



Premium wheel-end brake products

Bendix® Brakes

Application Guidelines



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Important Information about These *Guidelines*

Purpose

The purpose of these *Brake Application Guidelines* is to provide original equipment manufacturer (OEM) builders of medium and heavy duty trucks with information about which Bendix Spicer Foundation Brake products are approved by Bendix Spicer Foundation Brake for use in common vocational applications in the USA and Canada.

Use of Guidelines

These *Guidelines* apply to the specific on, on-off, and off highway vocational categories and axle applications which are listed, for vehicles operated in the USA and Canada. The categories equate to the commodity and service categories used by OEM truck builders. Within each category, Bendix Spicer Foundation Brake has approved the steer axle brake and drive axle brake applications shown in the table (subject to any applicable notes), provided that the vehicle falls within the "Definitions" and "Typical Vehicle Types" and meets the "General Requirements" set out for that category. Brake approval is based on gross axle weight rating (GAWR), static loaded radius of tire (SLR), air chamber size, brake adjuster length (S-cam brake only), and the brake lining material.

These *Guidelines* do **not** apply to the use of Bendix Spicer Foundation Brake products in vehicles operated outside the USA and Canada, in vocational categories or axle applications other than those specified herein, for duty cycles or ratings other than those listed herein, for vehicles with fixed liftable auxiliary axles (tag or pusher) or for any off-road applications. Approval for such uses may be requested on an individual basis by submitting a *Brake Application Approval Request Form* to the Bendix Spicer Foundation Brake Application Engineering Department at the address below.

Brake Warranties

Bendix Spicer Foundation Brake warranties for steer axle, drive axle and trailer brakes are set out in the Bendix Spicer Foundation Brake *Applications and Installations (BW7216)* must either meet the requirements of these *Guidelines* for automatic approval or be approved by the Bendix Spicer Foundation Brake Application Engineering Department. Failure to obtain application approval or the use of Bendix Spicer Foundation Brakes or their components in non-approved applications will void the Bendix Spicer Foundation Brake warranty coverage. Modification of the vehicle or brake configuration, changes in the vocational use, or service outside the limits of these *Guidelines* may void the Bendix Spicer Foundation Brake warranty coverage.

Questions

For answers to questions concerning these *Guidelines* or to request a *Brake Application Approval Request Form* for a use not covered by these *Guidelines*, contact one of the following:

| | |
|--|---|
| Bendix Spicer Foundation Brake LLC 866-610-9709 www.foundationbrakes.com | Roadranger™ Sales and Service Office 800-826-HELP (826-4357) 24 hours a day in the USA and Canada |
|--|---|

Changes to Guidelines

These *Guidelines* are subject to change at any time, without prior notice, at the discretion of Bendix Spicer Foundation Brake LLC.

For updates visit www.foundationbrakes.com

Effective Date: [October 2007]

City Delivery

Definitions

- Pickup and delivery service within cities and/or suburban areas
- Operation on road surfaces of concrete, asphalt and maintained gravel
- Three (3) miles between starts/stops (typical)
- 100% load going/40% load return (typical)

Typical Vehicle Types

| | | | |
|----------------------|--------------------|---------------------|--------------|
| Auto Transport Truck | Moving Van | Pickup and Delivery | Tanker Truck |
| Beverage Truck | Municipal Truck | Refrigerated Truck | |
| Flatbed Truck | Newspaper Delivery | Stake Truck | |

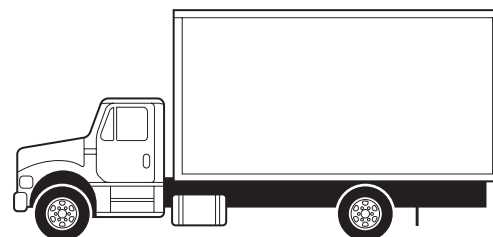
General Requirements

- Cam same operation for all steerable axle brakes
- Air chamber bracket assembly gusset and additional camshaft bracket support [see page 45](#), attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use type 30/36 or 36/36 Spring brake chambers.
 - c. Super Single Tire (Wide Base Tires)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Air chamber bracket with gusset, [see page 45](#), when the application includes any of the following components:
 - a. Super single tire
 - b. Type 30/36 or 36/36 Spring brake chambers
 - c. High-articulation mechanical suspensions
 - d. Two-speed axle or Planetary double reduction axles
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometers [180 max microinch] and .38 mm [.015"] runout when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632
- Due to legal maximum highway GAWR (17,000-20,000 lb.) per code of federal regulations, 23 CFR - chapter 1, part 658 and brake balance to trailers, brakes should be rated to 20,000 when used on structurally rated 23,000 GAWR drive axles.



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|-----------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1504D | 12,000 | 21.5 | ES450S | 20 | 5.5 | 3 |
| ES1504D | 13,200 | 21.5 | ES420,440,600 | 20 or 24 | 5.5 | 3 |
| ES1506D | 10,000 | 19.6 | ES290 | 24 | 5.5 | |
| ES1655L | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655L | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 20,000 | 21.5 | ES1100/600*, 1050 | 24 | 5.5 | 1 |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1508D | 17,000 | 16.8 | ES290 | 30 | 5.5 | |
| ES1657L | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657L | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657L | 23,000 | 21.5 | ES690 | 30 | 5.5 | |
| ES1657D | 23,000 | 21.5 | ES690 | 30 | 5.5 | |
| ES1658L | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ES1658D | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
All brakes shown meet FMVSS-121, S5.4 dynamometer requirements.

Recommended Options

- Wide Brake Package for longer brake life to reduce operating cost, [see page 34](#).
- LMS (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay.
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- 19.5" wheel package for significantly reduced weight and lower frame height:
Steer axle: ES1504D or ES1506D
Drive axle: ES1508D
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

Notes:

1. * - Indicates Combination lining block
2. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.
3. For tractor applications only

Construction

Definitions

- Construction vocation typically involves the movement of material and/or equipment to and from a job site
- 90% of loaded operation on road surfaces of concrete, asphalt, gravel, crushed rock or hard packed dirt and up to 10% of loaded operation into sandy or muddy job sites

Typical Vehicle Types

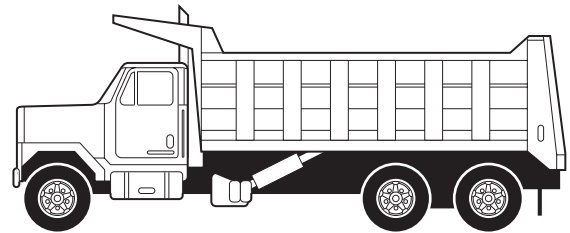
| | | | | |
|-----------------|-----------------|---------------------|----------------------|---------------|
| Asphalt Truck | Dump Truck | Mixer | Tank Truck | Utility Truck |
| Block Truck | Flatbed Truck | Semi-end dump | Transfer Dump | Wrecker |
| Concrete Pumper | Landscape Truck | Snowplow/Snowblower | Truck Mounted Cranes | |

General Requirements

- Anti-compounding air system
 - Cam same operation for all steerable axle brakes and EB1807R brakes
 - Air chamber bracket with gusset for all construction applications, [see page 45](#)
 - Air chamber bracket assembly gusset and support, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base Tires)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs.].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|---------------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| ADB22X Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#).
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Fire Service

Definitions

- Vehicles used to transport people and equipment for the purpose of extinguishing fires or ambulance service
- Mileage is typically under 20,000 miles per year
- Typical vehicle routes are three (3) miles between start and stop
- Multiple high deceleration stops are common
- Auxiliary retarders are common
- Higher parking performance required

Typical Vehicle Types

| | |
|------------------|-----------|
| Aerial Ladders | Pumpers |
| Aerial Platforms | Ambulance |
| Tankers | |

Vehicle Configuration

4 x 2, 4 x 4, or 6 x 4 straight trucks

General Requirements

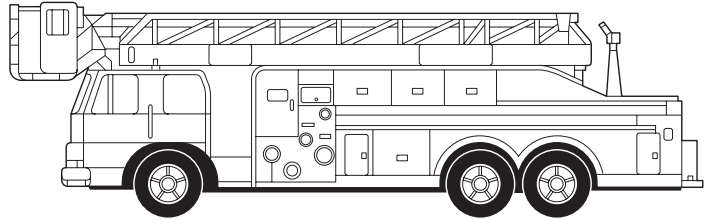
- Anti-compounding air system
- Cam same operation for all steerable axle brakes and EB1807R brakes
- Air chamber bracket with gusset for all Fire Service applications, see page 45
- Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base Tires)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.

- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 14,600 | 21.5 | ES420,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | S420,600,1100/600* | 24 | 5.5 | 2 |
| ES1656D | 22,000 | 21.5 | EES1100 | 24 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,600 | 30 | 6.0 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 6.0 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 6.0 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 22.0 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber.
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Heavy Haul

Definitions

- Movement of heavy equipment or materials at legal maximums or special permit loadings
- Operation on road surfaces of concrete, asphalt and maintained gravel
- High horsepower engines and auxiliary gear boxes are typically used
- Vehicles may be equipped with two retarders
- 100% load going and empty return

Typical Vehicle Types

Tractor/Trailer Combination:

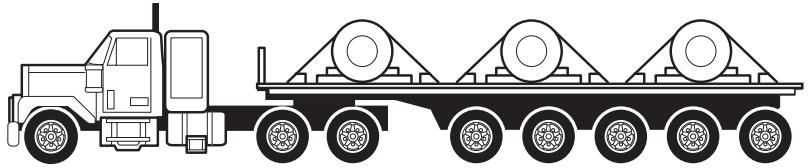
- Equipment Hauling
- Flatbed
- Lowboy
- Steel Hauling

General Requirements

- Anti-compounding air system
 - Cam same operation for all steerable axle brakes and EB1807R brakes
 - Air chamber bracket with gusset for all Heavy Haul applications, see page 45
 - Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brakes chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Drum brake / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber.
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Intercity Coach

Definitions

- Transporting people and sometimes light freight between cities and/or suburban areas
- Operation on road surfaces of concrete, asphalt, maintained gravel, crushed rock, or hard packed dirt
- High mileage operation
- Typical vehicle routes exceed 30 miles between start and stop
- No towed load allowed

