

A Presentation

AIR BRAKE SYSTEM

ON

LHB COACHES

**(Axle Mounted Disc Brake With
Wheel Slide Protection Unit)**

CONSTITUENTS OF BRAKE SYSTEM

(POSITIONS & FUNCTIONS)

▶ Mainly Brake Equipment's are placed at four locations:

▶ Container frame (On Under frame):

▶ Pressure tanks (Air reservoirs):

▶ Main reservoir

-One 125L for brake application
(Protected by check valve)

▶ Auxiliary reservoir

- One 75L for toilets & brake

(Capacity of Both 125L and 75L available for brake application)

▶ Controlled reservoir

-One 6L for DV

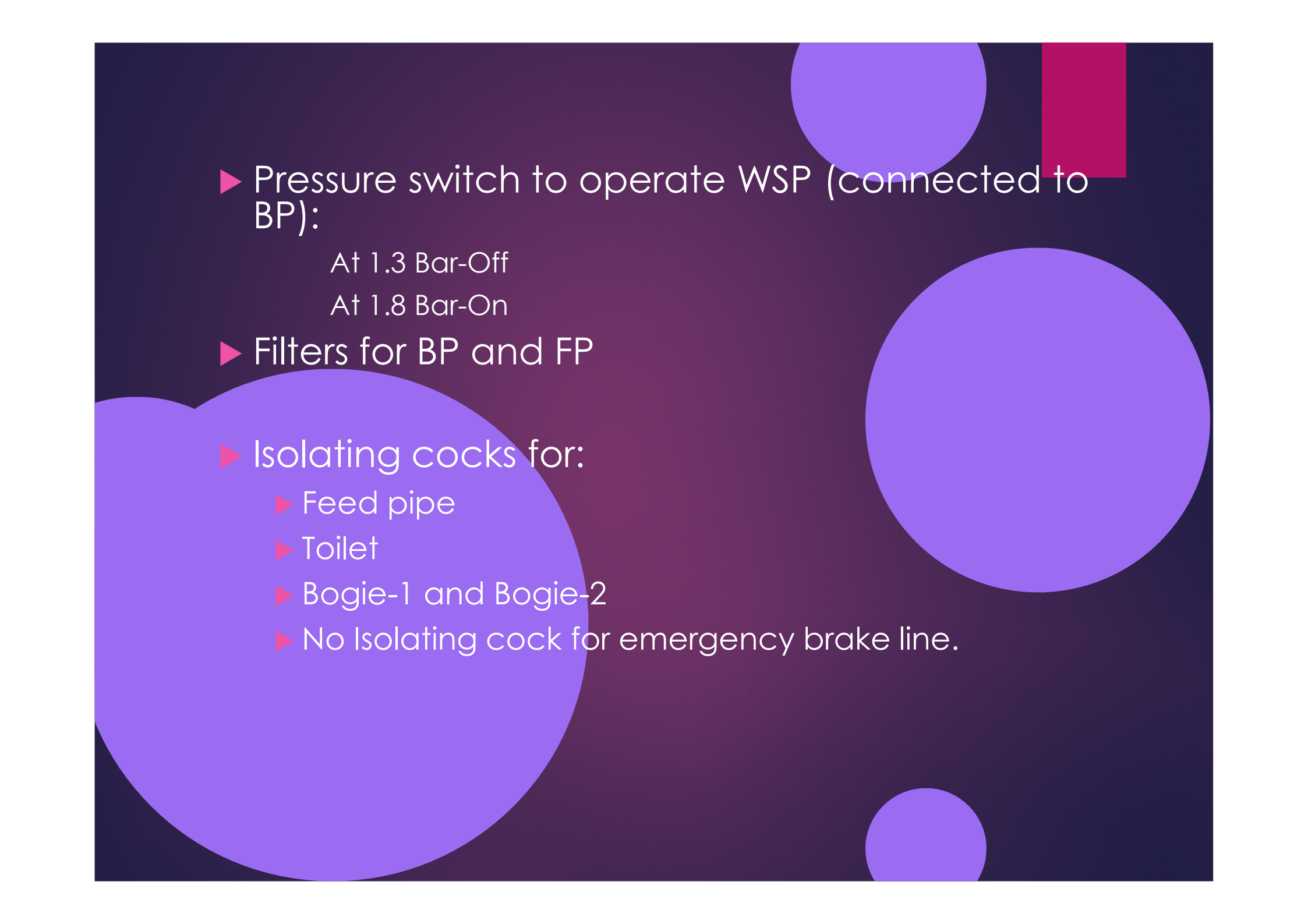
CONSTITUENTS OF BRAKE SYSTEM

(POSITIONS & FUNCTIONS)

- ▶ Brake control panel (Centralized control, On under frame):

- ▶ Test fittings (To Check Pressure) :

- ▶ Feed Pipe pressure
- ▶ Brake Pipe pressure
- ▶ Control Reservoir pressure
- ▶ Brake Cylinder pressure

- 
- ▶ Pressure switch to operate WSP (connected to BP):

