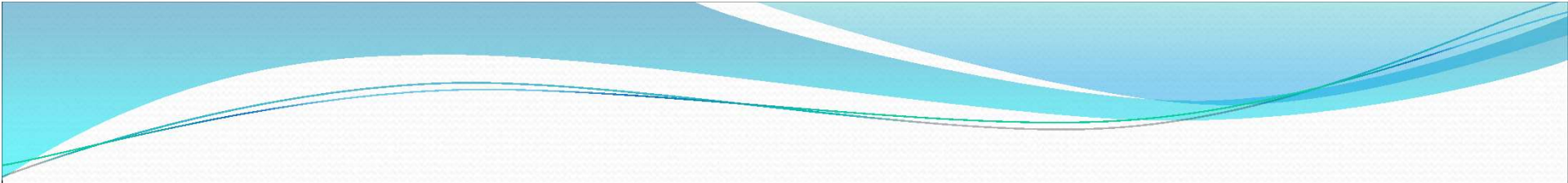
Time Schedule



Parameters affecting accuracy

- Track parameters
 - *Track to main line standards*
 - *Track gauge NOT TO BE TIGHT*
 - *Cross level to be maintained such that wagon CG will not shift*
 - *Packing below sleepers to be rigid to prevent pumping*
 - *No gradient in line*
 - *Layout to be straight as far as possible*
 - *Rigid joints of the rails*
 - *Proper insulation of weigh-rail*
 - *No shifting of center point of weigh-rail with respect to support sleepers*

- 
- **Speed of the train**
 - Excessive speed causes error in determining peak value
 - **Driving skill of driver**
 - Jerks cause load shift between wagons
 - Rake being weighed should be moved 50 – 100m from weigh-line to achieve uniform speed
 - **Proper voltage to electronics panel**
 - Non-fluctuating power supply
 - Proper earthing to avoid damages from surges / line transients

- 
- Proper working of PC
 - Keep weigh-house clean and dust-free
 - Scrap below weigh-rail
 - Will restrict deflection of weigh-rail

GEN: Switch on machine 15-minutes before weighment for thermal stability.



- Documents:

1. STR

2. International Recommendations OIML 106 – 1997 on Automatic Rail Weighbridges

- Important Considerations

1. Power Supply and Earthing

2. Periodic Verification and Stamping

3. Spares

4. M&P

5. Trained Personnel

JPO – Board's Guidelines

- **ADRM** responsible to co-ordinate and ensure that all functional, accuracy, legal and maintenance parameters are satisfied.
- **Commercial Department – Custodian**
 - Ensuring verification
 - Sealing, Locking and avoiding tampering
 - Proper switching on and off
 - Starting mini DG in case of power failure



- **Mechanical Department**

- AMC and satisfactory execution
- Preventive and Break down maintenance
- Testing of Weighbridges
- Ensuring stamping by State Government

- **Operating Department**

- Passing rakes through weighing line without stopping short of weighbridge
- Not utilising weighment line for stabling etc.



- **Engineering Department**

- Maintaining specified track parameters
- Approach track to be maintained for smooth entry / exit on weigh rails
- Drainage of track upto 100m on either side of weighbridge
- Indication Boards
- Maintenance of room, security grills
- Providing and maintaining water connection near weighbridge for wetting of earthing pit



- **Electrical Department**

- Providing 2 separate 230V AC power points of adequate capacity – one each for Weighbridge and AC/Lights.
- The alternative arrangements for standby power supply through generating set + maintenance
- Provision of earthing and its maintenance, subjected to annual checks
- Maintaining Lights, Fan, AC

- **S & T Department**

- Maintaining jumpers for track circuit, block joints

- **Security Department**

- General security of the installation



Thank you