Typical Vehicle Types

Tour Coach
Cross Country Coach

Vehicle Configuration

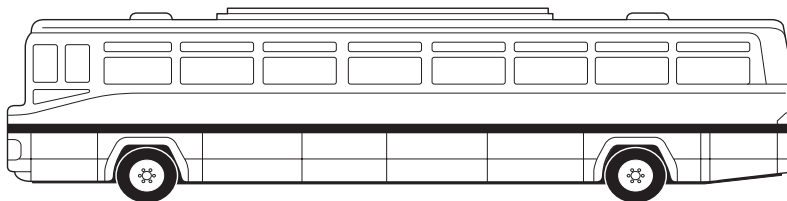
6 x 2 straight coach with non-liftable tag or pusher axles

General Requirements

- Anti-compounding air system
 - Cam same operation for all brakes
 - Air chamber bracket with gusset for all intercity coach applications, see page 45
 - Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometers [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|-----------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1506D | 10,000 | 19.6 | ES290 | 24 | 5.5 | |
| <u>ES1655L</u> | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| <u>ES1655L</u> | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| <u>ES1655D</u> | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| <u>ES1655D</u> | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| Drive Axle Brakes | | | | | | |
| ES1508D | 17,000 | 16.8 | ES290 | 30 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1658D | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |

For all vocations additional lining options available. Submit application request for possible approval.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- LMS (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- 19.5" wheel package for significantly reduced weight and lower frame height:
Steer axle: ES1506D
Drive axle: ES1508D
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

Notes: 1. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Line Haul

Definitions

- Line Haul is moving different types of freight in high mileage operation (over 60,000 miles/year)
- Operation on road surfaces of good to excellent concrete or asphalt
- Typical vehicle routes exceed 30 miles between start and stop
- Typical vehicle configurations are 4 x 2, 6 x 2 and 6 x 4 tractor/trailer combinations and straight trucks

Typical Vehicle Types

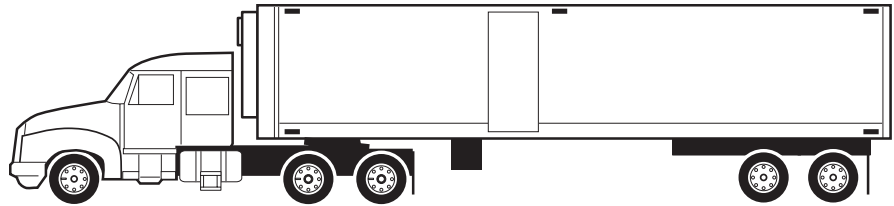
| | | | |
|-------------|-----------------|----------------------|-------------|
| Auto Hauler | Flatbed Trailer | Refrigerated Freight | Pipe Hauler |
| Bulk Hauler | General Freight | Livestock Hauler | Tanker |
| Doubles | Grain Hauler | Moving Van | Triples |

General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes
- Air chamber bracket assembly gusset and additional camshaft bracket support [see page 45](#), attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)**Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Use air chamber bracket with gusset for applications, [see page 45](#), when the application includes any of the following components:
 - a. Super single tire
 - b. Type 30/36 or 36/36 Spring brake chambers
 - c. High articulation suspensions
 - d. Two-speed axle or Planetary double reduction axles
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models, with the exception of the ES1504L, the camshaft input torque is limited to 2545 N•m [22,500 in-lb].
- Brake model ES1504L camshaft input torque is limited to 1490 N•m [13,200 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometers [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632
- Due to legal maximum highway GAWR (17,000-20,000 lb) per code of federal regulations, 23 CFR - chapter 1, part 658 and brake balance to trailers, brakes should be rated to 20,000 lb when used on structurally rated 23,000 lb GAWR drive axles.



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|-----------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| <u>ES1504L</u> | 12,000 | 21.5 | ES420 | 16 or 20 | 5.5 | |
| <u>ES1504L</u> | 13,200 | 21.5 | ES420 | 20 | 5.5 | |
| <u>ES1504D</u> | 12,000 | 19.6 | ES450S | 20 | 5.5 | |
| <u>ES1504D</u> | 13,200 | 21.5 | ES420,440,600 | 20 or 24 | 5.5 | |
| <u>ES1506D</u> | 10,000 | 19.6 | ES290 | 24 | 5.5 | |
| <u>ES1655L</u> | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| <u>ES1655L</u> | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| <u>ES1655D</u> | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| <u>ES1655D</u> | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1508D | 17,000 | 16.8 | ES290 | 30 | 5.5 | |
| ES1657L | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1658L | 20,000 | 21.5 | ES420,450 | 30 | 5.5 | |
| ES1658D | 20,000 | 21.5 | ES420,450 | 30 | 5.5 | |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval. All brakes shown meet FMVSS-121, S5.4 dynamometer requirements.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- LMS (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- 19.5" wheel package for significantly reduced weight and lower 5th wheel height:
 - Steer axle: ES1504D or ES1506D
 - Drive axle: ES1508D
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance.

Notes: 1. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Logging

Definitions

- Movement of logs, chips and pulp between logging sites and/or mill
- High horsepower engines are typically used in this vocation
- Typical vehicle routes are between three (3) and thirty (30) miles from start to stop
- 90% of loaded operation on road surfaces of concrete, asphalt, maintained gravel, crushed rock or hard packed dirt and up to 10% of loaded operation into sandy or muddy job sites
- 100% load going and empty return

Typical Vehicles Types

Chip Hauler
Log Hauler

Straight Truck with Trailer
Tractors with Pole Trailers

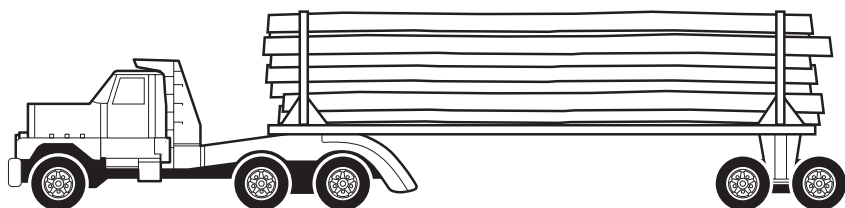
General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes and EB1807R brakes
- Air chamber bracket with gusset for all logging applications, see page 45
- Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Mining

Definitions

- Movement of rock, ore, gravel and minerals between mine sites and delivery sites
- High horsepower engines are typically used in this vocation
- Typical vehicle routes are between three (3) and thirty (30) miles from start to stop
- 90% operation on-highway and up to 10% into sandy or muddy job site
- 100% load going and empty return

Typical Vehicle Types

Bottom Dump Trailer
Semi-End Dump

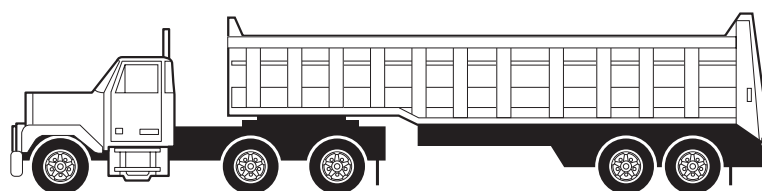
Transfer Dump
Hopper Trailer Combinations

General Requirements

- Anti-compounding air system
 - Cam same operation for all steerable axle brakes and EB1807R brakes
 - Air chamber bracket with gusset for all mining applications, see page 45
 - Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Drum brake / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| ES1807R | 32,500 | 22.7 | E190HS, E290HS | 30LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Motorhome

Definitions

- Vehicles generally used for non-commercial transportation and as traveling domiciles for families
- 100% loaded full time
- May pull small passenger car, SUV or pick-up truck
- Typical vehicle routes exceed 30 miles between start and stop
- Annual mileage will be under 30,000
- Typical operation is on paved roads and short distances within campgrounds and parks

Typical Vehicle Types

Recreational Vehicles

Vehicle Configurations

Straight coach type vehicles with towing ability:

- 4 x 2 straight coach
- 6 x 2 (with non-liftable tag or pusher axles)

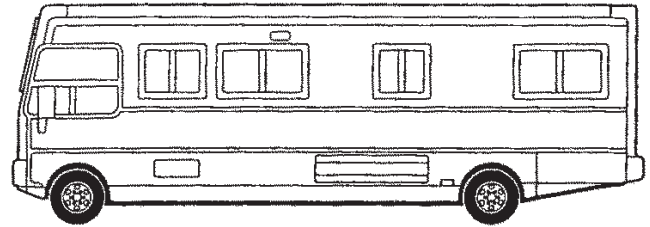
General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes
- Air chamber bracket assembly gusset and additional camshaft bracket support [see page 45](#), attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Air chamber bracket with gusset for applications, [see page 45](#), when the application includes any of the following components:
 - a. Super single tires
 - b. Type 30/36 or 36/36 Spring brake chambers.
- BSFB Application Engineering approval for:
 - a. Vehicle towing unbraked trailer vehicle.
 - b. Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometers [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|-----------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1504D | 12,000 | 19.6 | ES450S | 20 | 5.5 | |
| ES1506D | 10,000 | 19.6 | ES290 | 24 | 5.5 | |
| ES1655L | 13,200 | 21.5 | ES420,440,600 | 20 | 5.5 | |
| ES1655L | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1655D | 13,200 | 21.5 | ES420,440,600 | 20 | 5.5 | |
| ES1655D | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1508D | 17,000 | 16.8 | ES290 | 30 | 5.5 | |
| ES1657L | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657L | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657L | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1658L | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ES1658D | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval. All brakes shown meet FMVSS-121, S5.4 dynamometer requirements.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- 19.5" wheel package for significantly reduced weight and lower frame height:
 - Steer axle: ES1504D or ES1506D
 - Drive axle: ES1508D
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

Notes: 1. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.
 2. Air system Crack pressure for ADB must be approved by BSFB Application Engineering.