At 1.3 Bar-Off

At 1.8 Bar-On

- ▶ Filters for BP and FP

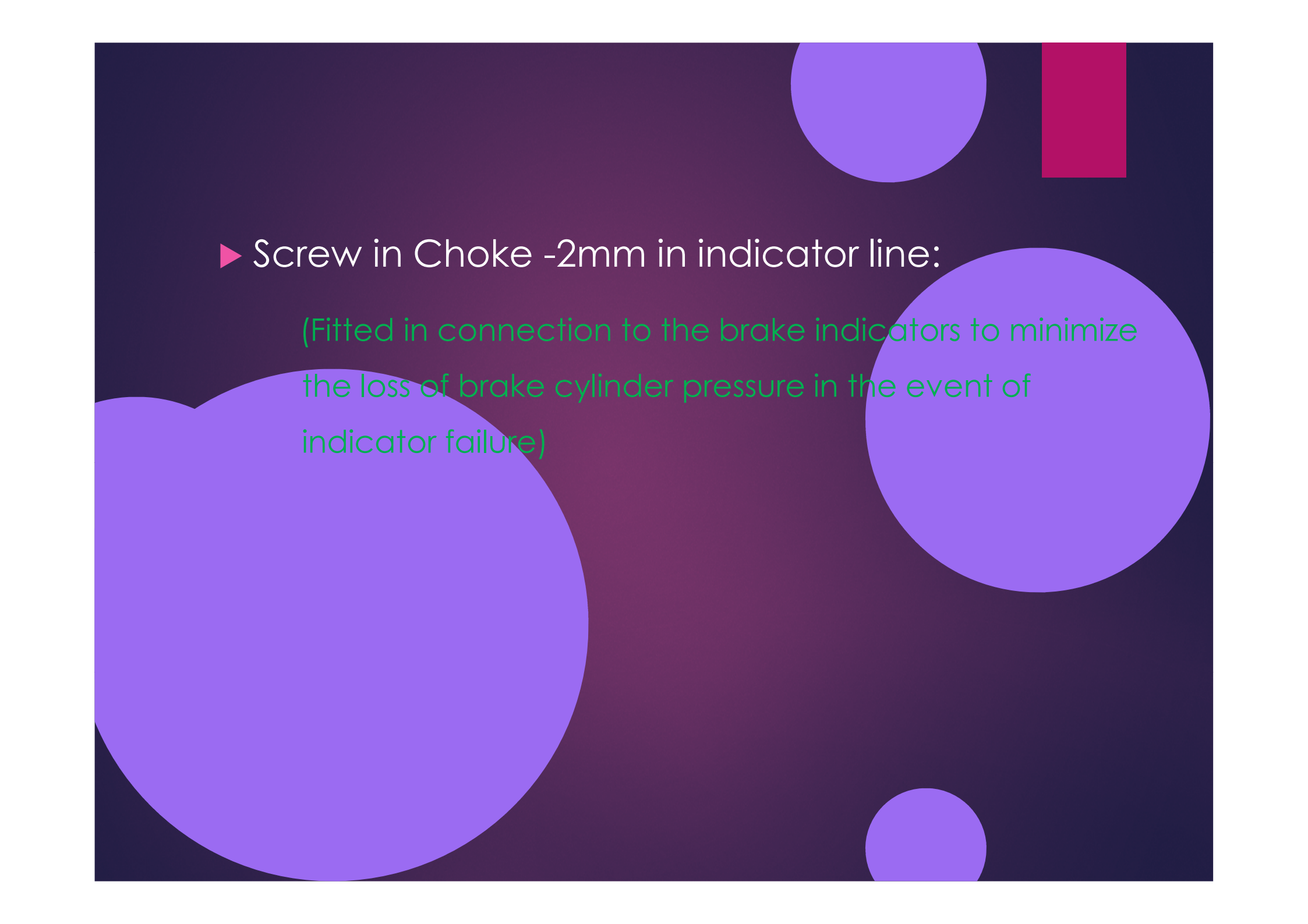
- ▶ Isolating cocks for:

- ▶ Feed pipe

- ▶ Toilet

- ▶ Bogie-1 and Bogie-2

- ▶ No Isolating cock for emergency brake line.



► Screw in Choke -2mm in indicator line:

(Fitted in connection to the brake indicators to minimize the loss of brake cylinder pressure in the event of indicator failure)

▶ **Distributor Valve with intermediate flange:**

- ▶ Consists basic valve to which the Relay valve is directly mounted.
- ▶ In the KE0 valve type-A chamber not incorporated at the valve.
- ▶ It has a quick release device mounted to the valve body.

▶ Equipment's on Bogies:

▶ Hose connections:

- ▶ 4 Nos (To Connect BC line to each axle)
- ▶ 8 Nos (Bifurcates BC to each brake cylinder)

▶ Brake calipers (Type UP10):

- ▶ Qty required: 8 Nos (4 nos per bogie-2 LH and 2 RH)
- ▶ Suitable for fitting UIC type 200x2 square pads of thickness 35 mm

Calipers shall give effective brake radius of 247mm

- ▶ Lever Ratio: 2.17 for all except 2.48 for ACCN/SG and Power car

▶ Brake cylinder (Type UP-10X):

- ▶ Compact construction

- ▶ Auto slack adjuster
 - Brake shoe clearance due to wear corrected automatically by single acting slack adjusted

- ▶ No manual adjustment to make after brake pad replacement.

- ▶ Piston travel: 21 mm (max)

- ▶ Slack capacity: 160mm (max)

- ▶ Cylinder size: 10 inches

- ▶ Max BC pressure: 3.0 kg/cm²

▶ Brake pads -35mm thick and 200 Cm²
(Composite type):

- ▶ Quantity per coach: 32 Nos. (16 LH - 16 RH)
(16 on each bogie-2 on each caliper)
- ▶ Wear limit -28mm max.

▶ Brake Disc:

- ▶ Quantity per coach -8 Nos (two per axle)
- ▶ Disc dimensions -640X110
- ▶ Material: Grey cast iron

▶ Speed sensor cable with pole wheel (80 teeth):

- ▶ 4 Nos. -One per axle)
- ▶ Gap between speed
Sensor and pole wheel -0.7 to 1.1

► Inside the coach:

► WSP micro processor (Electronic unit)

► Emergency Brake Pull Boxes

(One in each toilet and one in each cabin except power car & Chair Car)

- Emergency brake valve (in guard cabin) is directly connected to BP and vent it when being actuated (vent the pipe quickly).
- In each coach emergency pull boxes are installed, which operates through emergency brake valve.
- If handle of pull box moved then the brake valve exhaust the BP via a large orifice up to 2 bar after this it stop to vent.
- Emergency brake light outside the coach will be activated by using the pull box, which is equipped with an electrical switch.

▶ Equipment on car body:

- ▶ Angle cocks 8 Nos.

(At coach ends on BP and FP Pipes-FP and BP bifurcated into two branches to make coupling between two adjacent coaches)

- ▶ Brake and feed pipe coupling 8 Nos. (4BP and 4 FP)

- ▶ Brake application and release indicators 4 Nos (2per Bogie-2 on each side of the coach)

- ▶ Antiskid valve (Electro-valve) 4 Nos
 - ▶ 2 per Bogie or One per Axle

- ▶ Terminal Box for speed sensor cable - 4 Nos

- ▶ Terminal Box for Antiskid valve - 4 Nos

- ▶ Emergency brake valve -1 Nos.
- ▶ Emergency Brake accelerator -1 Nos.
 - ▶ Mounted in brake pipe. If any fast pressure reduction in BP, equal to emergency brake application it support this pressure reduction and vents the BP via a large orifice. This causes an equal BP reduction speed over the whole train in BP, so the actuation speed of the Brake cylinders at the end of a train will be as fast as in coaches near the actuation point.
- ▶ Two 28mm pipes running through the coach for BP and FP
 - ▶ BP is used to control the DV by pressure increase or reduction for brake application and release

PIPES AND PIPE FITTINGS

- ▶ No flange/threaded joints i.e. no threads required on pipe.
- ▶ Metric Pipes (Seamless Precision Pipes):
(Metric pipes described by O.D.)
 - ▶ DIN2391C-DIN17456 Gr1.4301 (X5CrNi1810) NBK 3.1B
 - ▶ C-quality grade (Precision steel tubes-geometry and surface of the tubes)
 - ▶ NBK-Normalized (annealed above the upper transformation point in a controlled atmosphere or under vacuum)
 - ▶ 3.1B- Supply condition
 - ▶ Pipes used:
 - ▶ 28mm for BP and FP Thickness = 1.5mm
 - ▶ 10mm for emergency
 - ▶ and pressure gauges Thickness = 1mm
 - ▶ 18mm for brake cylinder pipes (BC line) Thickness = 1.5mm

PIPE FITTINGS-BITE TYPE

- ▶ Cutting ring ensures sealed joint.
- ▶ Designed for metric tubes i.e. OD of pipe is important
- ▶ Proper assembly results is achieved by 1 and 1/2 turns of the nut only
- ▶ Nomenclature:
 - ▶ GE12ZLR1/2EDA3C
 - ▶ GE - Code for shape and style
 - ▶ 12 – Tube OD (in mm)
 - ▶ Z – DPR type (Progressive type)
 - ▶ L – Light Series
 - ▶ R1/2 – Thread type and Size
 - ▶ ED - Seal Type
 - ▶ A3C- Fitting Material /coating



▶ Precautions:

- ▶ Fittings are to be handled with care. Bite edge to be protected
- ▶ Do not use hand cutters. Edge of should be straight
- ▶ Fix pipes line with clamps.
- ▶ Non standard materials or tolerances lead to incorrect fittings.
- ▶ The tools & lubricants recommended by EO ensure safe assembly.

