Alberta LEARNING

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LETHBRIDGE COMMUNITY COLLEGE

Medicine Hat College

NAIT THE NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY

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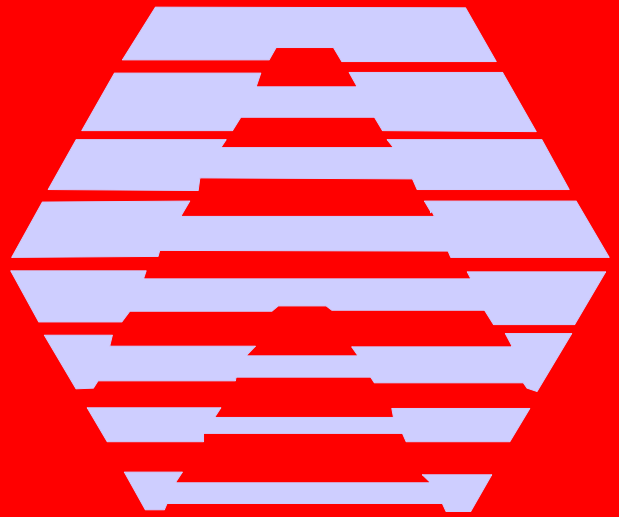
Red Deer College

SAIT Building Careers Building Business

Heavy Equipment Technician

Air Brakes System Mechanical Components



First Period

Module # 190108b

Objective One:

- Explain the operating principles of a typical cam-operated foundation brake.

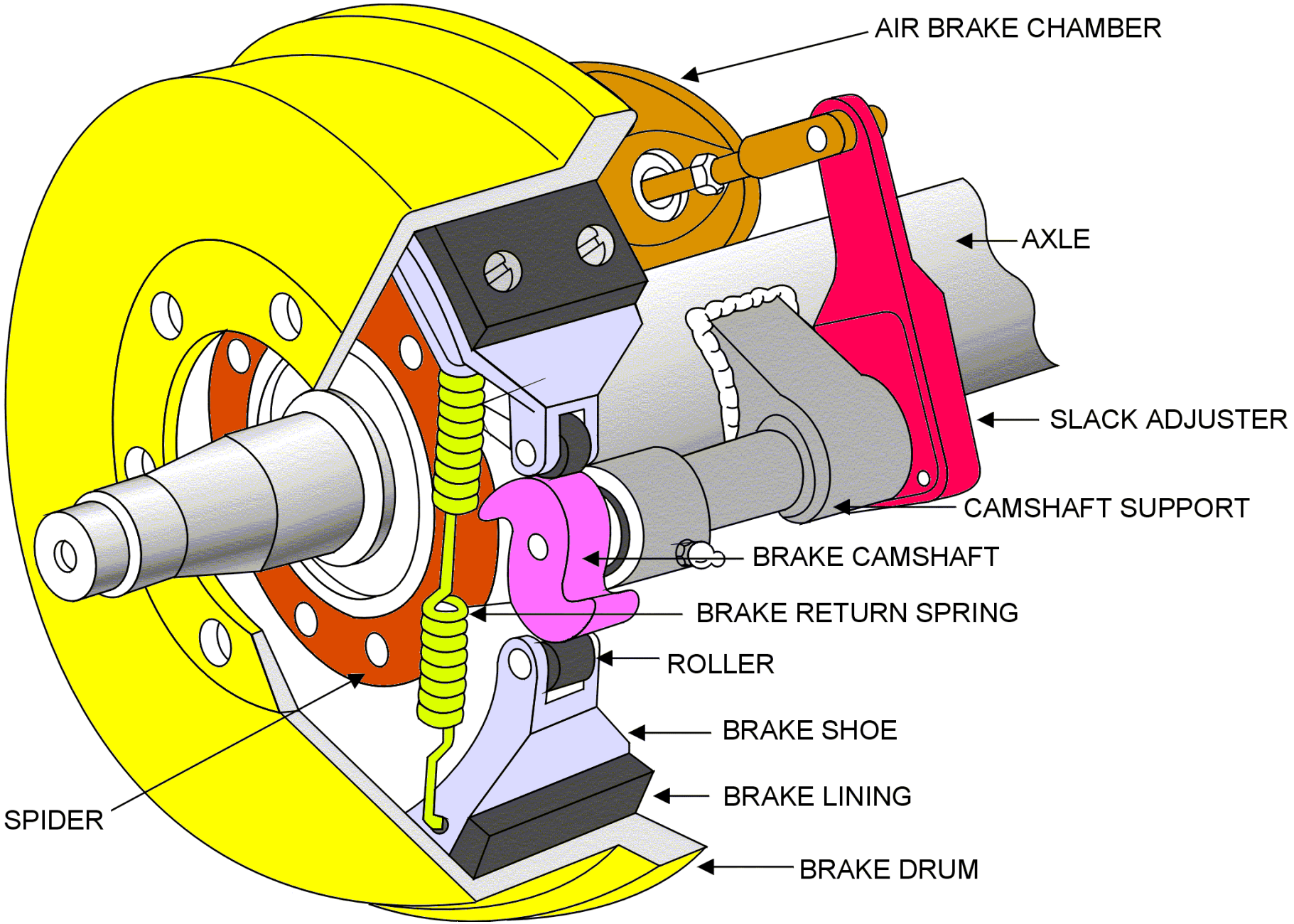

AIR BRAKE CHAMBER
AXLE
SLACK ADJUSTER
CAMSHAFT SUPPORT
BRAKE CAMSHAFT
BRAKE RETURN SPRING
ROLLER
BRAKE SHOE
BRAKE LINING
BRAKE DRUM
SPIDER

Figure 2

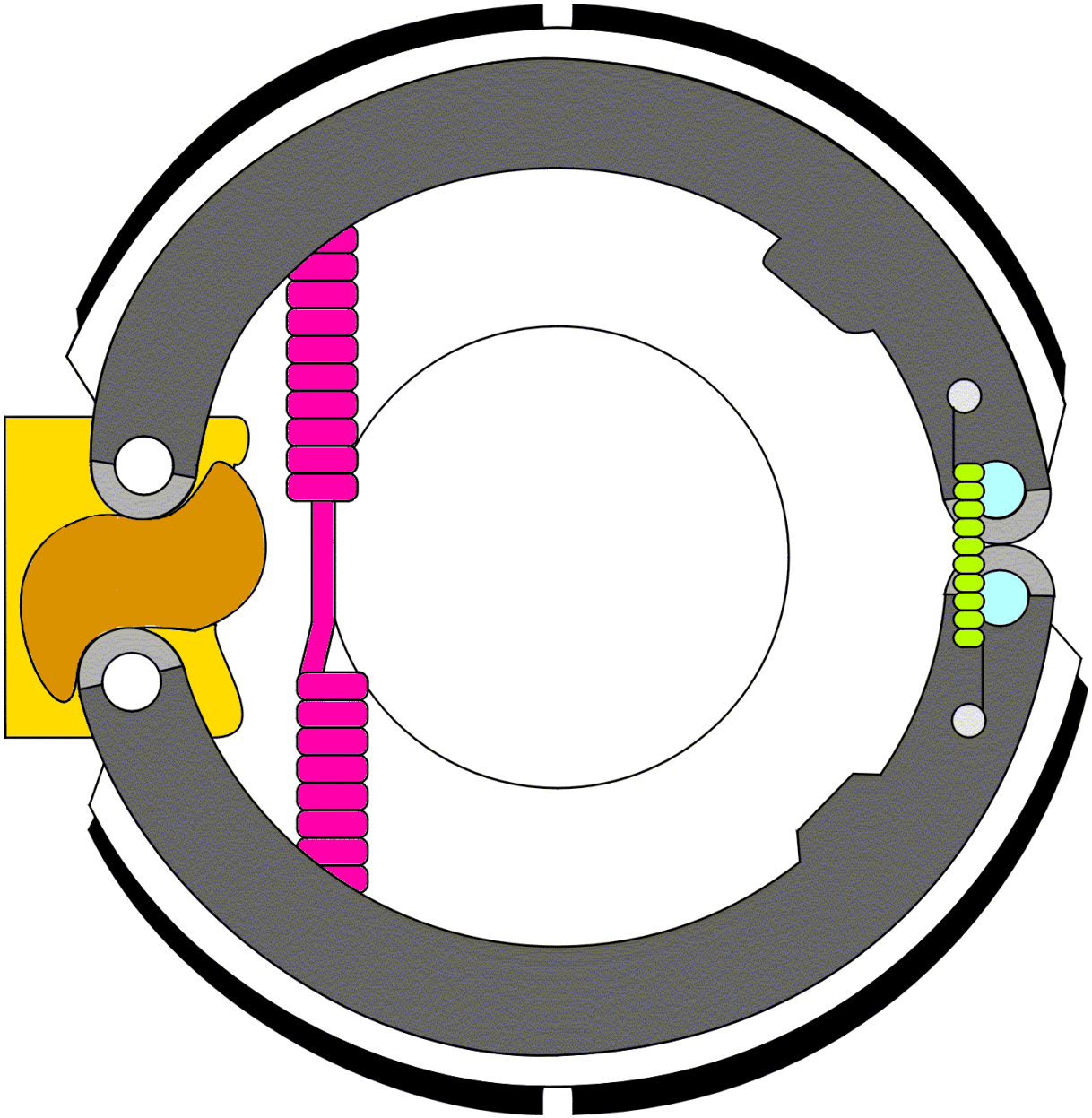


Figure 3 - Cam-operated foundation brake pertain - brake released.

Brakes Released

- No air pressure in service brake chamber.
- Service brake chamber push rod retracted by spring pressure.
- Brake shoes held in the released position by spring pressure.
- Shortest push rod travel without the brakes dragging.