Oil Field

Definitions

- Movement of production related products, supplies and tools between job sites
- Movement of processing equipment and laboratories on job sites
- Low mileage operation on road surfaces made of concrete, asphalt, maintained gravel, crushed rock or hard packed dirt

Typical Vehicle Types

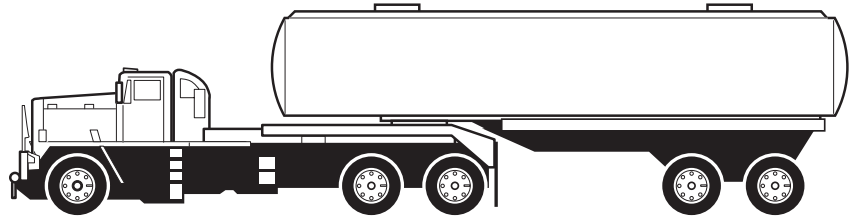
| | |
|-------------------|-------------------------|
| Cementing Vehicle | Geophysical Exploration |
| Demolition | Rigging Truck |
| Drill Rig | Tanker |
| Fracturing Truck | Winch Truck |

General Requirements

- Anti-compounding air system
 - Cam same operation for all steerable axle brakes and EB1807R brakes
 - Air chamber bracket with gusset for all oil field applications, see page 45
 - Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ES1658D | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required

Refuse

Definitions

- Vehicles used for residential refuse/recycle pickup, typically a high number of stops per mile
- Vehicles operated in commercial/industrial pickup, typically a low number of stops per mile
- Vehicles used in transfer/relocation on typically greater than 10-mile trips
- 90% of loaded operation on road surfaces of concrete, asphalt or maintained gravel and up to 10% of loaded operation into landfill, transfer or recycling sites

Typical Vehicle Types

| | | |
|-------------------------------|---------------------|------------------|
| Front/Rear/Side Loader | Sewer/Septic/Vacuum | Roll-Off |
| Liquid Waste Hauler | Scrap Truck | Transfer Vehicle |
| Residential/Commercial Pickup | Street Sweeper | |

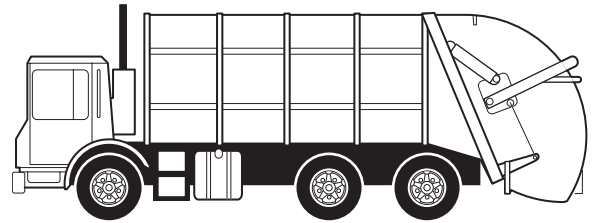
General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes and EB1807R brakes
- Air chamber bracket with gusset for all refuse applications, see page 45
- Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Trucks equipped with remotely controlled neutral brake engagement valves must incorporate a pressure limiting device set to a maximum pressure of 60 psi and must supply air pressure to all service chambers on the vehicle
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|--------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| ES1655D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100/600*,1050 | 24 | 5.5 | 2 |
| ES1656D | 24,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES420 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 20.7 | ES420 | 30 | 5.5 | |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 20.5 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- **LMS** (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (**ASA**) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Rescue

Definitions

- Specialized vehicles for rapid acceleration to crash sites away from hydrant hookups
- Operation on road surfaces made of concrete, asphalt, maintained gravel, crushed rock, hard packed dirt, or other similar surfaces for 90% of the time and into sandy or muddy crash sites for 10% of the time
- Low mileage operation
- High horsepower engines typically used in this vocation
- Auxiliary retarders are common

Typical Vehicle Types

| | |
|----------------------------------|-------------------------|
| Airport Rescue Fire (ARF) | Crash Fire Rescue (CRF) |
| Rapid Intervention Vehicle (RIV) | Emergency Service |

Vehicle Configuration

4 x 4 or 6 x 6 straight trucks

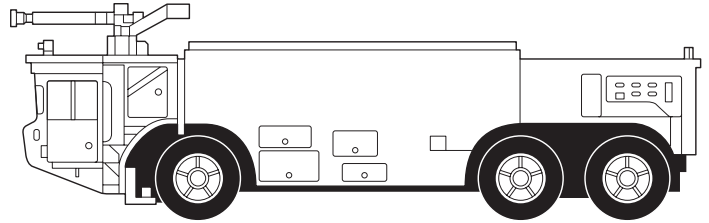
General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes and EB1807R brakes
- Air chamber bracket with gusset for all rescue applications, [see page 45](#)
- Air chamber bracket assembly gusset and additional camshaft bracket support [see page 45](#), attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|---------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1656D | 16,000 | 21.5 | ES420,600,1100/600* | 24 | 5.5 | 2 |
| ES1656D | 22,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,600 | 30 | 6.0 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 6.0 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 6.0 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 22.0 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| EB1807R | 32,500 | 22.7 | E190HS,E290HS | 30 LS | 6.0 | 1,3 |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval.
 All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

School Bus

Definitions

- Transporting students to and from school and/ or school related events
- Operation on road surfaces of concrete, asphalt, maintained gravel, crushed rock, or hard packed dirt
- Two (2) stops per mile are considered typical
- 100% load going / empty return (typical)

Typical Vehicle Types

Front Engine Commercial Chassis Front Engine Integral Coach
Rear Engine Integral Coach

Vehicle Configurations

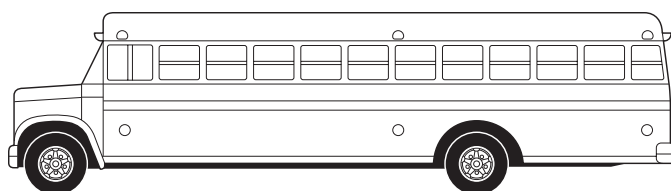
4 x 2 straight bus

General Requirements

- Anti-compounding air system
 - Cam same operation for all brakes
 - Air chamber bracket with gusset for all school bus applications, see page 45
 - Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers.
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support.
 - d. Super Single Tire (Wide Base)
- Note:** The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
 - Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
 - For all S-cam brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
 - Applications on vehicles with fixed or liftable auxiliary axles (tag or pusher) must be approved on an individual basis by the BSFB Application Engineering Department, as auxiliary axles may impact the braking performance of the vehicle.

General Recommendations

- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometers [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|-----------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1506D | 10,000 | 19.6 | ES290 | 20 | 5.5 | |
| <u>ES1655D</u> | 13,200 | 21.5 | ES420,440,450S,600 | 20 or 24 | 5.5 | |
| <u>ES1655D</u> | 14,600 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,440,600 | 24 | 5.5 | |
| ADB22X | 20,000 | 21.5 | Bendix® | 20 | N/A | |
| Drive Axle Brakes | | | | | | |
| ES1508D | 17,000 | 16.8 | ES290 | 30 | 5.5 | |
| ES1657D | 20,000 | 21.5 | ES410,420,440,450,600 | 30 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 5.5 | |
| ES1658D | 23,000 | 20.7 | ES420,450 | 30 | 5.5 | |
| ADB22X | 23,000 | 21.5 | Bendix® | 18 | N/A | |

For all vocations additional lining options available. Submit application request for possible approval. All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

- Wide brake package for longer brake life to reduce operating cost, [see page 34](#)
- LMS (Low-Maintenance System) brakes and hubs for extended lubrication intervals, simplified hub installation and reduced bearing endplay
- ADB (air disc brake) on steer axles for improved braking performance
- ADB (air disc brake) on all vehicle axles for improved fade resistance and stopping power
- 19.5" wheel package for significantly reduced weight and lower frame height:
Steer axle: ES1506D
Drive axle: ES1508D
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

Notes: 1. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

Transit Coach

Definitions

- Transporting people in and around city or suburban areas
- Operation on well-maintained highways and residential streets made of asphalt or concrete
- Very frequent stops (nine per mile) are considered typical

Typical Vehicle Types

Airport Shuttle
Shuttle Bus

City Bus
Trolley

Vehicle Configurations

4 x 2 straight coach

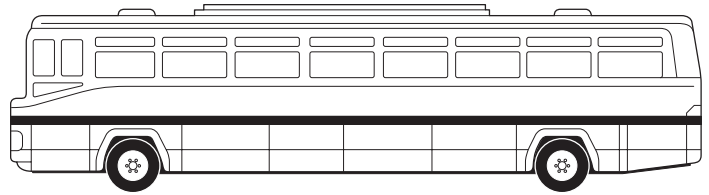
General Requirements

- Anti-compounding air system
- Cam same operation for all steerable axle brakes
- Air chamber bracket assemblies with gusset for all transit coach applications, see page 45
- Air chamber bracket assembly gusset and additional camshaft bracket support see page 45, attached to the axle housing when the:
 - a. Brake centerline to air chamber centerline distance (BCCC dimension) is greater than 343 mm [13.5"]
 - b. Application use a type 30/36 or 36/36 Spring brake chambers
 - c. Camshaft brackets with BCCC dimension of less than 8.12" does not require a gusset or additional support..
 - d. Super Single Tire (Wide Base)

Note: The above support can be supplied by BSFB or the vehicle manufacturer but must be approved by BSFB Application Engineering Department.
- Applications for use in countries other than the USA and Canada must be reviewed by BSFB Application Engineering.
- Vehicle manufacturer is responsible for air system design, parking and stopping distance performance.
- For all brake models the camshaft input torque is limited to 2545 N•m [22,500 in-lbs].
- Extra heavy duty (severe service) Brake drum on steer, drive and auxiliary axles.

General Recommendations

- Cam same for all brake assemblies
- Dust shields for all applications
- Use Auxiliary retarders per TMC RP636
- Brake drum / Rotor material specification per SAE J431. Drum / rotor surface finish 4.57 micrometer [180 max microinch] and .38 mm [.015"] runout, when mounted on a hub rotated on bearings. See notes section for Minimum Drum Weight requirements
- Brake air system balance per TMC RP632



| Brake Model | Max. GAWR (lb) | Max. SLR (in) | Linings | Air Chamber Size (in ²) | Brake Adjuster Length (in) | Notes |
|--------------------------|----------------|---------------|---------------------|-------------------------------------|----------------------------|-------|
| Steer Axle Brakes | | | | | | |
| ES1655D | 14,600 | 21.5 | ES420,600 | 24 | 5.5 | |
| ES1656D | 16,000 | 21.5 | ES420,600,1100/600* | 24 | 5.5 | 2 |
| ES1656H | 16,000 | 21.5 | ES440 | 24 | 5.5 | |
| ES1656D | 22,000 | 21.5 | ES1100 | 24 | 5.5 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 5.5 | |
| ES1657D | 24,000 | 21.5 | ES690 | 30 | 5.5 | |
| Drive Axle Brakes | | | | | | |
| ES1657D | 20,000 | 21.5 | ES410,420,600 | 30 | 6.0 | |
| ES1657D | 22,000 | 21.5 | ES600 | 30 | 6.0 | |
| ES1657D | 23,000 | 22.0 | ES690 | 30 | 6.0 | |
| ES1657S | 26,000 | 22.0 | ES900,1050 | 30 | 6.0 | 3 |
| ES1657M | 26,000 | 22.0 | ES1100/800* | 30 | 6.0 | 2,3 |
| ES1657H | 32,500 | 22.7 | ES1100 | 30 | 6.0 | 3 |
| ES1658D | 23,000 | 22.0 | ES420 | 30 | 6.0 | |
| ES1658S | 29,000 | 22.0 | ES900,1050 | 30 LS | 6.0 | 1,3 |
| ES16510H | 28,000 | 21.5 | CM24 | 30 | 6.5 | |

For all vocations additional lining options available. Submit application request for possible approval.