▶ Advantages:

- ▶ Sealing capability
- ▶ High pressure resistance
- ▶ Durability
- ▶ Bite control
- ▶ Assembly cost
- ▶ Integrated preassembly tool
- ▶ Reliability
- ▶ Make-up
- ▶ No phantom leaks

ADDITIONAL EQUIPMENT FOR HAND BRAKE

- ▶ Hand brake indicators 2 Nos (One on side of coach)
- ▶ Cheek valve 1 Nos. (In feed pipe)
- ▶ 6 Ltrs. Air cylinder- 1 Nos.
- ▶ Roller lover valve- 1 Nos.
- ▶ Activating flexible balls- 1 Nos.

ADDITIONAL EQUIPMENT FOR HAND BRAKE

▶ Pressure gauges- 3 Nos.

▶ FP

▶ BP

▶ BC

▶ Brake caliper units- 2 Nos.

(of different type suitable for hand brake flexible connections)

▶ Connecting part for flexible ball- 2 Nos.

Feature of axle mounted disc brake system with WSP (compared with conventional brake system)

- ▶ Less thick stainless steel pipes (Metric pipes).
 - ▶ No threads/Flange joints
 - Bite Type fittings used.
- ▶ No brake rigging
- ▶ Wheel slide protection unit
 - Take cares wheel flattening
 - Complete coach.
- ▶ Centralized control
- ▶ Braking on Axle mounted disc
 - No wheel wear due to braking.
- ▶ Brake accelerator
 - for sharp reduction of BP pressure in complete train set.
 - Ensures brake application time and release.
- ▶ DV with relay
 - Ease for maintenance.
- ▶ All Pipes below under frame
 - Improved design (Properly supported
- ▶ Release rod
 - RED means brake applied
 - Green means brake released
- ▶ Brake Indicators

PROBLEM & SOLUTIONS

Problems	Solutions
Required dry & dust free air to the air brake system	To be provide dryers in all power cars in case of EOG trains & SLRs in case of SG rake →
Leakage of pressure from palm ends at curves	Need design review →
Pipes of BP & FP crack at bends	→
BP & FP steel pipes after T-Joint being damage	Thickness of BP & FP steel pipe after T-Joints should increase 1.5 to 2.0 mm & isolating cock to be provide →
Shelling mark on the wheel tread	Tolerances in BC pressure are much higher to be reduce →
More nos. of PEASD in SG coaches are difficult to attend ACP	Need design review →

PROBLEM & SOLUTIONS

Problems	Solutions
Coach isolation by R-charger handle not possible in KE series DV	Required change the position of NRV 
Provision of new brake pads 35mm was not possible	Solved 
Changing of bk. Pad in SG coaches much difficult due to less space for spanners	Design to be reviewed or spl. size tools is required 
WSP of each brand operated by different set of pressure line	Pressure switches should be operated by BP pressure

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity
1	Function Test of Bk. Rigging	Regularly in every schedule
2	Air piped connection for air tightness	- do -
3	Air pipe & connection tightness with testing medium	Half yearly onward in all major schedules
4	Connecting pipe exchange	4 yearly
5	Check Brake rigging & brake pads for damage & foreign bodies	Regularly in every schedule
6	Check bk. Shoes & pads for wear	- do -

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity
7	Check play of Brake shoe in holder	Monthly and onwards in all major schedule
8	Check play between Brake pad & disc	Six monthly
9	Check for tightness of bogie fixing air brake components	- do -
10	Proper securing of all air pipes & connections	- do -
11	Check ease of movement in the brake rigging	Half yearly onward in all major schedules
12	Lubricate all bearing & articulating points	Monthly



SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity
13	Overhaul the brake unit	4 yearly
14	Visual check for wheel brake disc for fracture of cracks	Regularly
15	Check brake disc for external damage	Half yearly onward in all major schedules
16	Check wheel brake disc for fracture	Monthly & onwards in all schedules
17	Check air coolers, scoops etc. for foreign bodies	- do -
18	Check wear on bk. Disc check wear depth & take note of furrowing and only cracking/splintering	Yearly

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity
19	Check for proper tightness of bk. Disk & fixing	Annually & onwards in all schedules
20	Clean individual components, checking for damage & wear & replace if necessary	- do -
21	Check operation of passenger emergency brake	All schedules
22	Clean air filter & air line filter	Half yearly onwards in all major schedules
23	Air line filter replacement	Yearly
24	Safety valve check for correct function	Monthly



SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity
25	Safety valve overhaul	Yearly
26	Pressure switches overhaul	Yearly
27	Shut off taps overhaul	Yearly
28	Magnet valve overhaul	Yearly
29	Anti slip valve overhaul	Yearly
30	Pressure regular overhaul	Yearly
31	Drain air tanks	6 Months



SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity	Actual
1	Function Test of Bk. Rigging	Regularly in every schedule	Daily
2	Air piped connection for air tightness	- do -	Daily
3	Air pipe & connection tightness with testing medium	Half yearly onward in all major schedules	Not carried out in open line
4	Connecting pipe exchange	4 yearly	- do -
5	Check Brake rigging & brake pads for damage & foreign bodies	Regularly in every schedule	Daily
6	Check bk. Shoes & pads for wear	- do -	Daily

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity	Actual
7	Check play of Brake shoe in holder	Monthly and onwards in all major schedule	Not carried out (detailed procedure required)
8	Check play between Brake pad & disc	Six monthly	Only visual examination
9	Check for tightness of bogie fixing air brake components	- do -	Daily
10	Proper securing of all air pipes & connections	- do -	Daily
11	Check ease of movement in the brake rigging	Half yearly onward in all major schedules	Being done
12	Lubricate all bearing & articulating points	Monthly	Lubricant not prescribed

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity	Actual
13	Overhaul the brake unit	4 yearly	After 2 yrs. Brake caliber jamming has been reported
14	Visual check for wheel brake disc for fracture of cracks	Regularly	Daily
15	Check brake disc for external damage	Half yearly onward in all major schedules	Weekly (only visual)
16	Check wheel brake disc for fracture	Monthly & onwards in all schedules	Only daily visual examination with naked eyes
17	Check air coolers, scoops etc. for foreign bodies	- do -	Weekly
18	Check wear on bk. Disc check wear depth & take note of furrowing and only cracking/splintering	Yearly	Shop item

SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity	Actual
19	Check for proper tightness of bk. Disk & fixing	Annually & onwards in all schedules	Only visual examination daily (detailed procedure required)
20	Clean individual components, checking for damage & wear & replace if necessary	- do -	Visual check carried out daily
21	Check operation of passenger emergency brake	All schedules	Daily
22	Clean air filter & air line filter	Half yearly onwards in all major schedules	Monthly
23	Air line filter replacement	Yearly	Not being replaced
24	Safety valve check for correct function	Monthly	Being checked daily

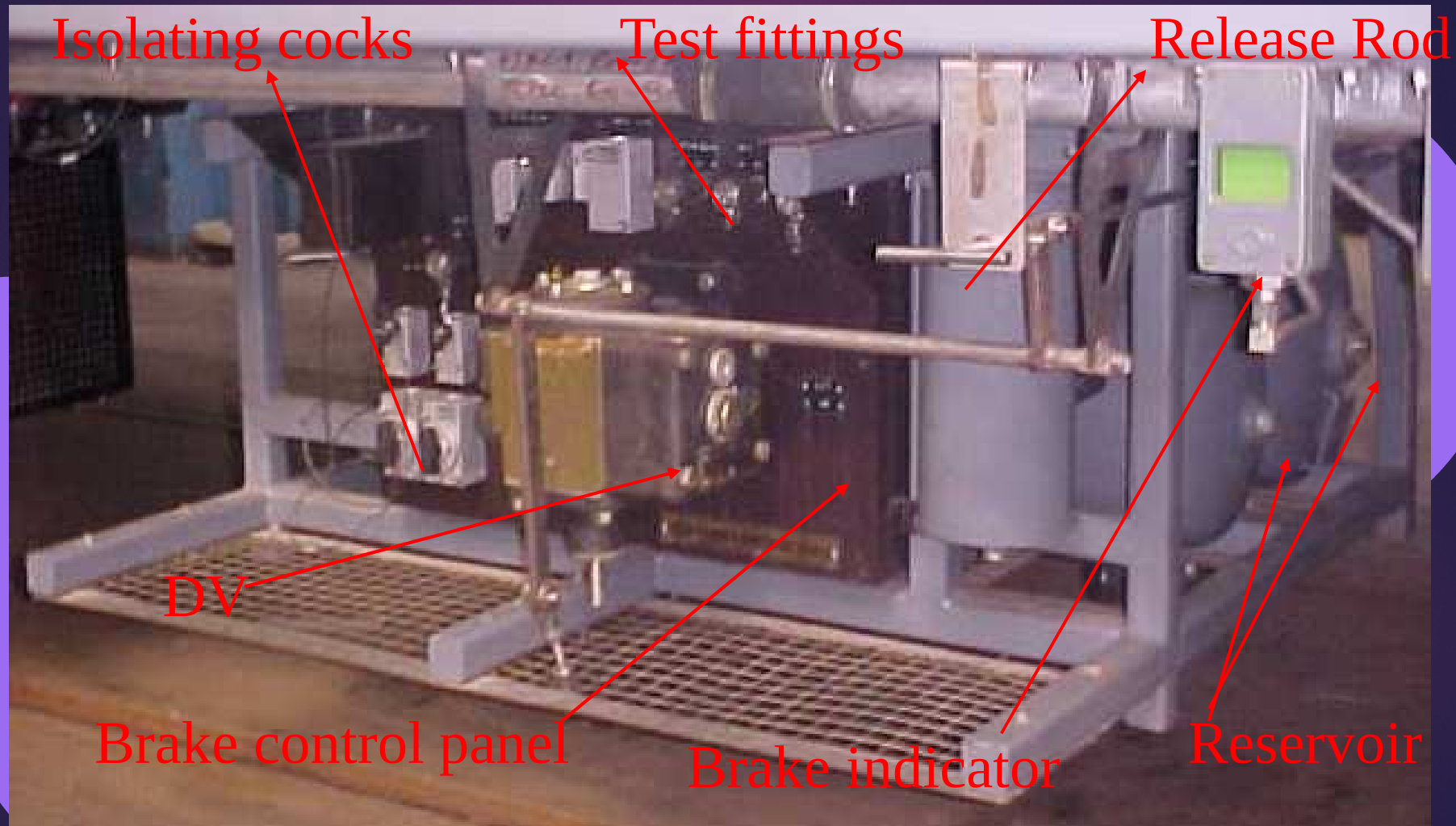


SCHEDULE OF MAINTENANCE

S.No.	Item	Prescribed periodicity	Actual
25	Safety valve overhaul	Yearly	Not being done
26	Pressure switches overhaul	Yearly	Not being done
27	Shut off taps overhaul	Yearly	Not being done
28	Magnet valve overhaul	Yearly	Not being done
29	Anti slip valve overhaul	Yearly	Not being done
30	Pressure regular overhaul	Yearly	Not being done
31	Drain air tanks	6 Months	Monthly