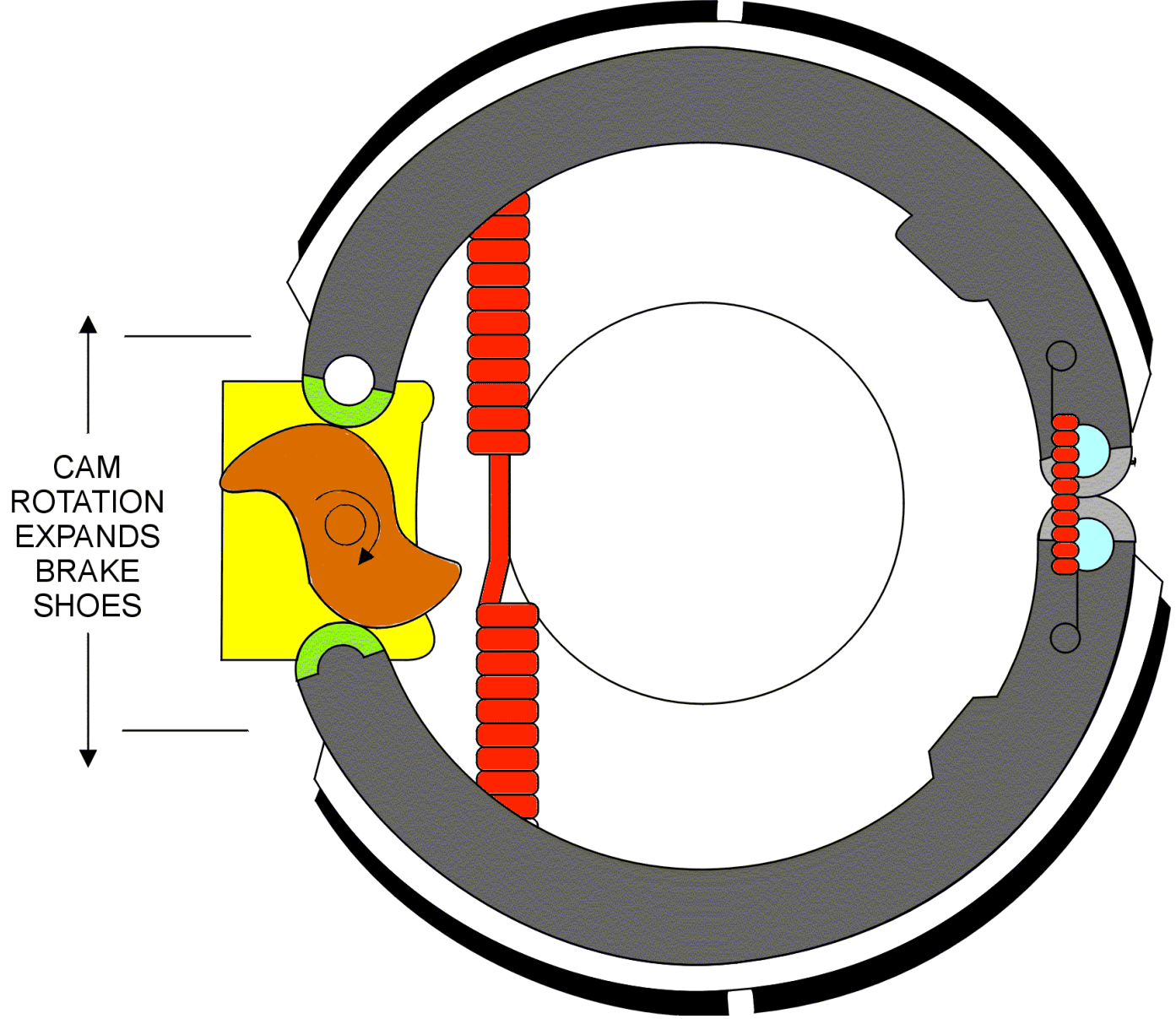


Figure 4 - Cam-operated foundation brake operation - brake applied.

Brakes Applied

- Air pressure applied to service brake pot.
- Push rod extends.
- S-cam rotates and forces brake shoes against drum.
- Air pressure applied controls braking effort.
- Torque created by friction between linings and drums is transferred through the brake spider and axle assemblies to the vehicle frame.

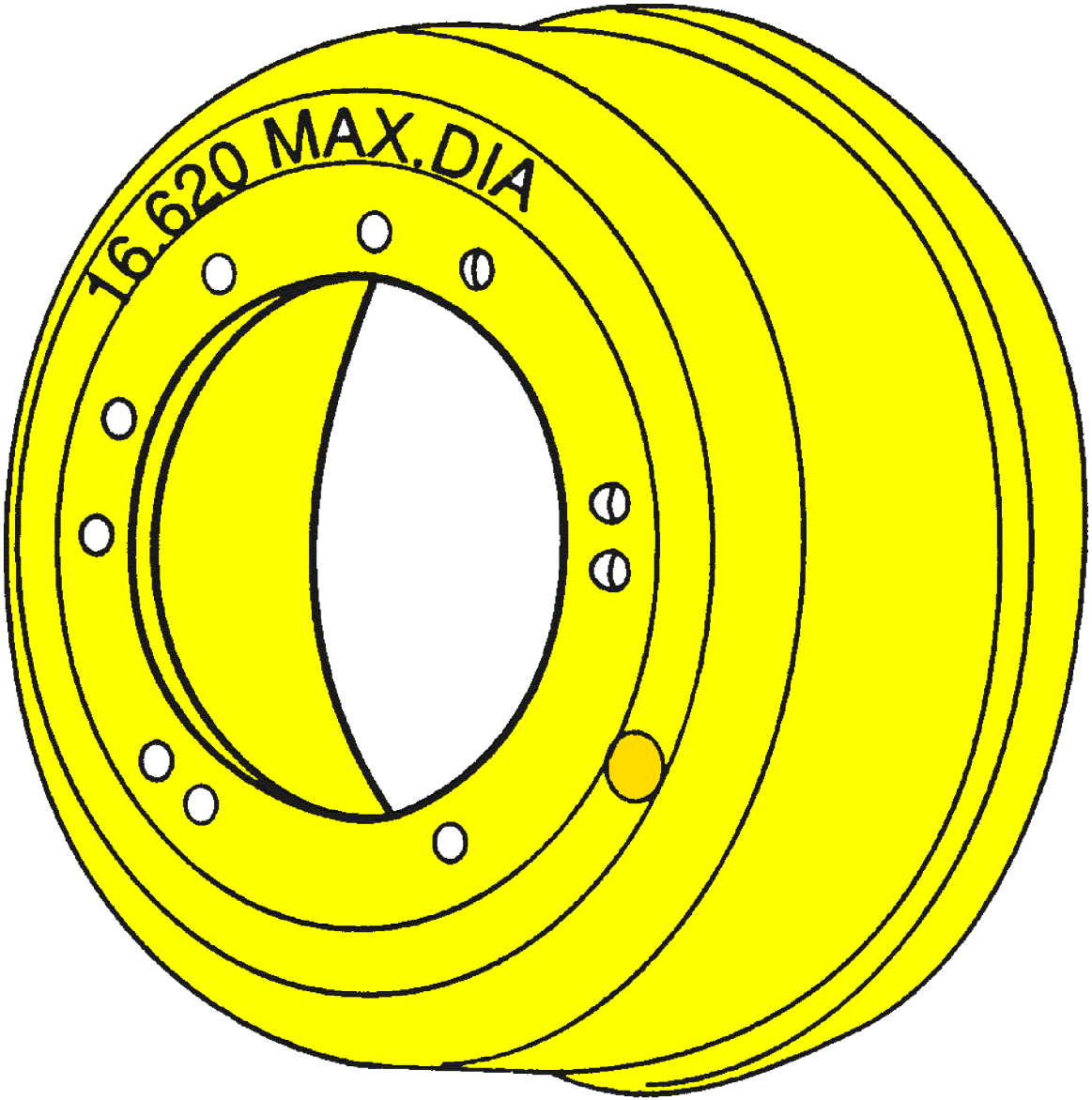


Figure 5 - Brake drum.

Brake Drum

- Provides a frictional surface.
- Inboard or outboard applications.
- Are balanced when manufactured.
- Are heat sinks → absorb heat generated during a brake application → thinner drums cannot absorb or dissipate as much heat and are more prone to brake fade.
- Maximum diameter stamped on drum (wear diameter not machined diameter) replace if exceeded.