All brakes shown with max GAWR less than 29,000 lb meet FMVSS-121, S5.4 dynamometer requirements. For all brakes shown with max GAWR of 29,000 lb and greater, FMVSS-121 is not applicable.

Recommended Options

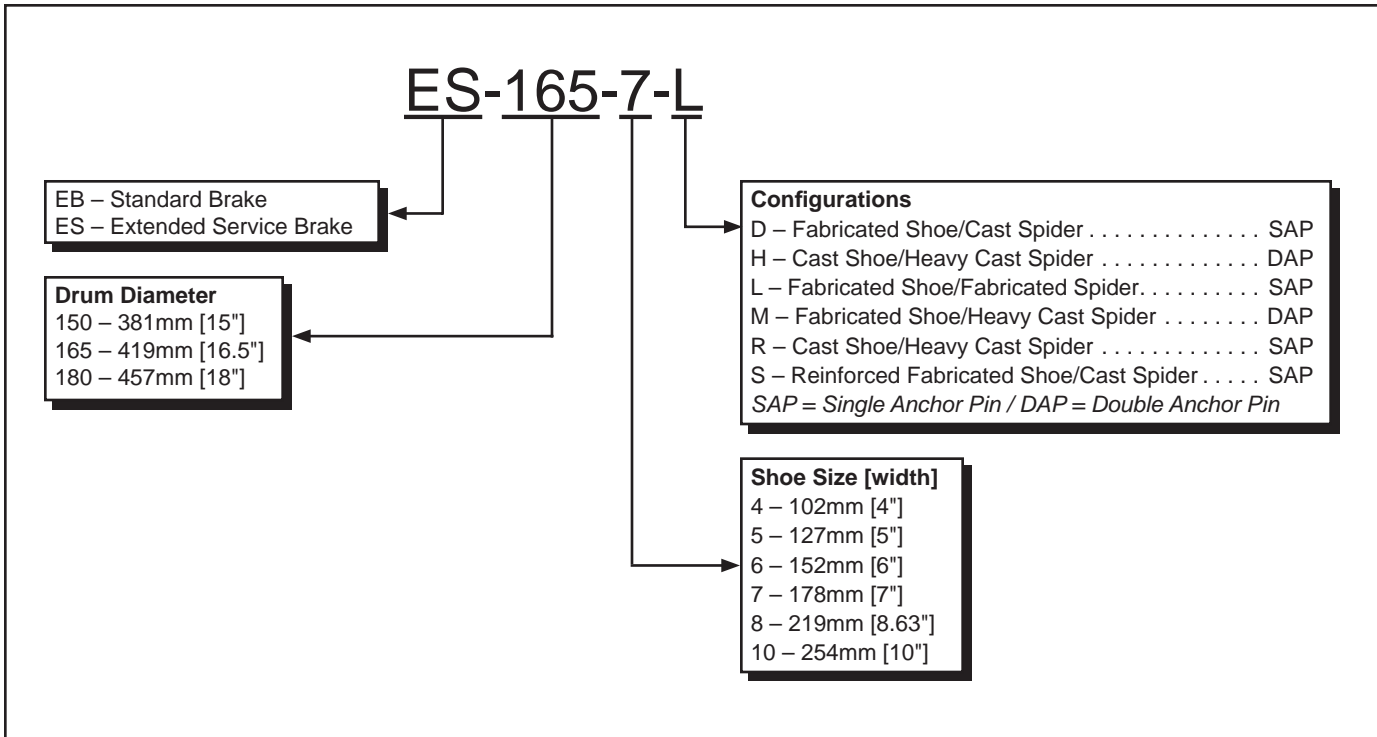
- Bendix® automatic slack adjusters (ASA) for maximized S-cam brake performance

- Notes:**
1. LS - Indicates Long stroke chamber
 2. * - Indicates Combination lining block
 3. Minimum drum weight of 54 kg (120 lb) is required
 4. Mixing of ADB (Air disc brakes) on steer axle and S-cam brakes (drive axle) require BSFB application approval.

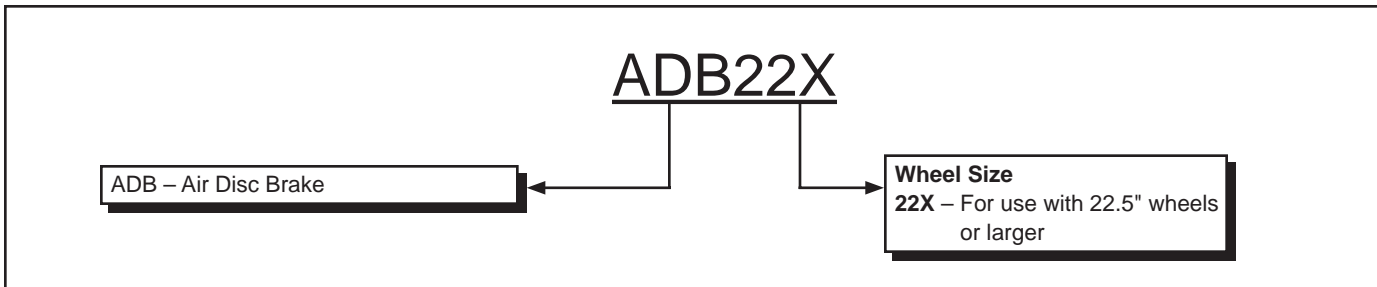
Nomenclature

Bendix® Brake Model Identification

Bendix® S-cam Brake



Bendix® Air Disc Brake



Nomenclature

Model Coverage

S-cam Brake

| Model | Size | | Configuration | | | Application |
|------------|-------------|-----------|---------------|------------|---------|-------------------------|
| | in. | mm | Shoe | Spider | Anchor* | |
| ES-150-4L | 15.0 x 4 | 381 x 102 | Fabricated | Fabricated | SAP | Steer Axles |
| ES-150-4D | 15.0 x 4 | 381 x 102 | Fabricated | Cast | SAP | Steer Axles |
| ES-150-6D | 15.0 x 6 | 381 x 152 | Fabricated | Cast | SAP | Steer or Drive Axles |
| ES-150-8D | 15.0 x 8.63 | 381 x 219 | Fabricated | Cast | SAP | Drive Axles |
| ES-165-5D | 16.5 x 5 | 419 x 127 | Fabricated | Cast | SAP | Steer or Drive Axles |
| ES-165-5L | 16.5 x 5 | 419 x 127 | Fabricated | Fabricated | SAP | Steer or Drive Axles |
| ES-165-6D | 16.5 x 6 | 419 x 152 | Fabricated | Cast | SAP | Steer or Drive Axles |
| ES-165-6L | 16.5 x 6 | 419 x 152 | Fabricated | Fabricated | SAP | Steer or Drive Axles |
| ES-165-6H | 16.5 x 6 | 419 x 152 | Cast | Cast | DAP | Steer Axle Transit Bus |
| ES-165-7D | 16.5 x 7 | 419 x 178 | Fabricated | Cast | SAP | Steer or Drive Axles |
| ES-165-7H | 16.5 x 7 | 419 x 178 | Cast | Heavy Cast | DAP | On/Off Hwy. Drive Axles |
| ES-165-7L | 16.5 x 7 | 419 x 178 | Fabricated | Fabricated | SAP | Steer or Drive Axles |
| ES-165-7M | 16.5 x 7 | 419 x 178 | Fabricated | Heavy Cast | DAP | On/Off Hwy. Drive Axles |
| ES-165-8L | 16.5 x 8.63 | 419 x 219 | Fabricated | Fabricated | SAP | Drive Axles |
| ES-165-8D | 16.5 x 8.63 | 419 x 219 | Fabricated | Cast | SAP | Drive Axles |
| ES-165-10H | 16.5 x 10 | 419 x 254 | Cast | Cast | DAP | Drive Axle Transit Bus |
| EB-180-7R | 18.0 x 7 | 457 x 178 | Cast | Heavy Cast | SAP | On/Off Hwy. Drive Axles |

ADB (Air Disc Brake)

| Model | Rotor Diameter | | Caliper | Application |
|--------|----------------|-----|--|---------------------------|
| | in. | mm | | |
| ADB22X | 16.94 | 430 | Dual Piston 2-Guide Pin Floating Design | Steer/Drive/Trailer Axles |

* SAP = single anchor pin
DAP = double anchor pin

Nomenclature

Wide Brake Package

Linehaul

| Steer Axle | | Drive Axle | |
|------------|--------------|------------|-----------------------|
| GAWR (lb) | Brake Model | GAWR (lb) | Brake Model |
| 12,000 | ES1655 L & D | 20,000 | ES1658 L & D |
| 13,200 | ES1655 L & D | 22,000 | ES1658 L & D |
| 14,600 | ES1656 L & D | 23,000 | ES1658 L & D (6" ASA) |