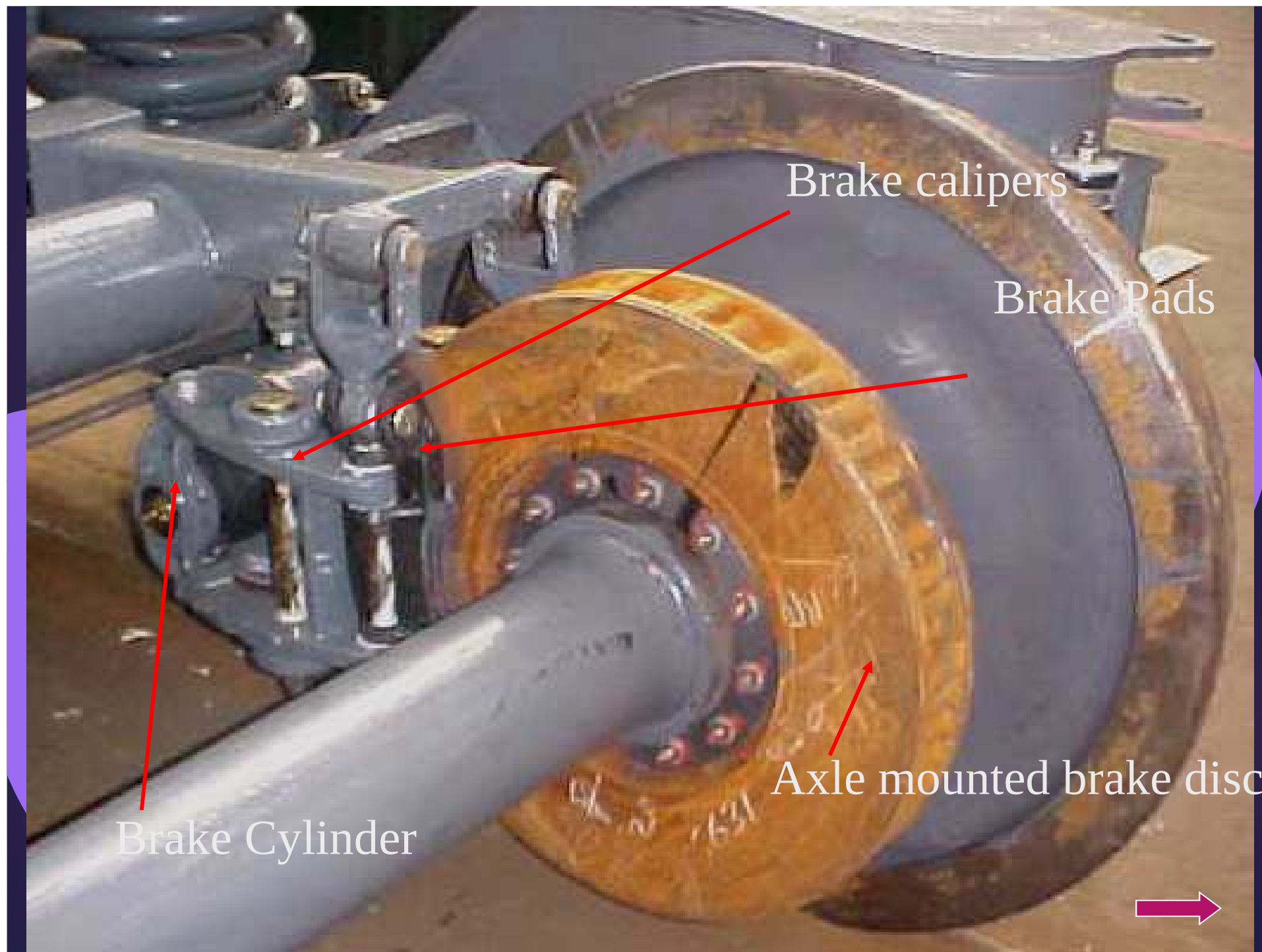


BRAKE CONTROL PANEL AND INDICATOR UNIT



SAB WABCO CONTROL PANEL





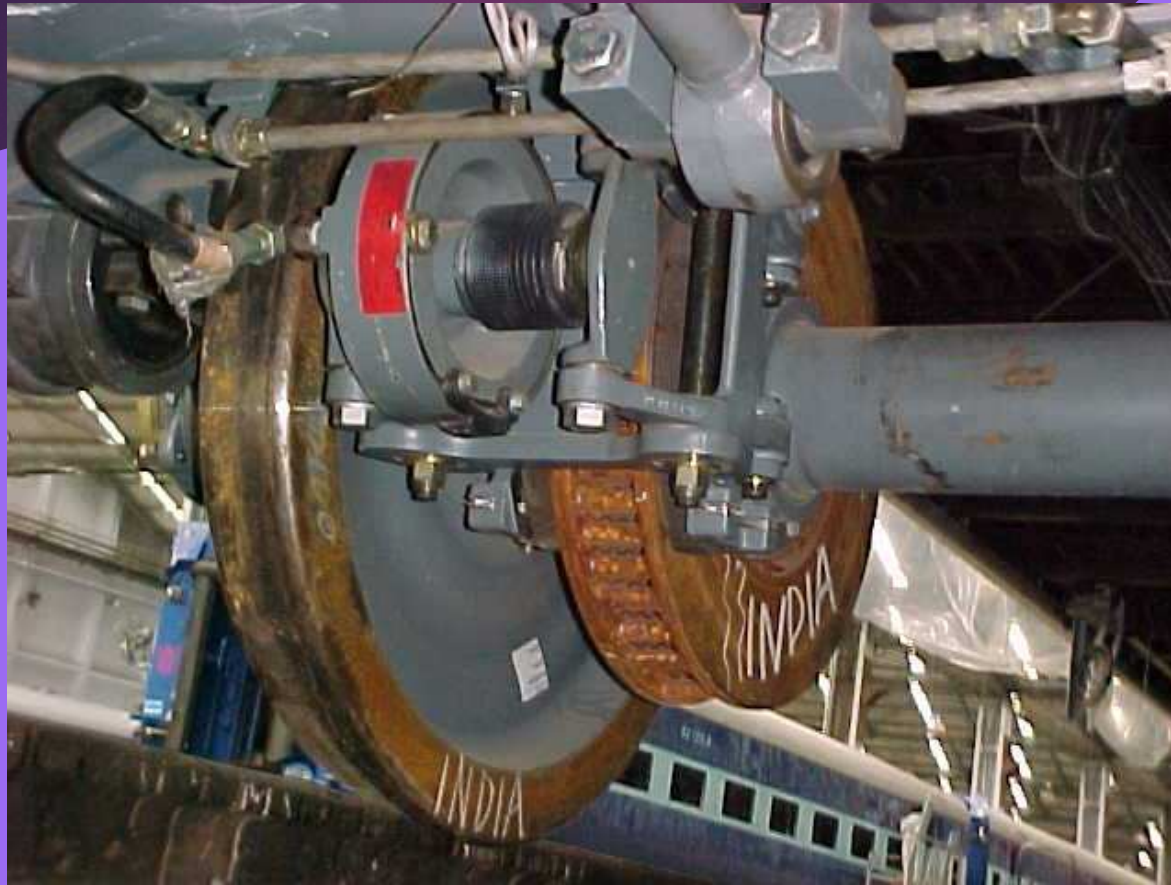
Brake calipers

Brake Pads

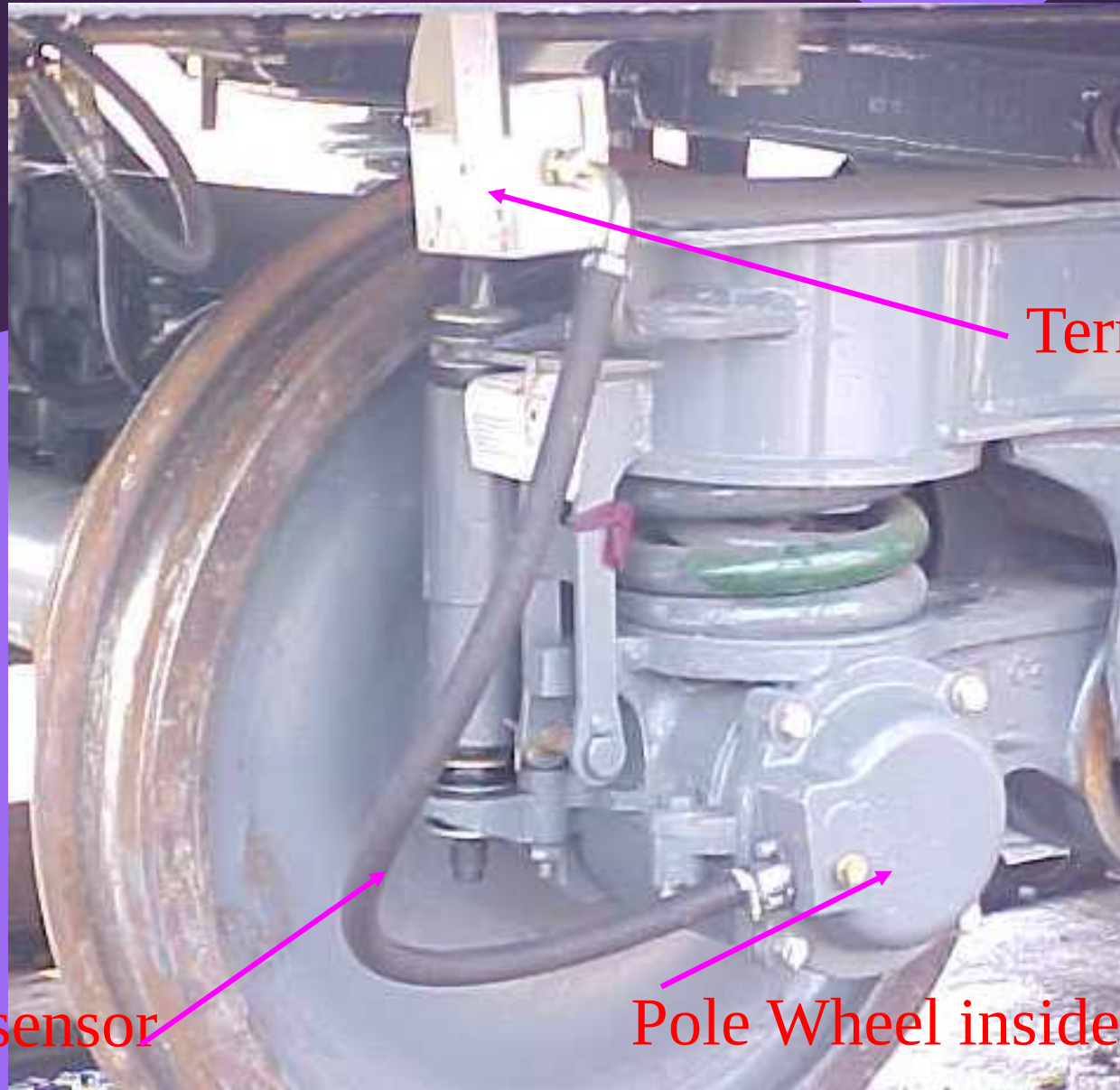