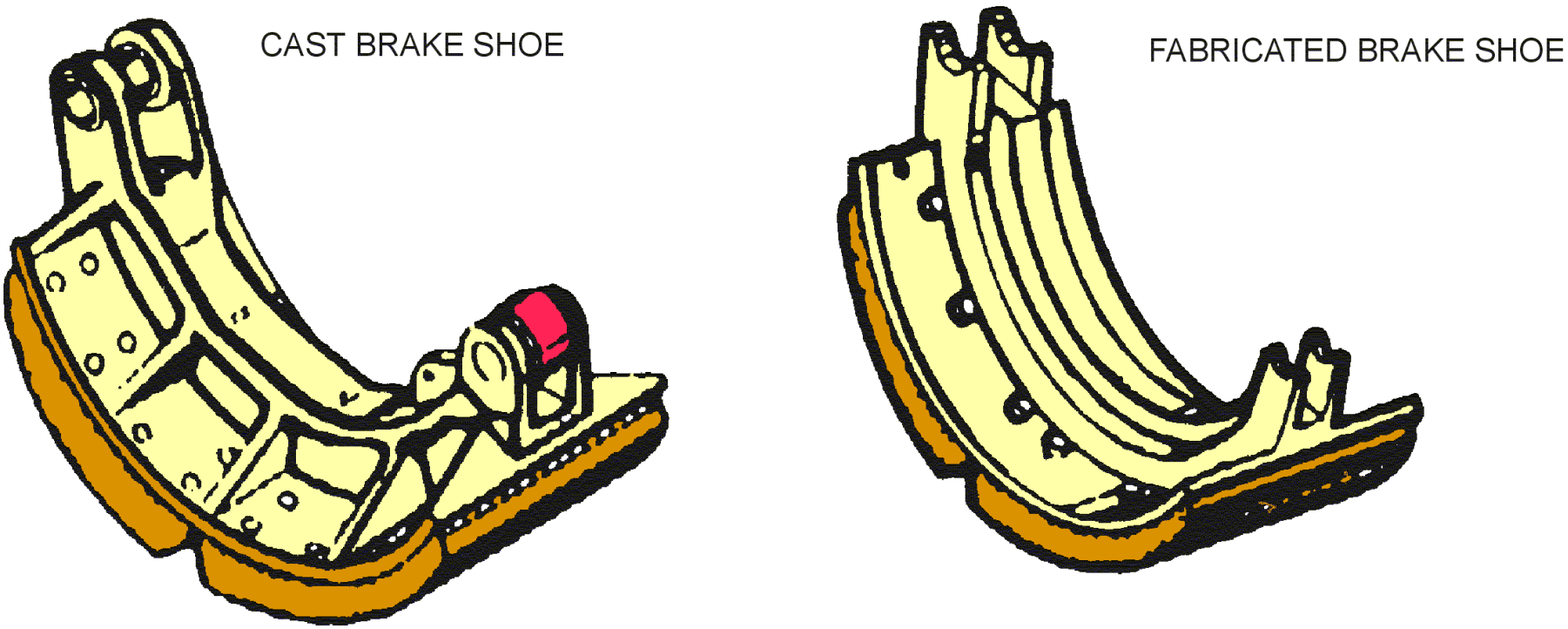


Figure 6 - Brake shoe types.

Brake Shoes

- Cast or fabricated types.
- P, Q, or T types.
- Are non-servo type brakes.
- Brake shoes are either primary (forward acting) or secondary (reverse acting).
- Avoid breathing brake dust $\rightarrow$ asbestos.

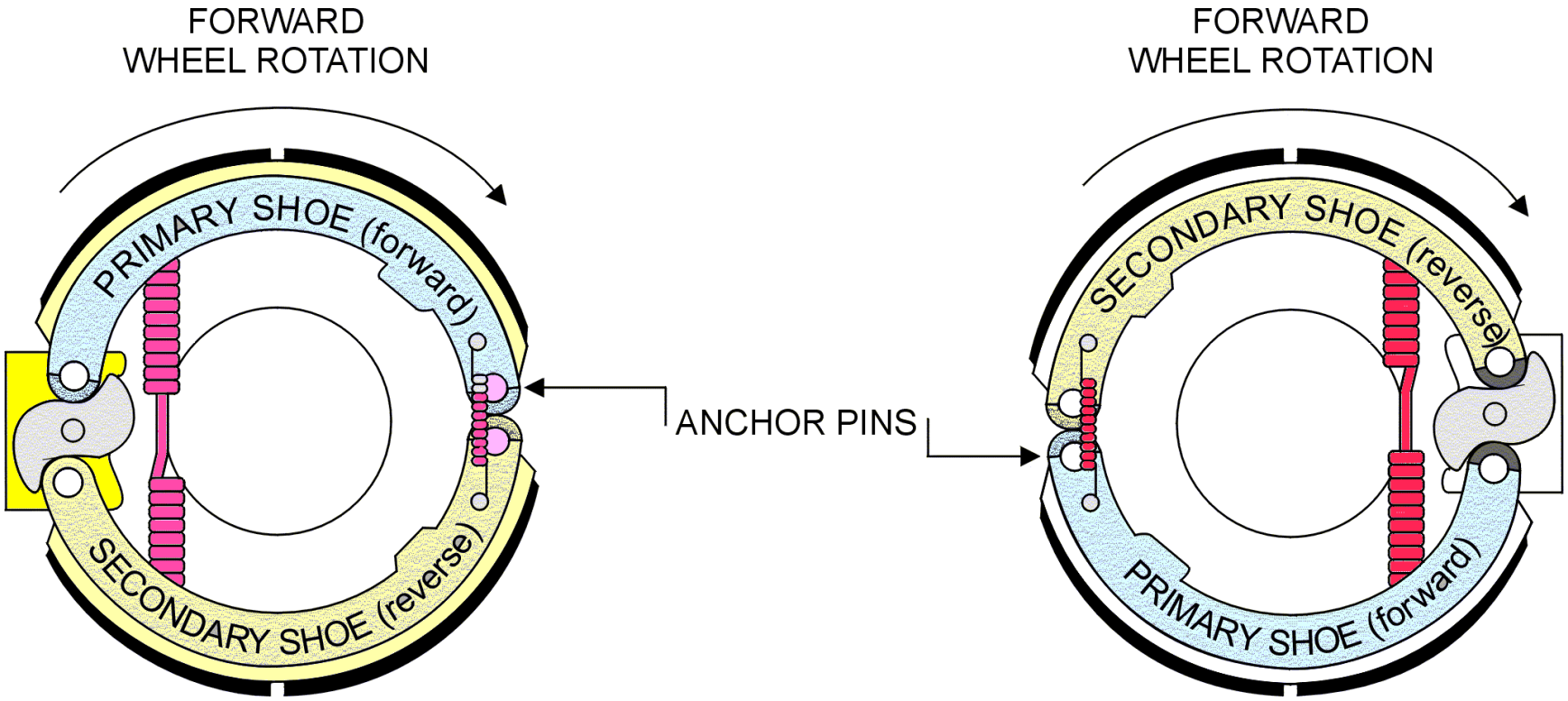
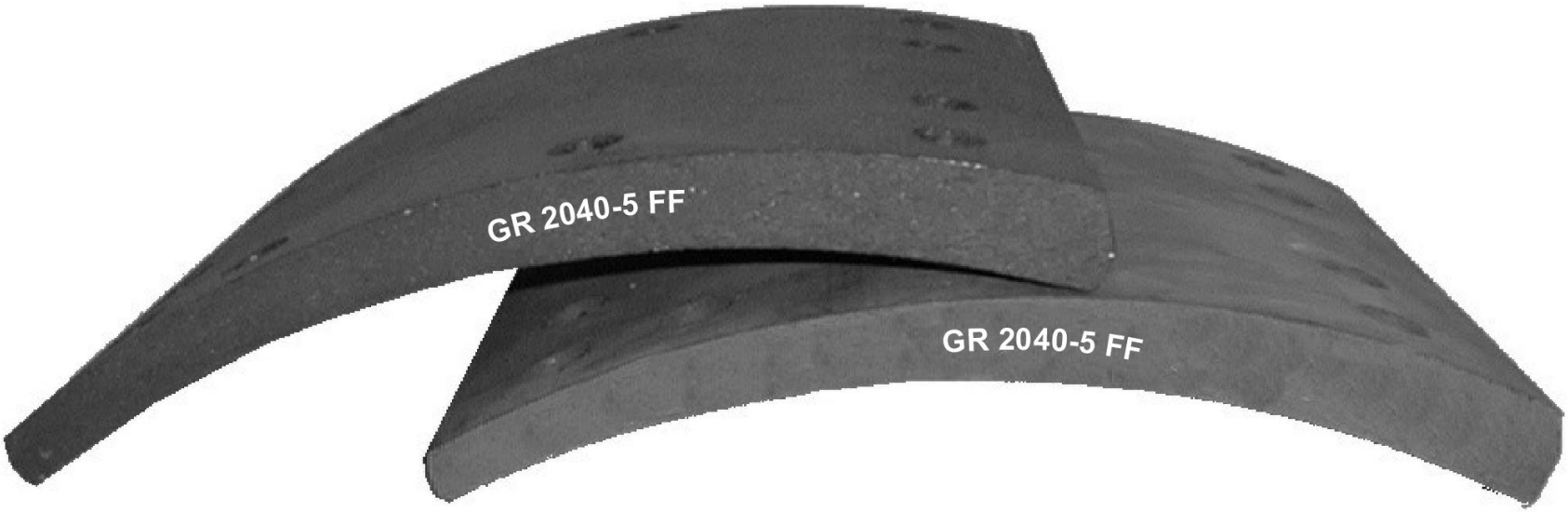


Figure 7 - Primary and secondary brake shoe location.

Brake Lining Identification

- Identified by edge code.
- Brake lining manufactured with different coefficients of friction.
- Friction code indicated by two letters → first letter for normal temperature → second letter for hot temperature.
- Is extremely important that replacement brake linings meet OEM specs or stopping distances can increase → brake fade.



Code Letter	Friction Material
C	Not over 0.15
D	Over 0.15 but not over 0.25
E	Over 0.25 but not over 0.35
F	Over 0.35 but not over 0.45
G	Over 0.45 but not over 0.55
H	Over 0.55

Friction Rating	FF
Material	Nonasbestos
Specific Gravity	1.92
Recommended Service	Normal
GAWR (1000 lb)	20 to 23
Suitable for Tractors	Yes
Suitable for Trailers	Yes
Suitable for Straight Truck	Yes

Figure 9 - Brake lining specifications.