City Delivery

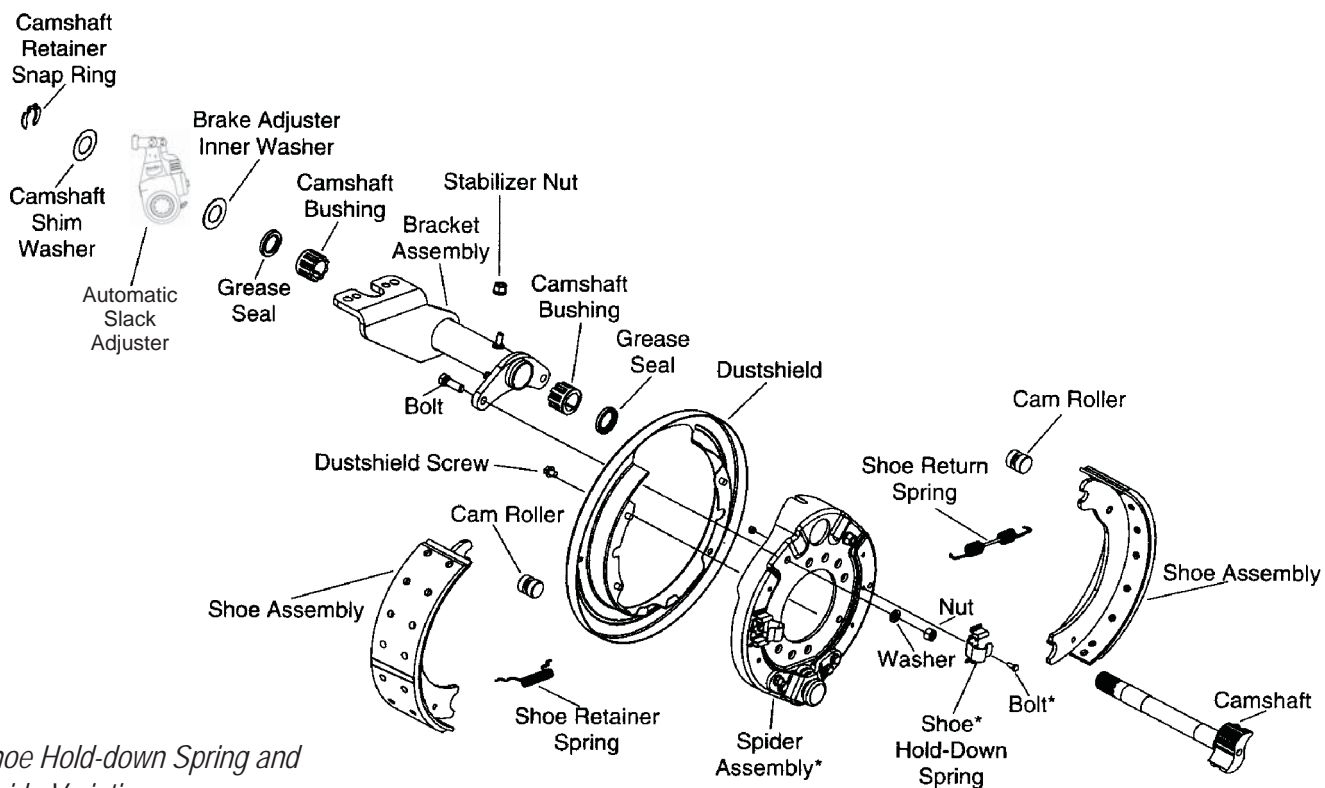
| Steer Axle | | Drive Axle | |
|------------|--------------|------------|-----------------------|
| GAWR (lb) | Brake Model | GAWR (lb) | Brake Model |
| 12,000 | ES1655 L & D | 20,000 | ES1658 L & D |
| 13,200 | ES1655 L & D | 22,000 | ES1658 L & D |
| 14,600 | ES1656 L & D | 23,000 | ES1658 L & D (6" ASA) |
| 20,000 | ES1657 L & D | | |

Construction, Heavy Haul, Mining, Oil Field, Intercity Coach, Logging

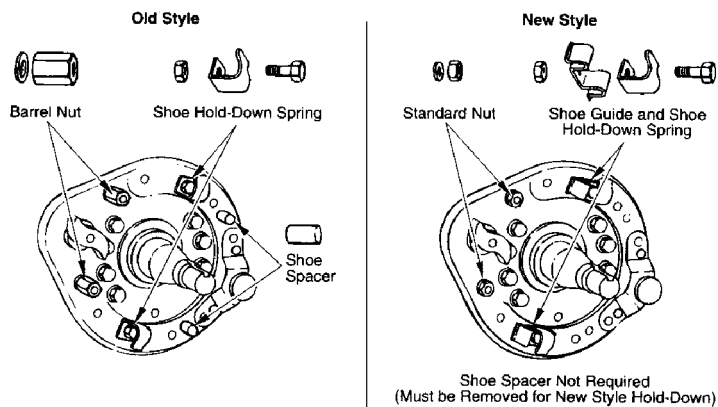
| Steer Axle | | Drive Axle | |
|------------|-----------------|------------|------------------|
| GAWR (lb) | Brake Model | GAWR (lb) | Brake Model |
| 12,000 | ES1655D | 20,000 | ES1658D |
| 13,200 | ES1655D | 22,000 | ES1658D |
| 14,600 | ES1656D | 23,000 | ES1658D (6" ASA) |
| 20,000 | ES1657D (ES420) | | |
| 22,000 | ES1657D (ES600) | | |