Axle mounted brake disc

Brake Cylinder

BRAKE CYLINDER AND CALIPERS



SPEED SENSOR CABLE WITH TERMINAL BOX



Terminal Box

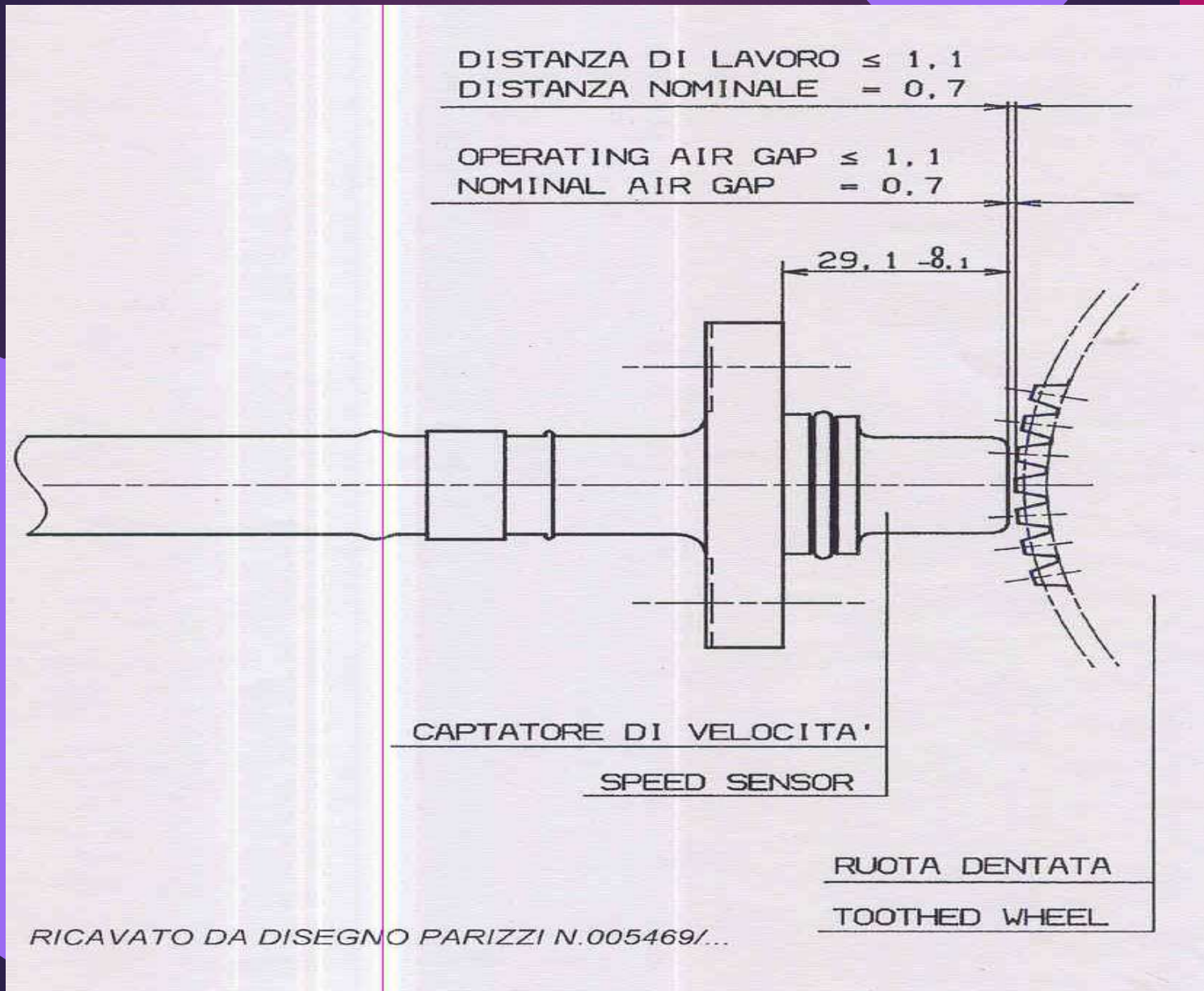
Cable sensor

Pole Wheel inside the cover