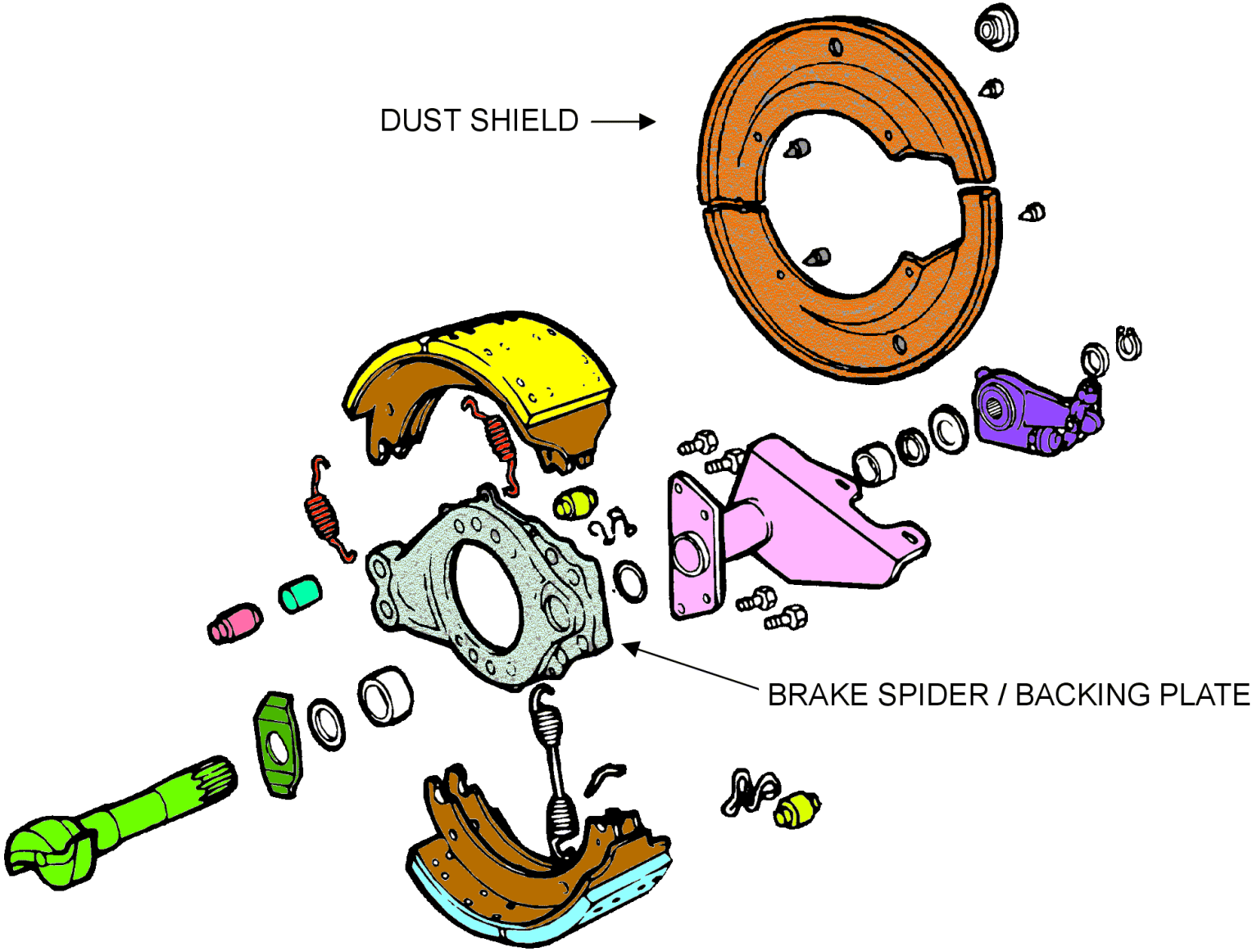


Figure 10 - Brake spider and backing plates.

Brake Spider and Dust Shield

- Spider is either bolted or welded to axle.
- Brake shoes are mounted on the spider.
- Spider must have sufficient strength to withstand the tremendous torque generated during braking.
- Dust shield used to prevent the entry of dust or other contaminants in normal operating conditions $\rightarrow$ may be remove in severe operating conditions.

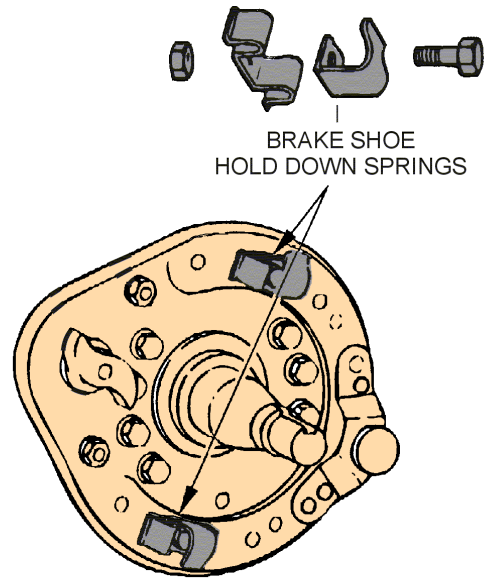
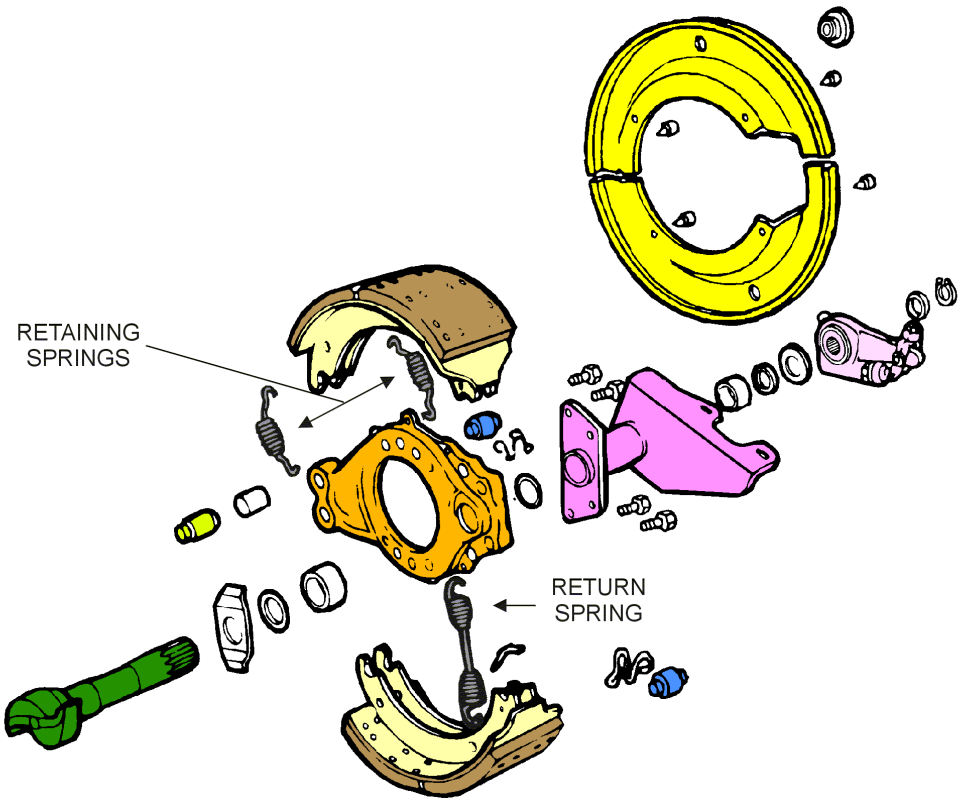


Figure 11 - Brake springs.



Brake Shoe Springs

- Are usually color-coded to ensure they are used in the proper application.
- Hold brake shoes against spider and s-cam.
- Replace springs when doing a brake job.