Nomenclature

ES-150-4L

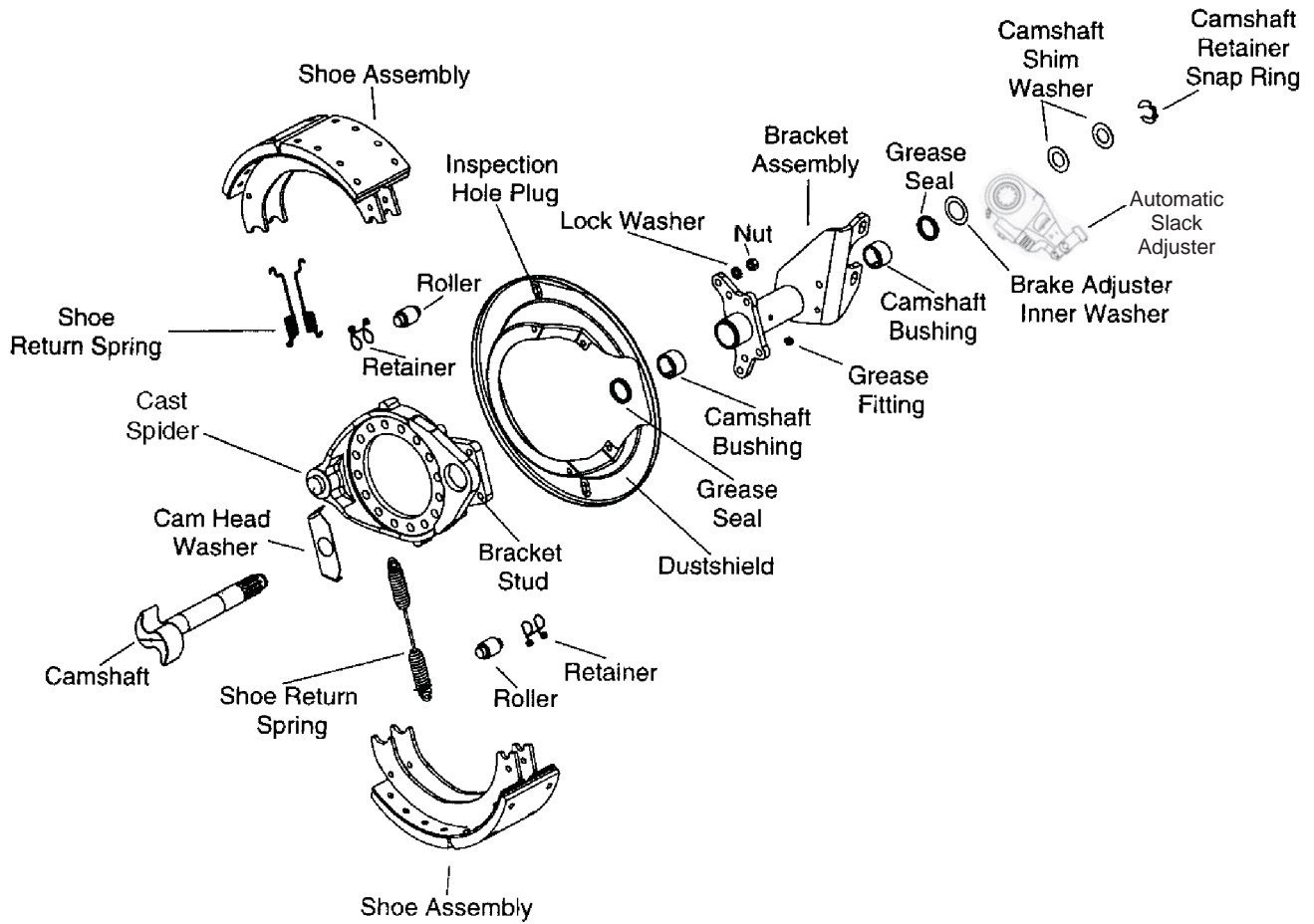


Shoe Hold-down Spring and Guide Variation



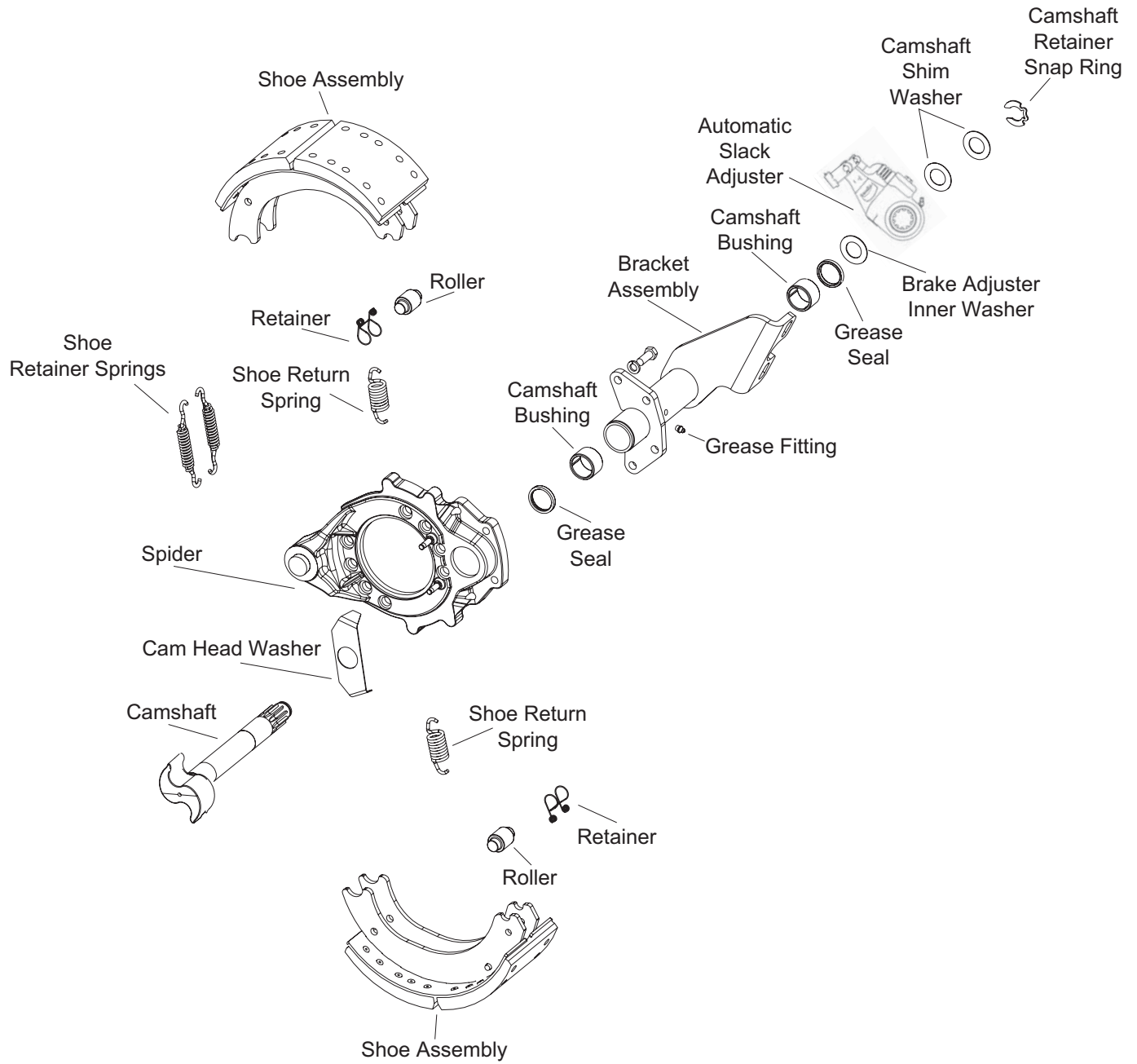
Nomenclature

ES-150-4D



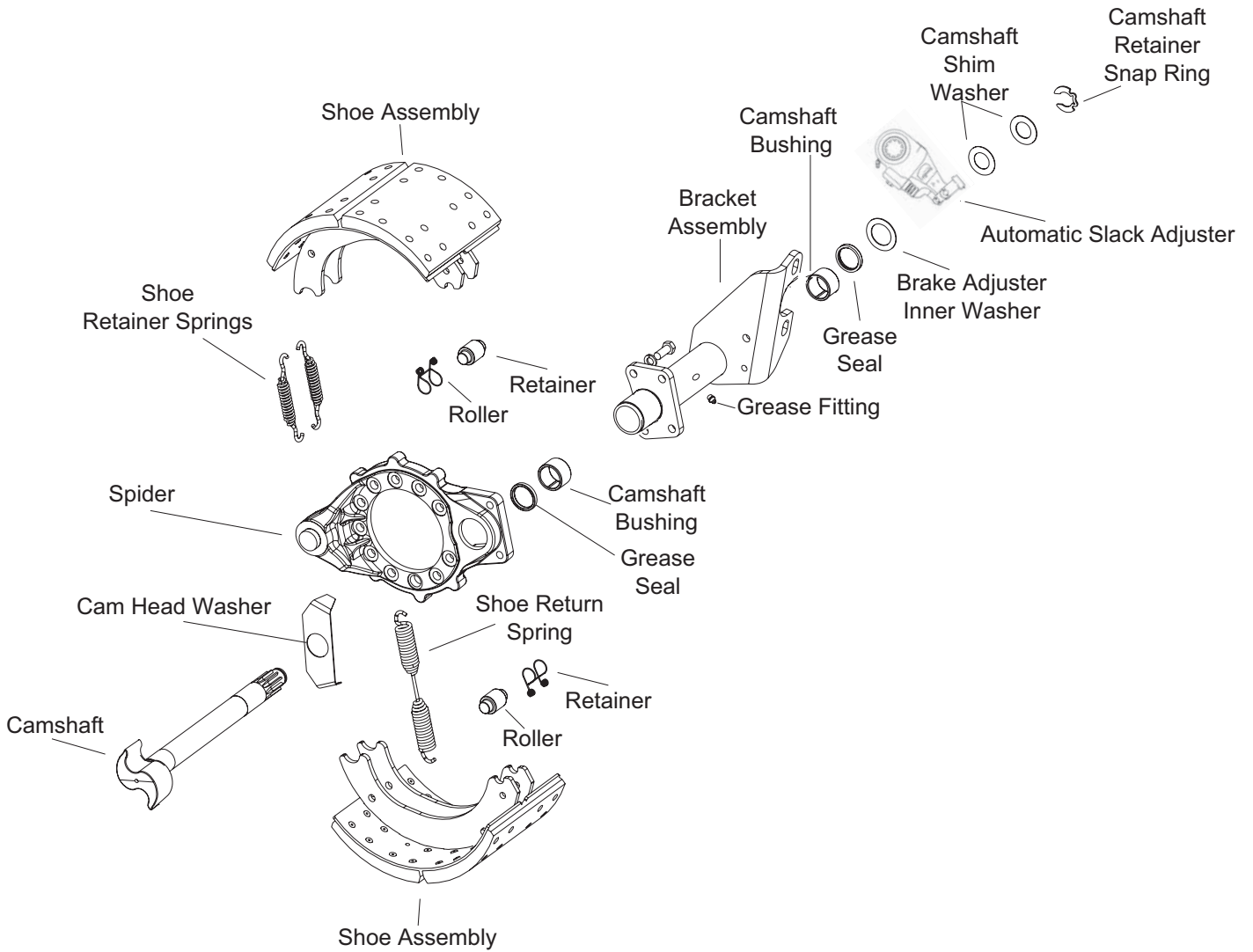
Nomenclature

ES-150-6D Steer Brake



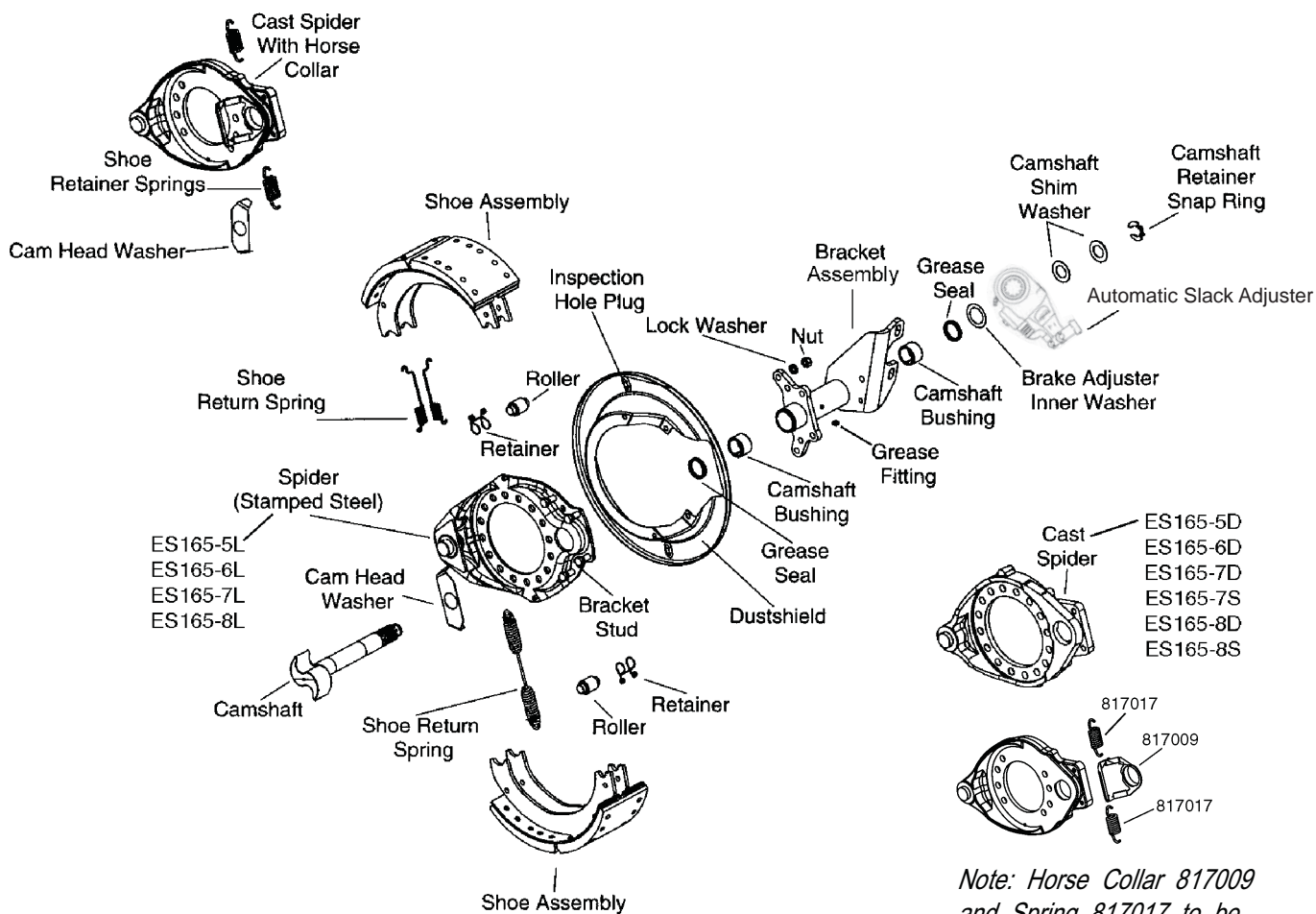
Nomenclature