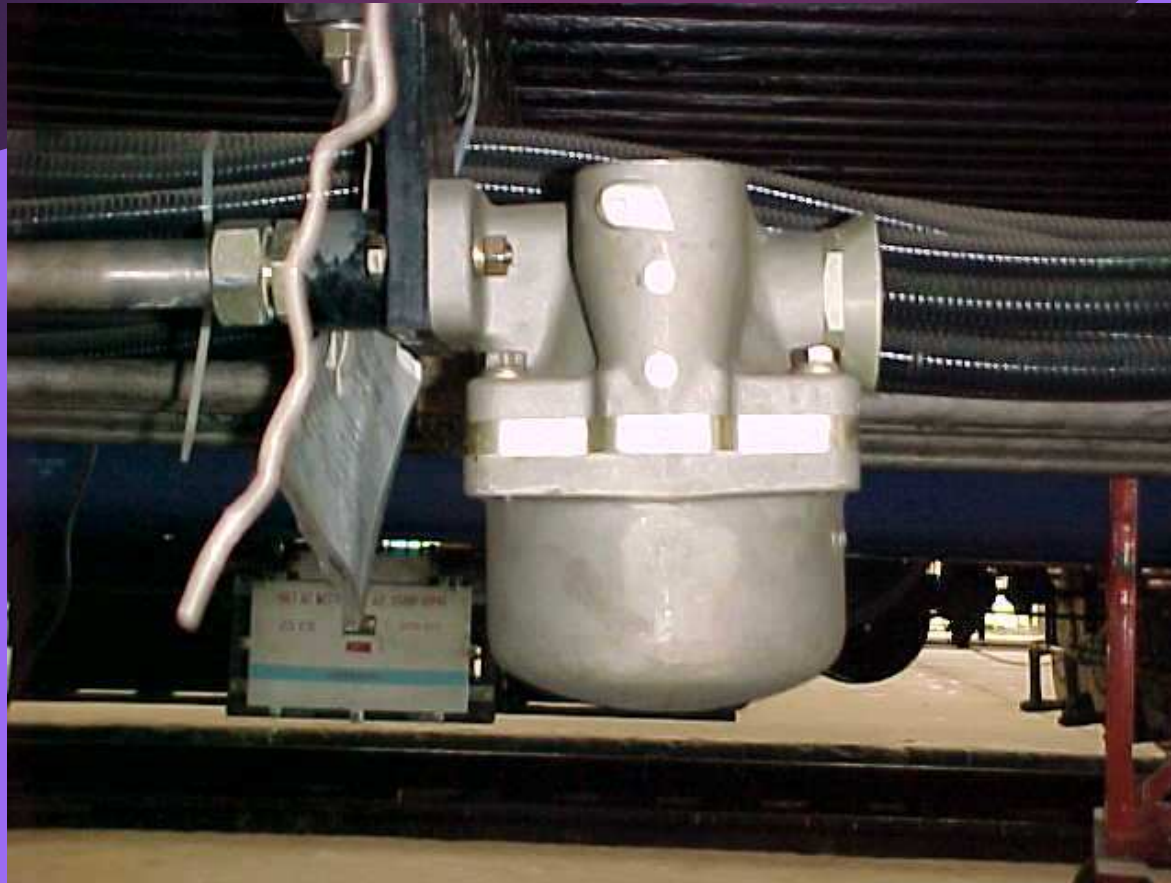
EMERGENCY PULL BOX



Speed sensor with Pole wheel



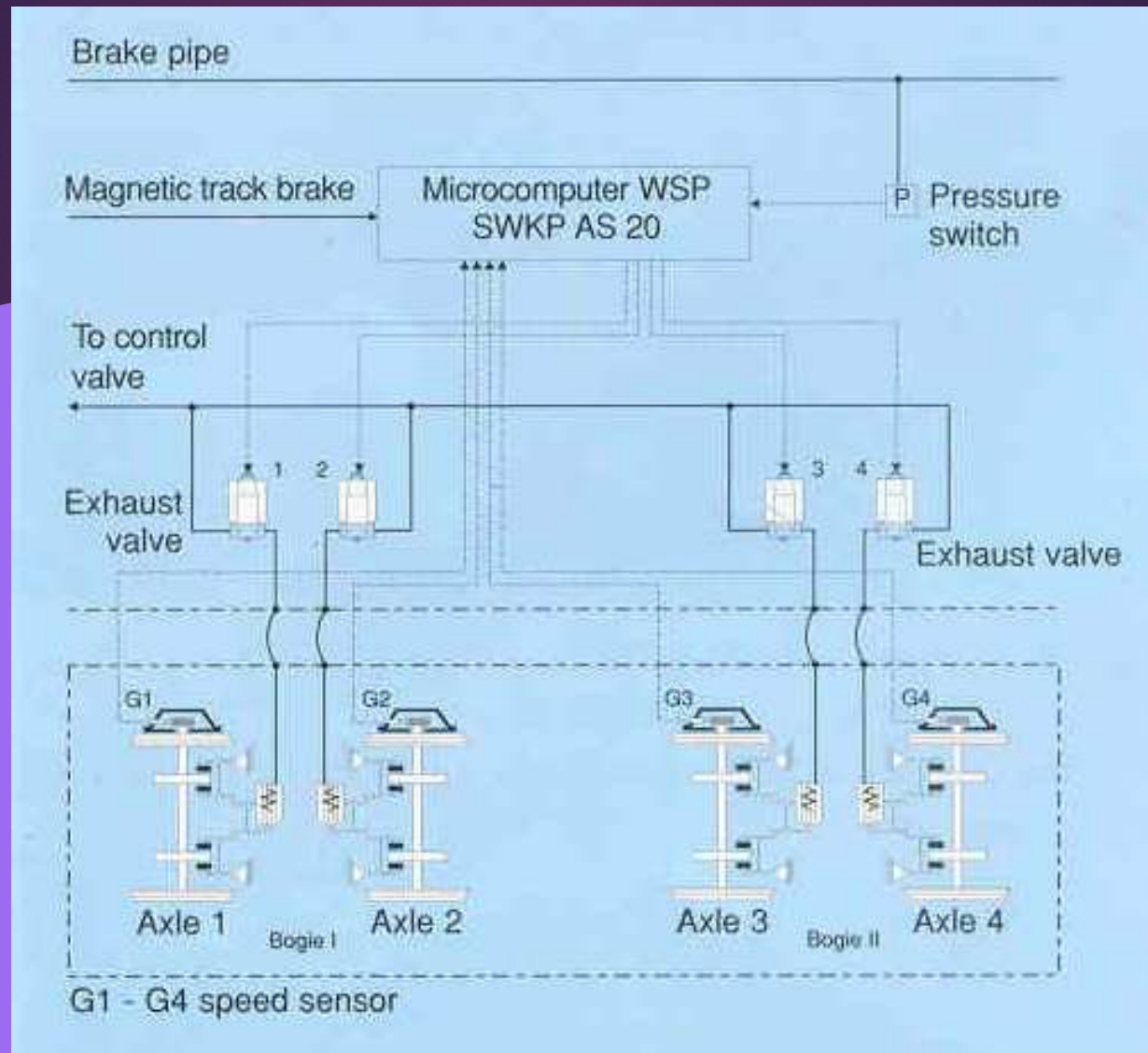
BRAKE ACCELERATOR



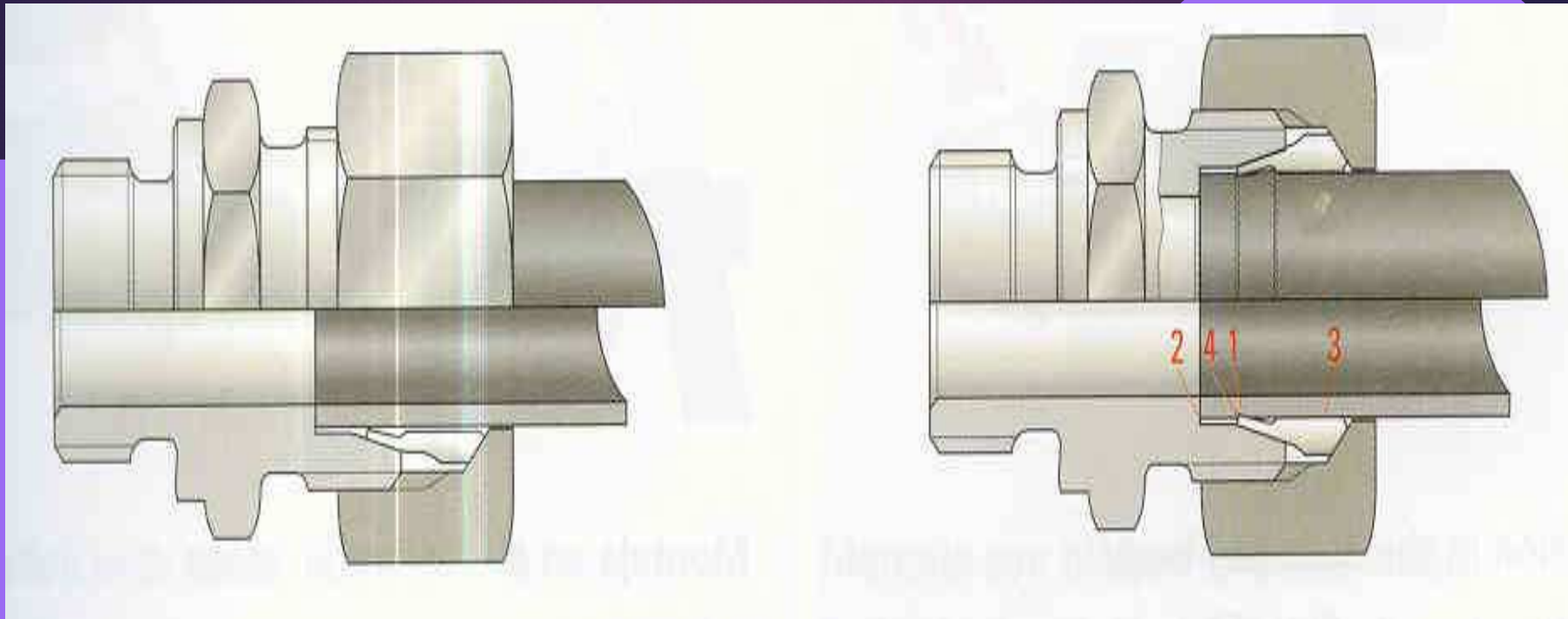