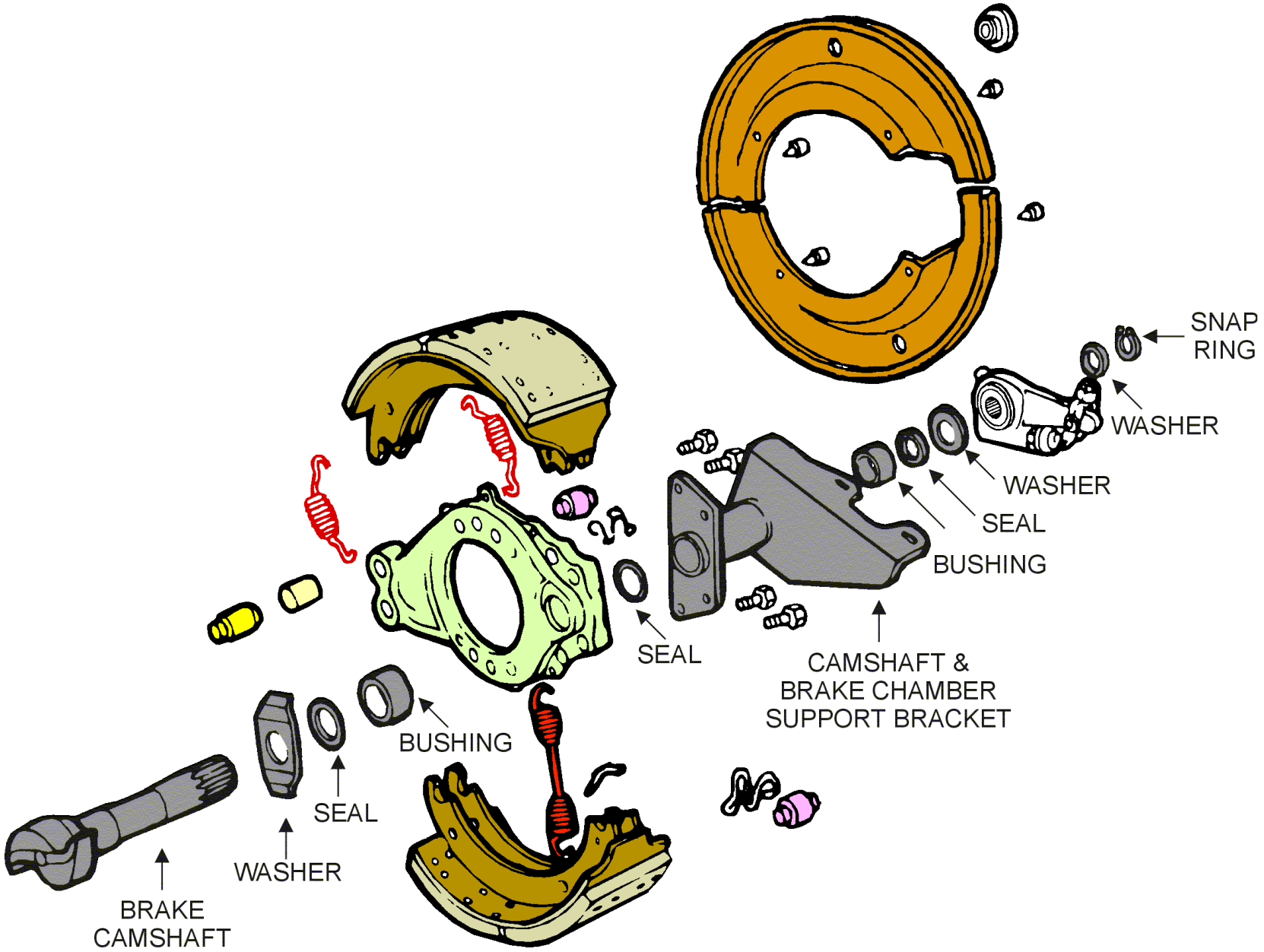


Figure 12 - Brake camshaft and support brackets.

Brake Cam Contours

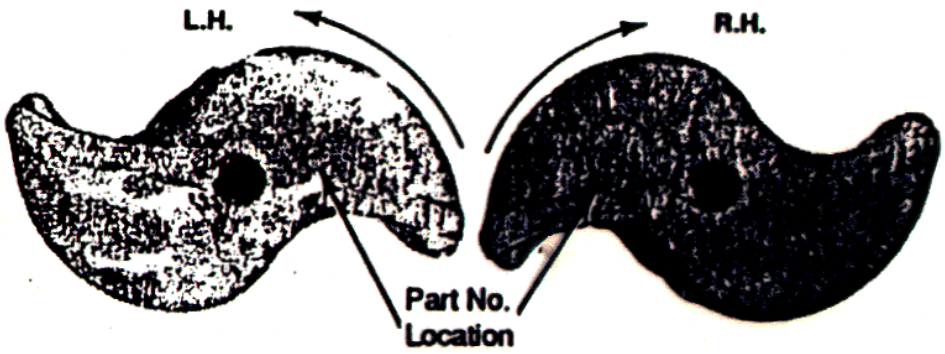
- S-cam applies brakes faster.
- Flat cam used on steering axle.

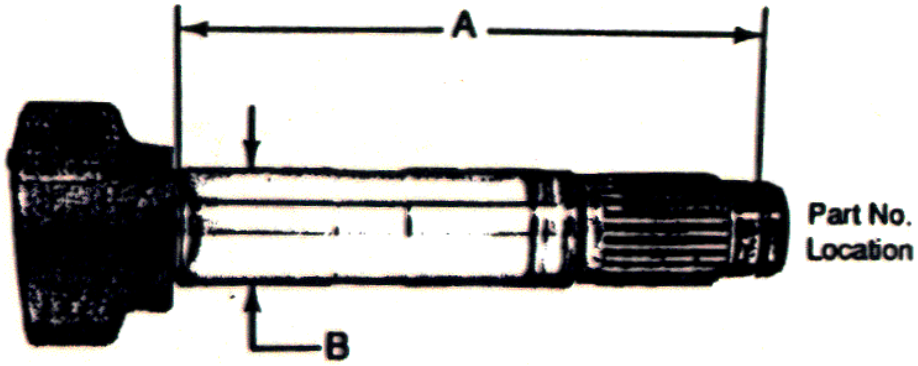
S-CAMSHAFT

FLAT CAMSHAFT

"S" HEAD CAMSHAFTS
1-1/2" - 28 (CONTINUED)

View from head end





NOTE: LH and RH indicates only the direction of cam rotation; **NOT** which side of the vehicle the cam is used on. (LH = Counterclockwise) (RH = Clockwise)

NOTE: Dimension shown is from shoulder of camhead to far edge of lock ring groove.

NOTE: Letter "S" after part number indicates that washers and a retaining ring are included.

Brake Camshaft Rotation

- Must be proper rotation for mounting application.
- “S” built for left hand rotation.
- “Z” built for right hand rotation.

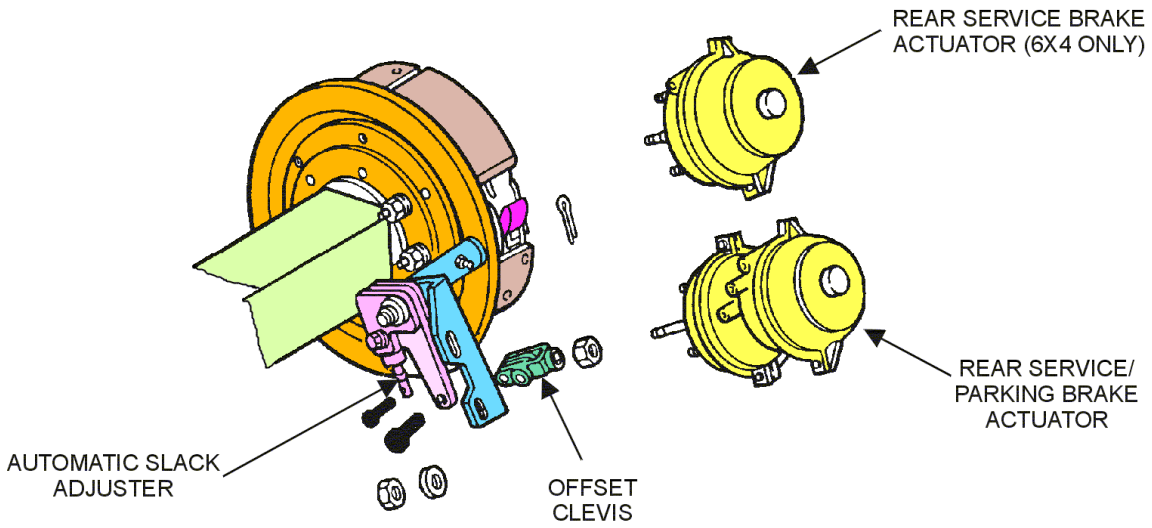
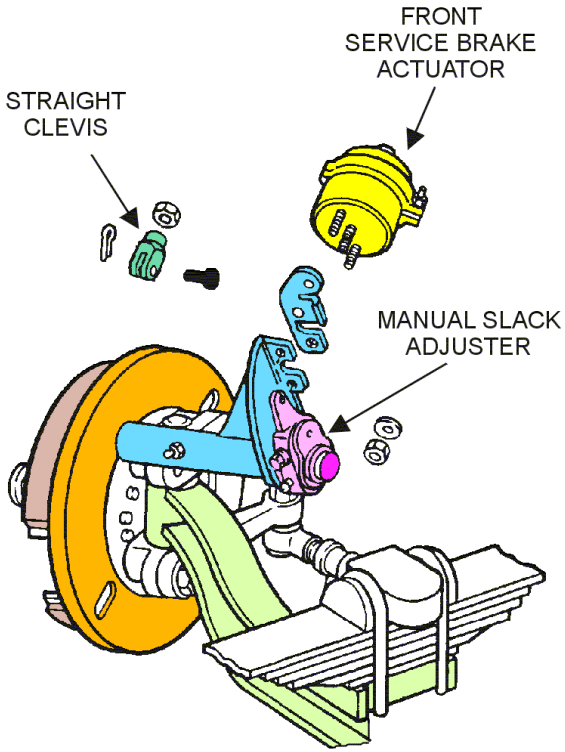


Figure 14 - Slack adjusters - types and mounting location.