ES-150-8D



Nomenclature

ES-165-5D, ES-165-5L, ES-165-6D, ES-165-6L, ES-165-7D,
 ES-165-7L, ES-165-7S*, ES-165-8S*, ES-165-8L, ES-165-8D

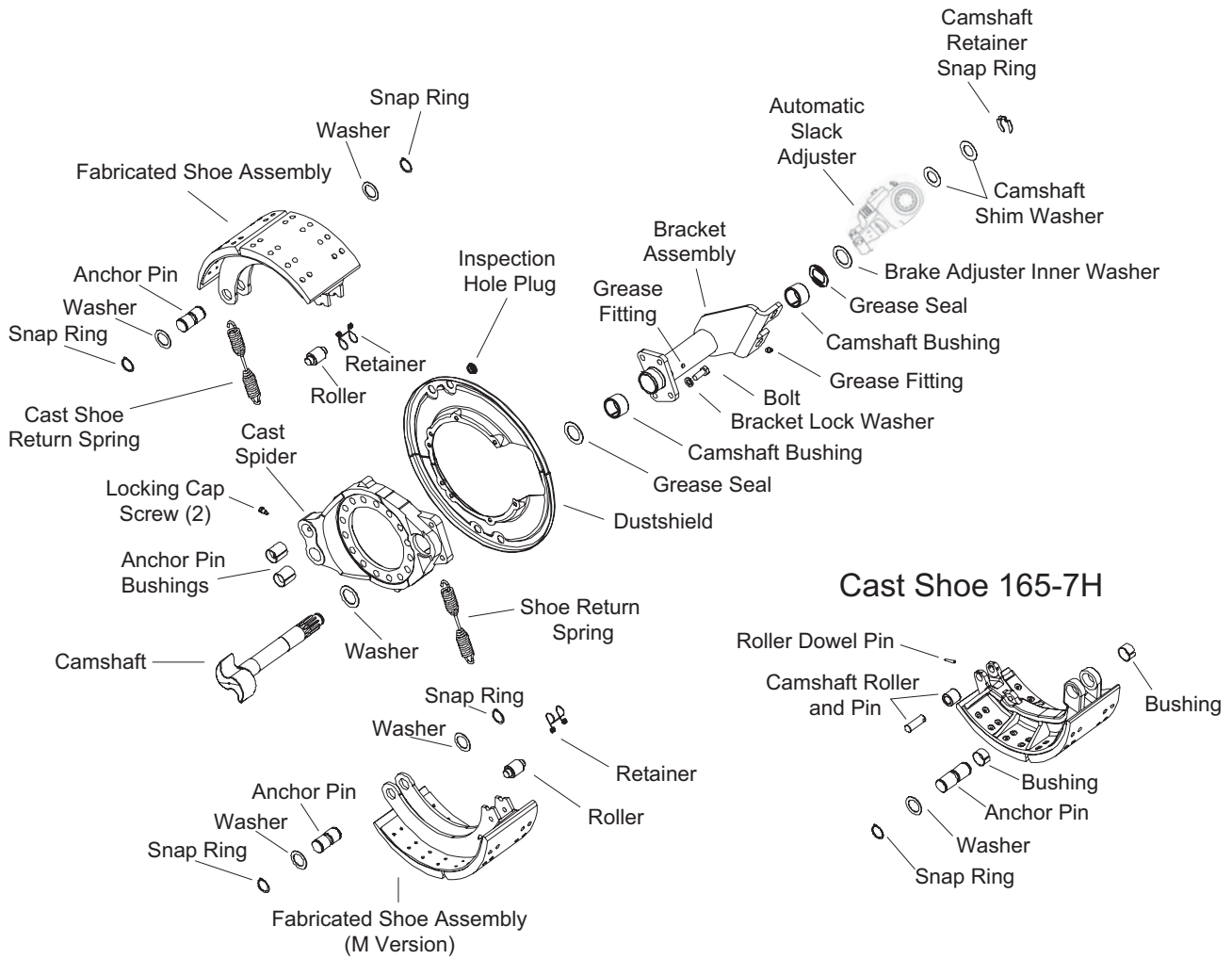


Note: Horse Collar 817009 and Spring 817017 to be used on steer axles greater than 14,600 with ES165-5L, ES165-5D, ES165-6L and ES165-6D brakes.