WSP ELECTRONIC UNIT



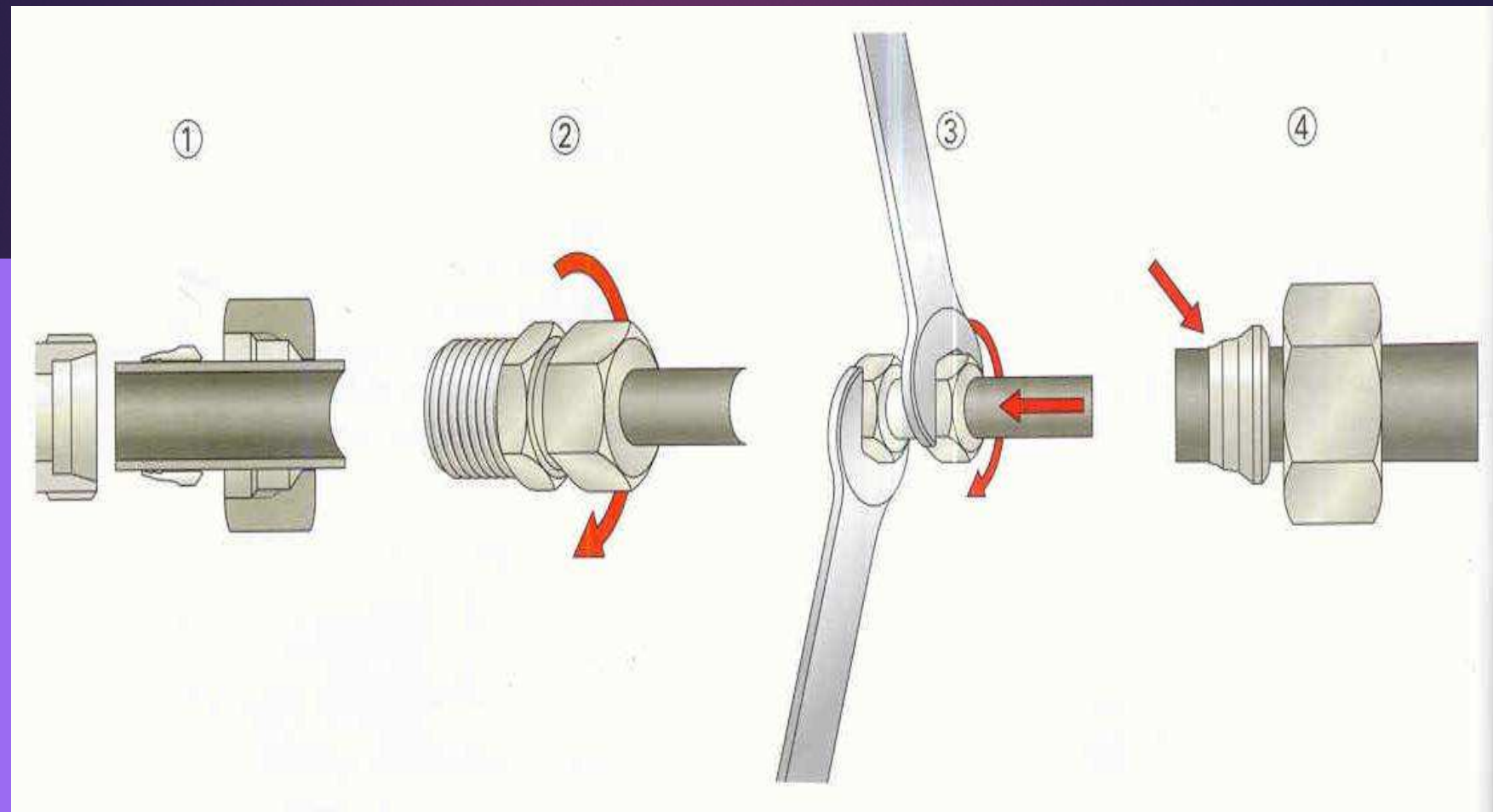
Principle of Antiskid System



PRINCIPLE OF BITYE TYPE FITTING



Tightening of the bite fitting



Electro valve-Pneumatic discharge assembly