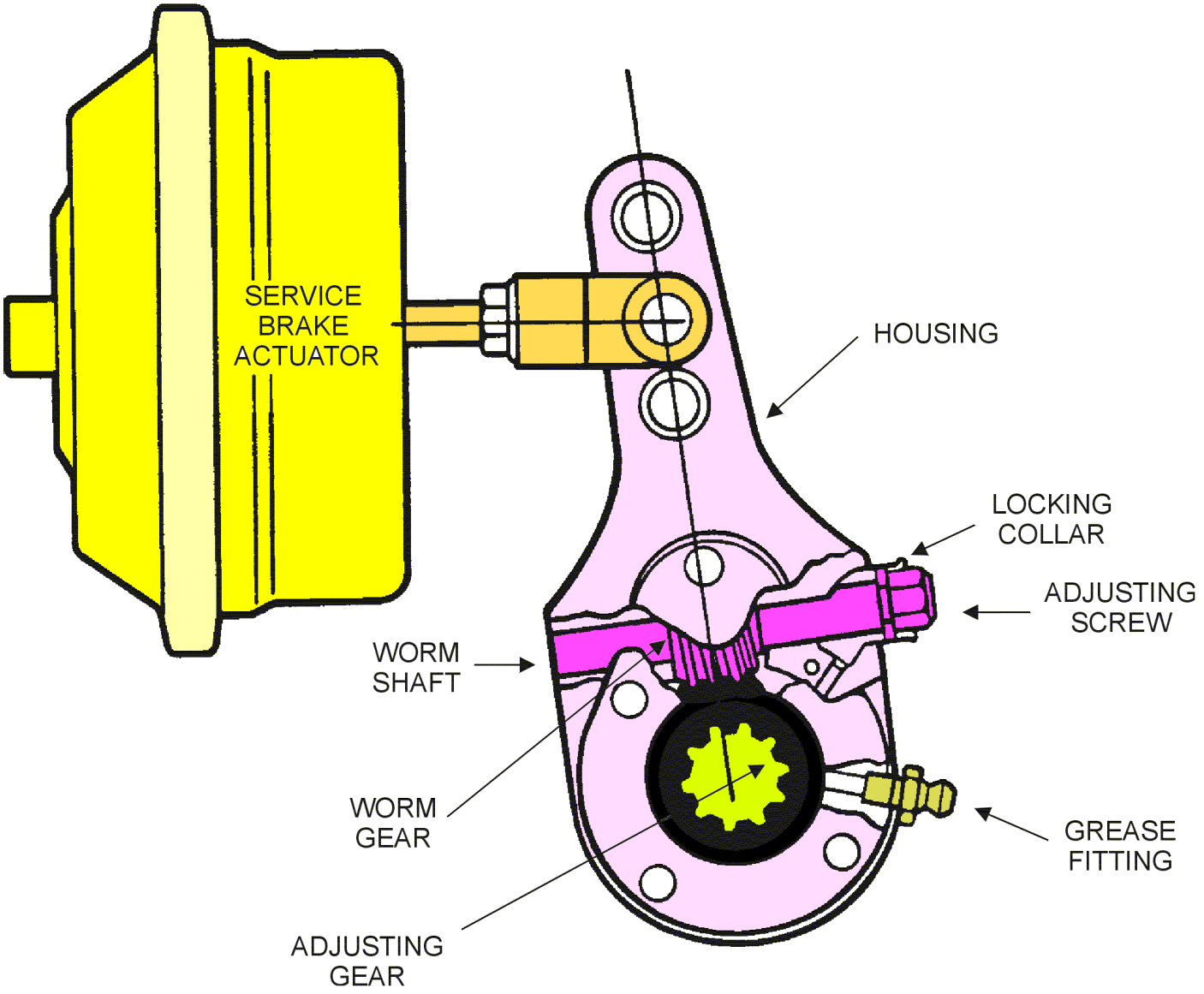
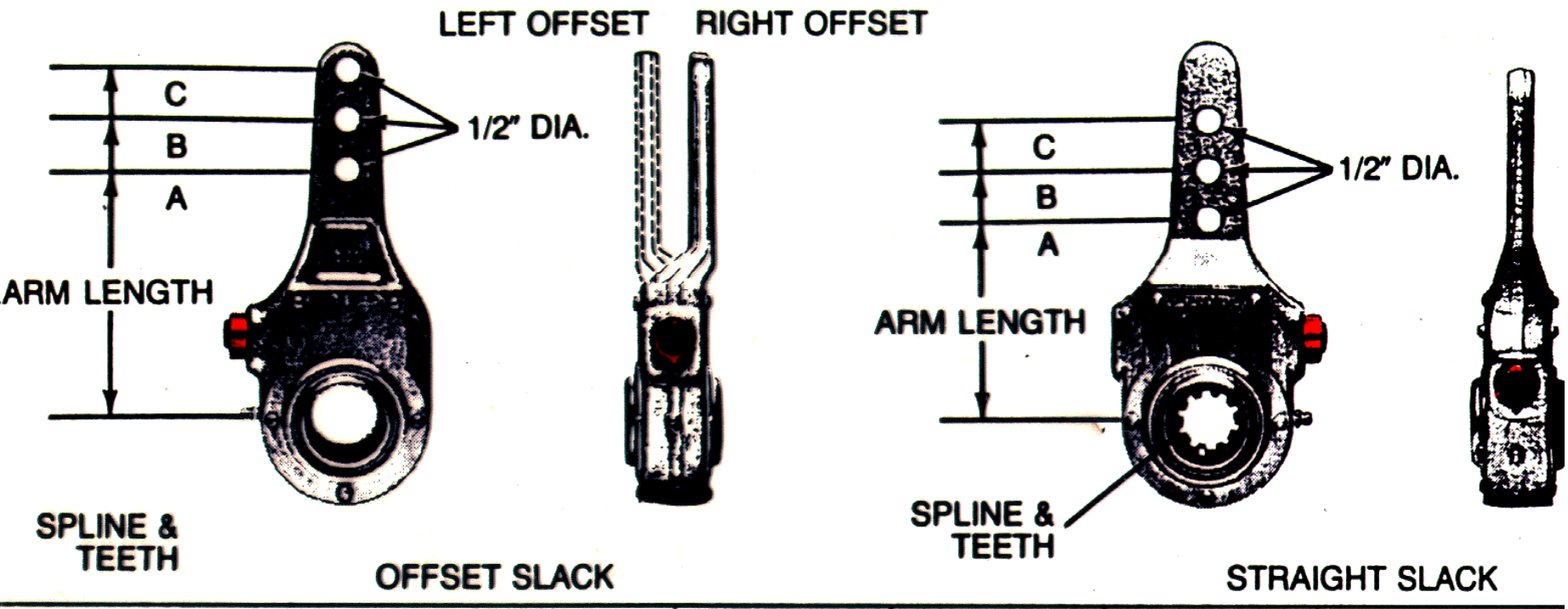

SERVICE
BRAKE
ACTUATOR
HOUSING
LOCKING
COLLAR
ADJUSTING
SCREW
WORM
SHAFT
WORM
GEAR
GREASE
FITTING
ADJUSTING
GEAR

Figure 15

MANUAL SLACK ADJUSTERS



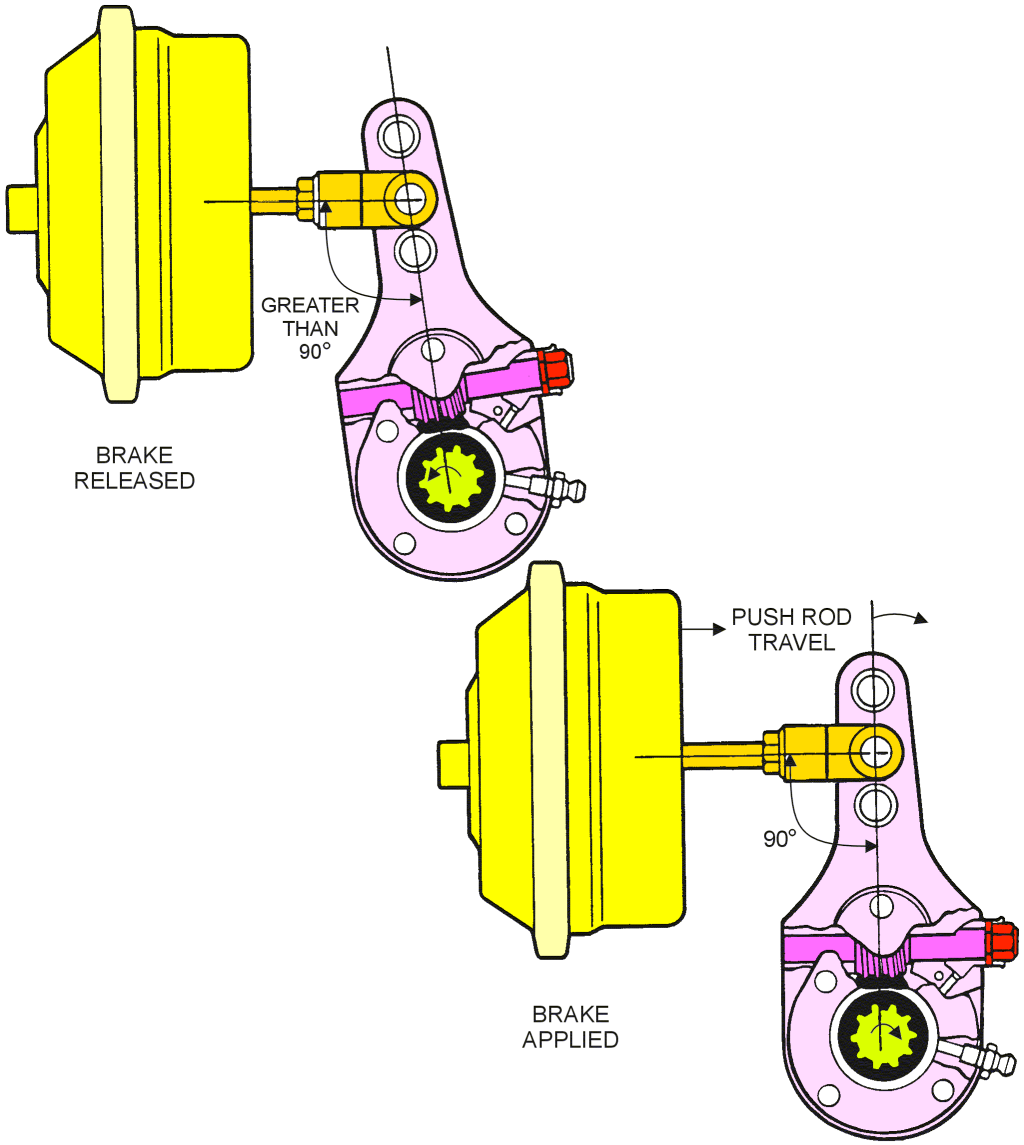
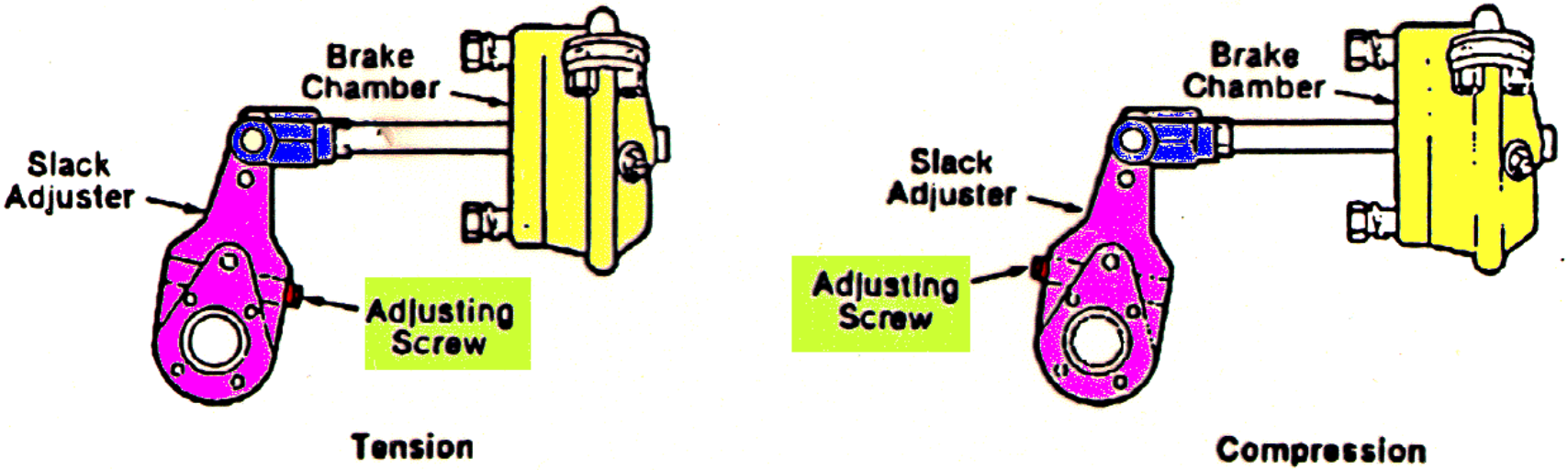

GREATER
THAN
90°
BRAKE
RELEASED
PUSH ROD
TRAVEL
90°
BRAKE
APPLIED

Figure 16

Slack Adjusters mounted in tension or compression



Provided the maximum torque rating is not exceeded, Bendix slacks can be mounted in either direction and still meet the engineering test specification (50K cycles at maximum rated load). Compression mounting is recommended and will yield a longer service life.

Figure 78

Manual Slack Adjusters

- Main purpose is to provide a place to adjust brake lining to brake drum clearance.
- Ensure adjusting rod lock is functioning properly so to maintain brake adjustment.
- Angle between centerlines of slack adjuster and push rod $\rightarrow$ greater than 90^{o} when released $\rightarrow$ minimum of 90^{o} when applied or application force decreases.

Figure 17 - Automatic slack adjuster.

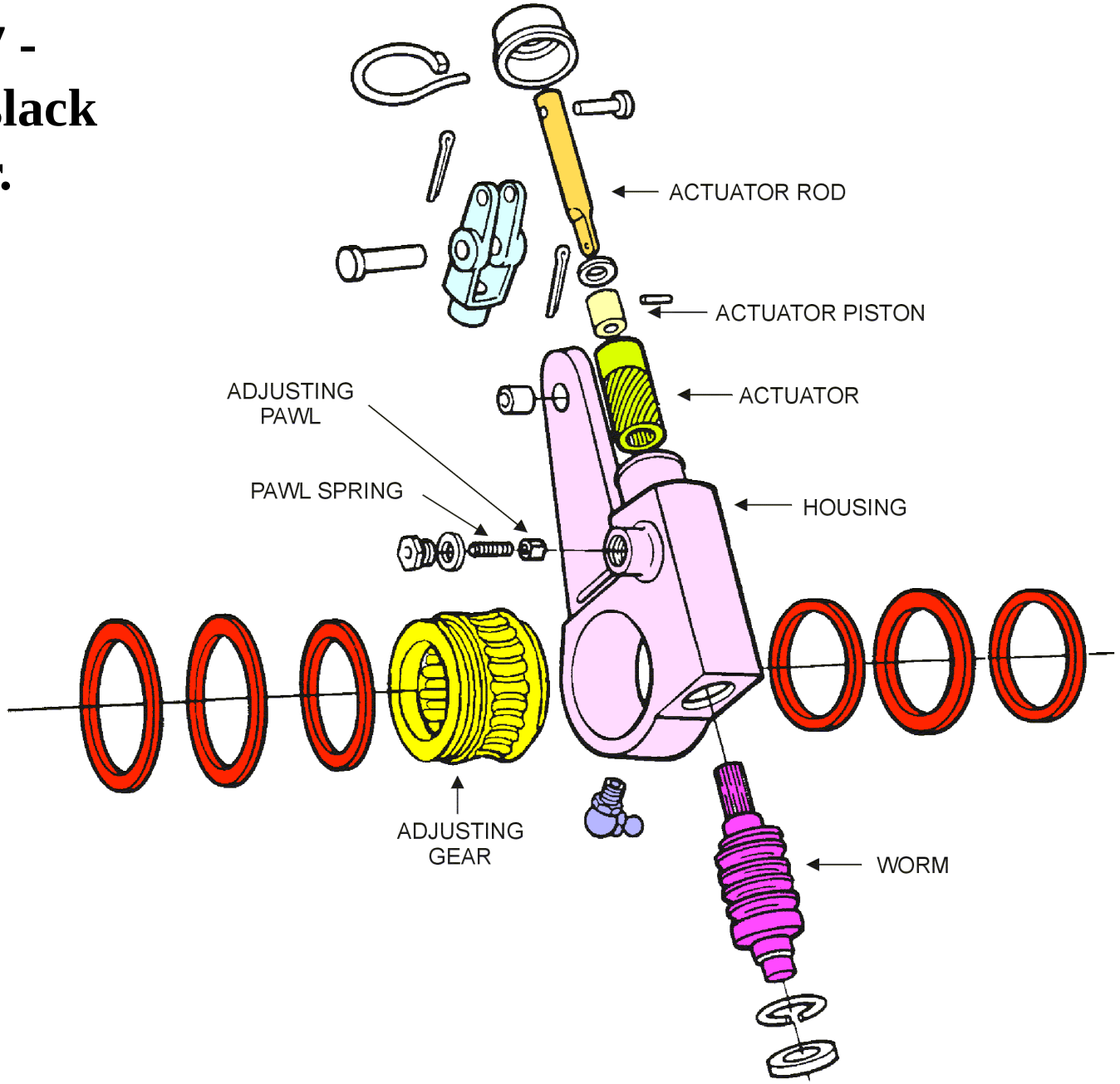
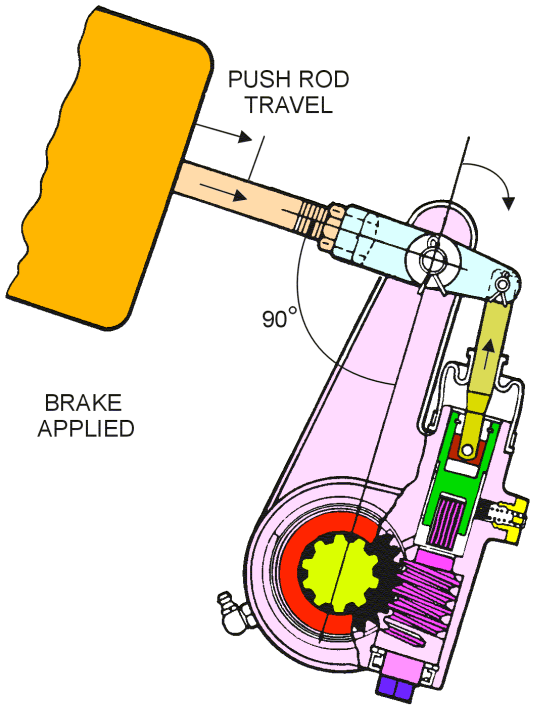
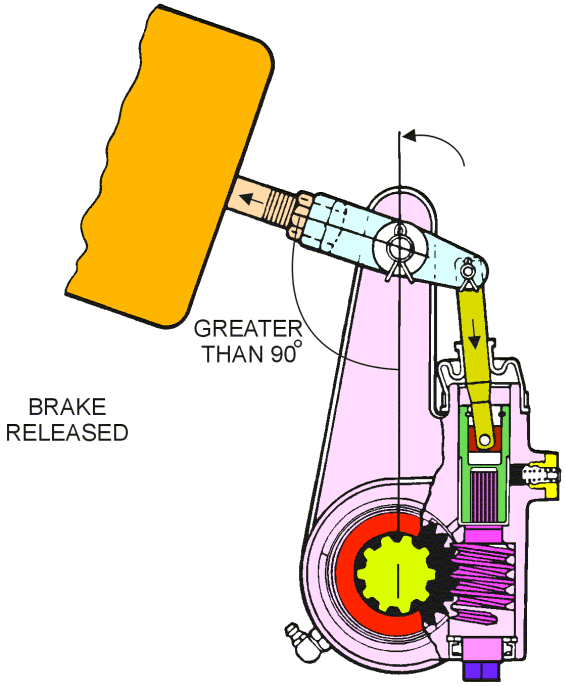


Figure 18 - Automatic slack adjuster operation.



ADJUSTER OPERATION

- CLEVIS MOVEMENT PULLS ACTUATOR ROD, ACTUATOR PISTON AND ACTUATOR
- ACTUATOR AND WORM DO NOT ROTATE UNTIL PAWL IS PUSHED OUTWARD
- ACTUATOR RATCHETS PAST THE PAWL



ADJUSTER OPERATION

- CLEVIS MOVEMENT PUSHES ACTUATOR ROD, ACTUATOR PISTON AND ACTUATOR
- ACTUATOR AND WORM ROTATE UNTIL PAWL IS PUSHED OUTWARD
- ACTUATOR RATCHETS PAST THE PAWL

Automatic Slack Adjusters

- Adjusts brakes when angle between the centerlines of the slack adjuster and the push rod reaches 90^{o} or goes less than 90^{o}.
- Can be adjusted manually if manufactures precautions are followed.
- Proper maintenance is a must to ensure proper operation.

Objective Two:

- Explain the operating principles of a typical air disc foundation brake.

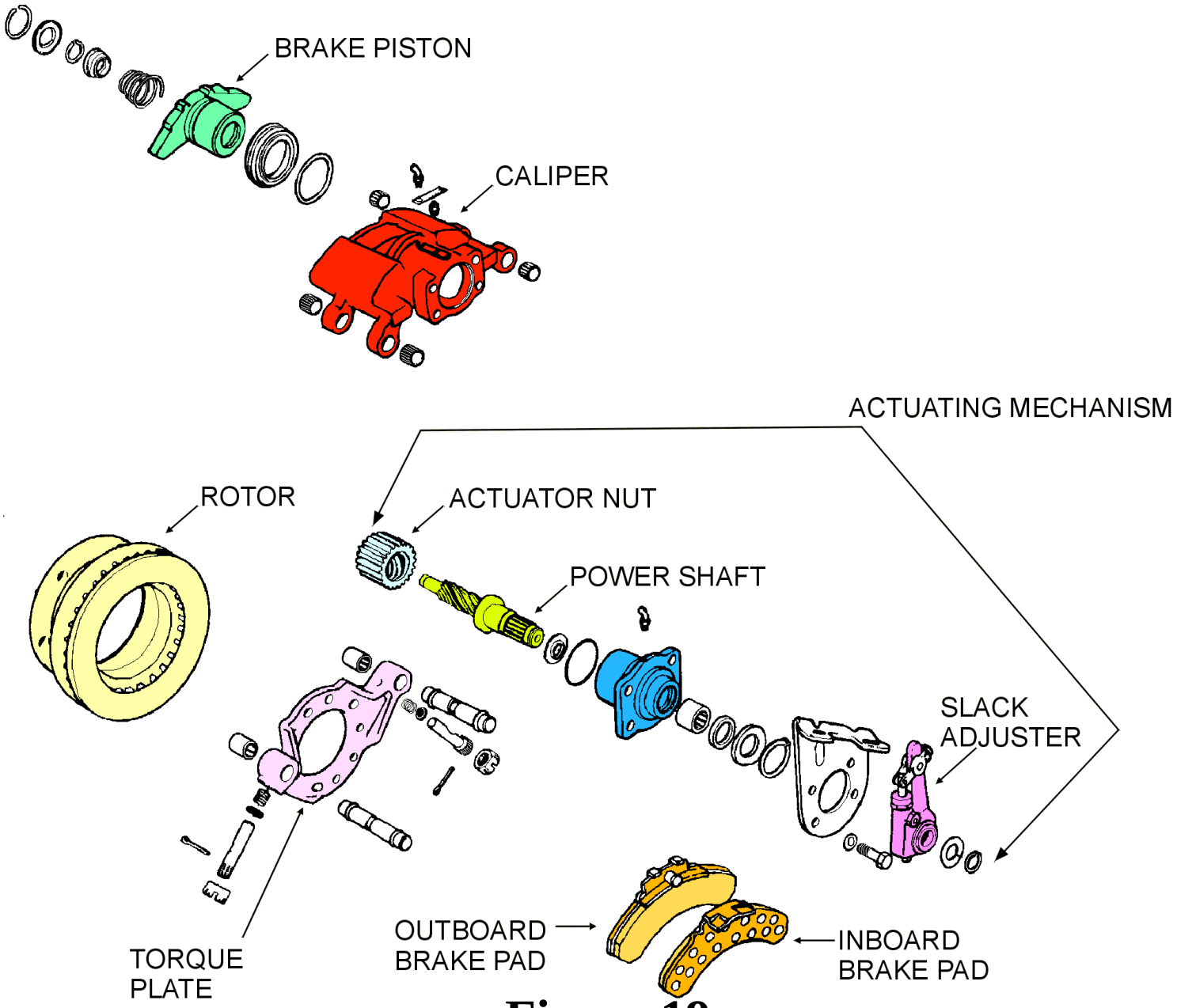

BRAKE PISTON
CALIPER
ACTUATING MECHANISM
ROTOR
ACTUATOR NUT
POWER SHAFT
SLACK
ADJUSTER
TORQUE
PLATE
OUTBOARD
BRAKE PAD
INBOARD
BRAKE PAD

Figure 19

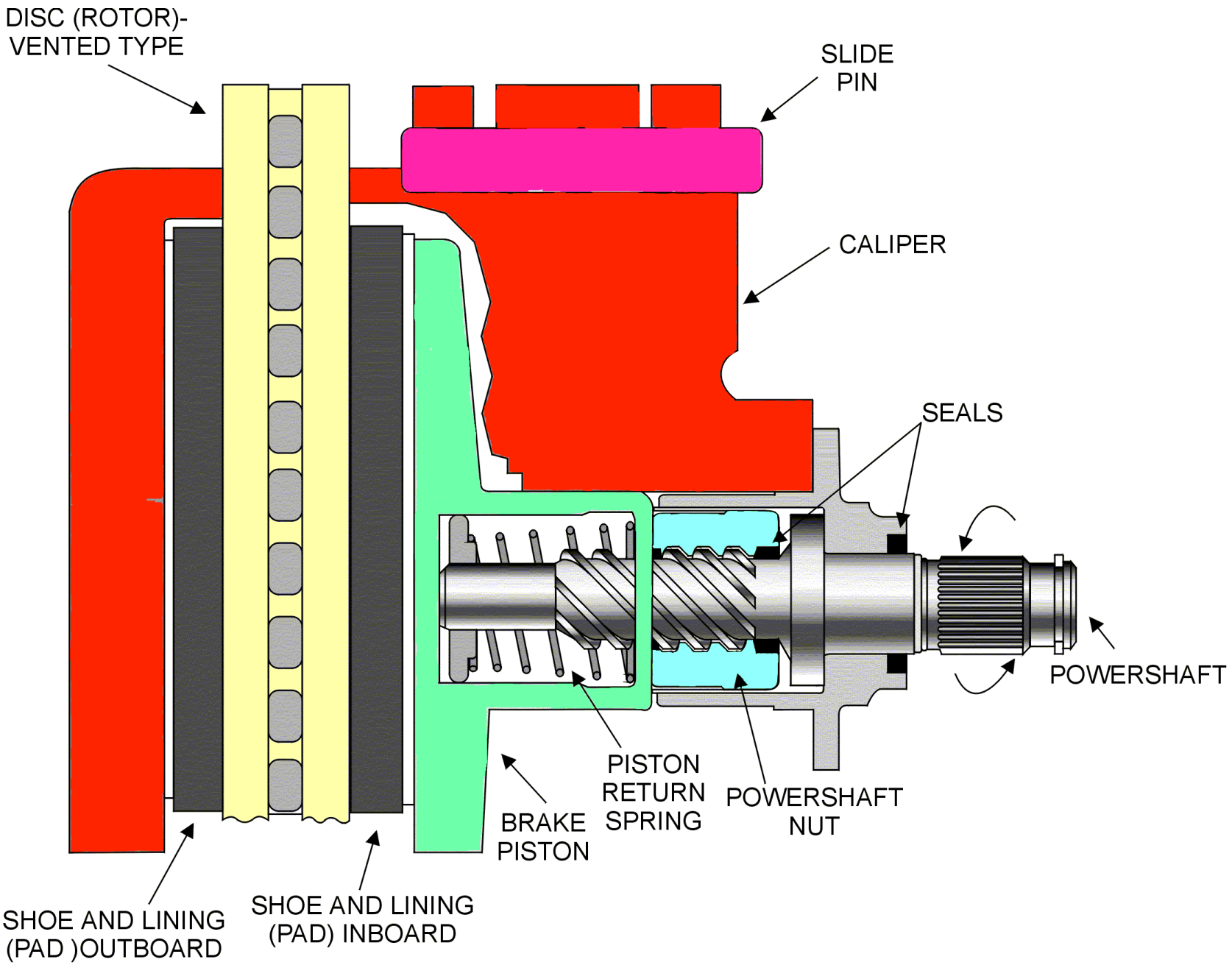

DISC (ROTOR)-
VENTED TYPE
SLIDE
PIN
CALIPER
SEALS
POWERSHAFT
PISTON
RETURN
SPRING
POWERSHAFT
NUT
BRAKE
PISTON
SHOE AND LINING
(PAD)OUTBOARD
SHOE AND LINING
(PAD) INBOARD

Figure 20

Disc Type Foundation Brakes

- Use a floating type caliper.
- Rotation of powershaft pushes inner pad and pulls outer pad against rotor.
- Create more braking effort than cam type foundation brakes because of clamping effect.
- More costly than cam type foundation brakes.