**Reinforced fabricated shoe*

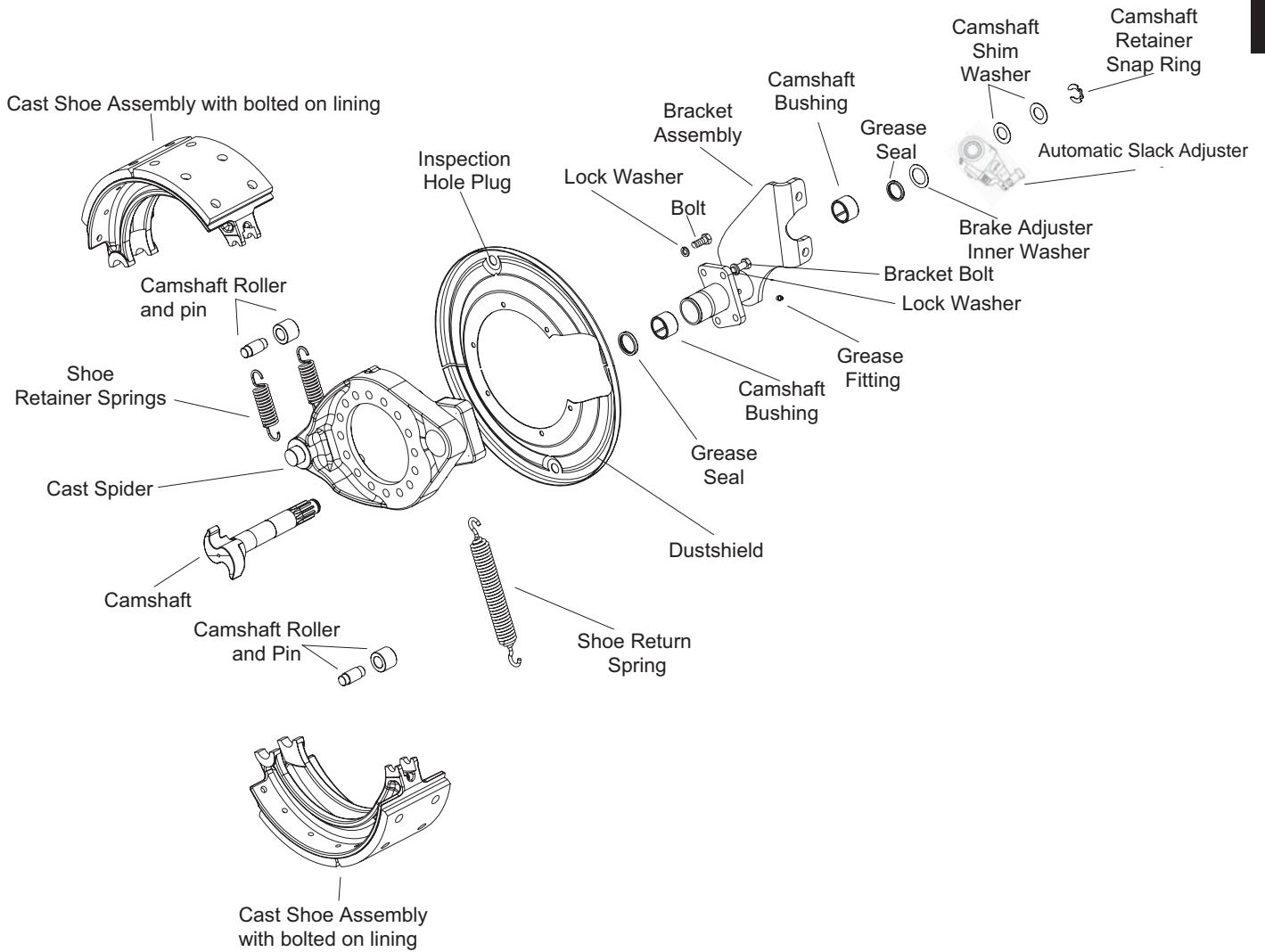
Nomenclature

ES-165-7M Heavy-duty Brakes / ES-165-6H, ES-165-7H, ES-165-10H Severe-duty Brake



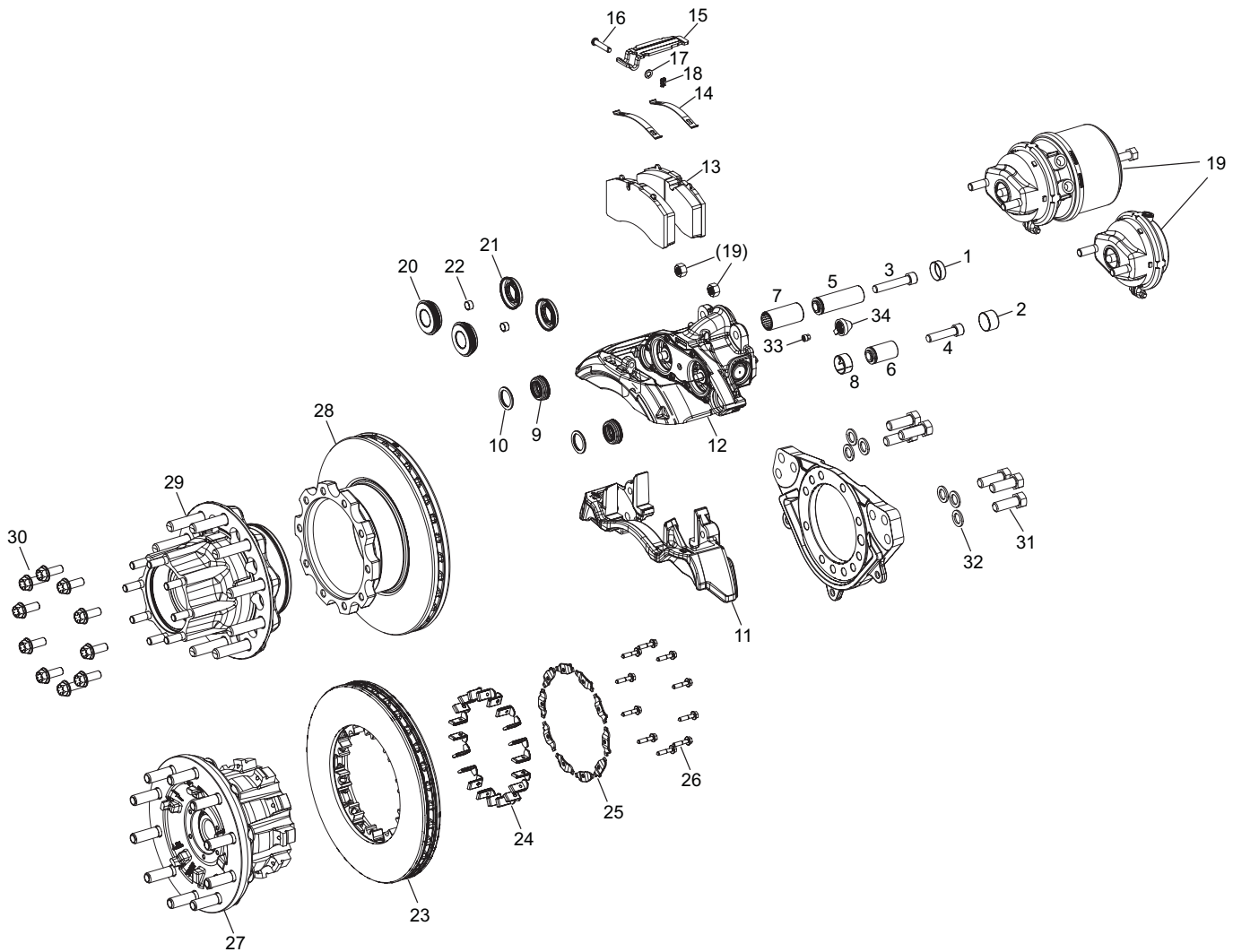
Nomenclature

EB-180-7R



Nomenclature

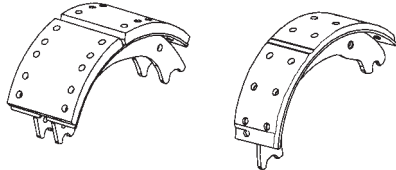
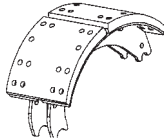
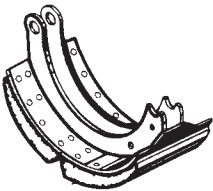
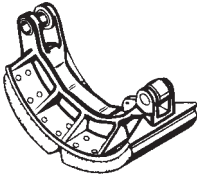
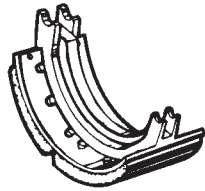
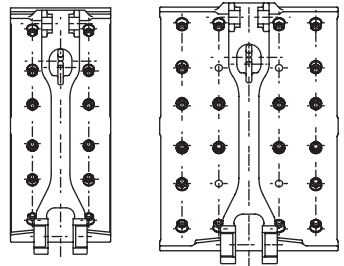


ADB22X



- | | |
|-----------------------------------|--|
| 1. Guide pin cap (fixed) | 18. Disc pad retaining pin splint |
| 2. Guide pin cap (floating) | 19. Air disc brake chamber |
| 3. Guide pin bolt (fixed) | 20. Tappet/boot assembly (outer) |
| 4. Guide pin bolt (floating) | 21. Boot (tappet inner) |
| 5. Guide pin (fixed) | 22. Tappet bushing |
| 6. Guide pin (floating) | 23. Splined disc rotor (SD) |
| 7. Guide pin bushing (fixed) | 24. SD rotor intermediate elements |
| 8. Guide pin bushing (floating) | 25. SD rotor intermediate element retainers |
| 9. Guide pin boot | 26. SD rotor intermediate element retaining screws |
| 10. Guide pin boot retaining ring | 27. Hub (for use with SD rotor) |
| 11. Carrier | 28. U-shaped rotor |
| 12. Caliper assembly | 29. Hub (for use with U-shaped rotor) |
| 13. Disc pad | 30. Fasteners (for use with U-shaped rotor) |
| 14. Disc pad retaining spring | 31. Torque plate to carrier mounting washers |
| 15. Disc pad retaining bar | 32. Torque plate to carrier mounting bolts |
| 16. Disc pad retaining bar pin | 33. Shear adapter |
| 17. Disc pad retaining pin washer | 34. Adjuster cover |

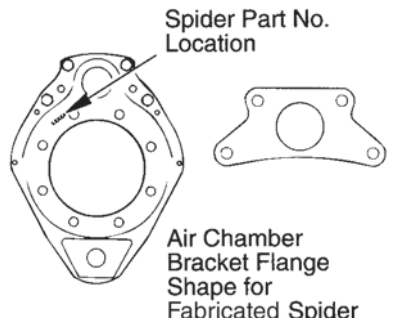
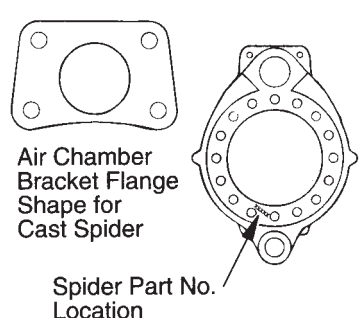
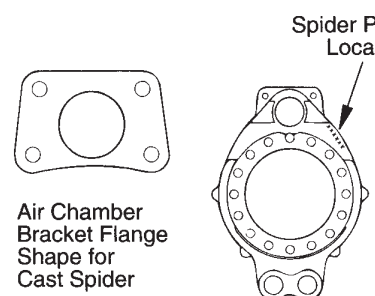
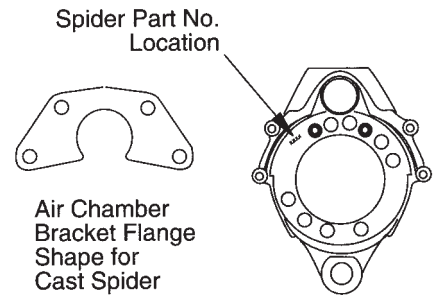
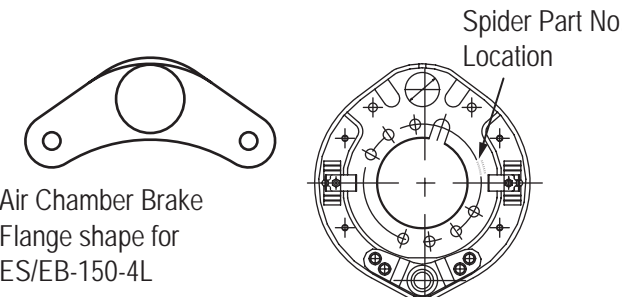
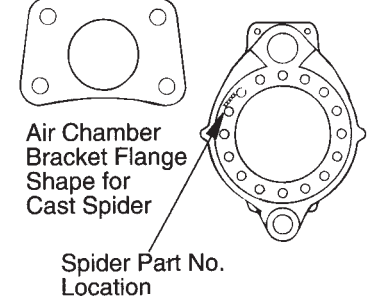
Nomenclature

Bendix® Brake Model Parts Identification for Shoes and Return Springs

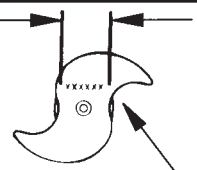
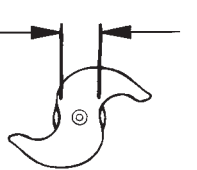
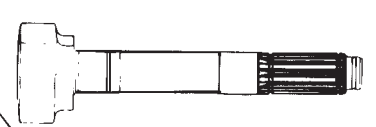
| | | |
|--|--|--|
| <p>ES-150-D ES-150-4L</p>  | <p>ES-165-D, L, S</p>  | <p>ES-165-7M</p>  <p>Double Anchor Pin Fabricated Shoe</p> |
| <p>ES-165-7H</p>  <p>Double Anchor Pin with Cast Shoe</p> | <p>EB-180-7R</p>  <p>Single Anchor Pin, Cast Shoe, Bolted Lining</p> | <p>ES-165-6H ES-165-10H</p>  <p>Double Anchor Pin, Cast Shoe, Bolted Lining</p> |
| <p>Shoe Return Spring</p> | | |
|  <p>ES-150-AD ES-150-4L ES-150-8D ES-165-5D, 5L, 6D, 6L, 6H, 7D, 7L, 8D, 8L, 10H ES-165-7M ES-165-7H EB-180-7R</p>  <p>ES-150-6D, ES-165-5D, 5L, 6D, 6L, 7D, 7L</p> | | |

Nomenclature

Brake Spiders

| | |
|--|---|
| <p>Lightweight Fabricated Spider Single Ancho Pin ES-165-XL</p> <p>X = 5, 6, 7, or 8 in. brake width</p>  <p>Spider Part No. Location</p> <p>Air Chamber Bracket Flange Shape for Fabricated Spider</p> | <p>Cast Spider Single Anchor Pin ES-165-XD</p> <p>X = 5, 6, 7, or 8 in. brake width</p>  <p>Air Chamber Bracket Flange Shape for Cast Spider</p> <p>Spider Part No. Location</p> |
| <p>Cast Spider Double Anchor Pin ES-165-7H, ES-165-7M, ES-165-6H and ES-165-10H</p>  <p>Air Chamber Bracket Flange Shape for Cast Spider</p> <p>Spider Part No. Location</p> | <p>Reduced Envelope Steer Brake Cast Spider Single Anchor Pin ES-150-4D or ES-150-6D</p>  <p>Air Chamber Bracket Flange Shape for Cast Spider</p> <p>Spider Part No. Location</p> |
| <p>Stamped Spider ES-150-4L</p>  <p>Air Chamber Brake Flange shape for ES/EB-150-4L</p> <p>Spider Part No. Location</p> | <p>Reduced Envelope Drive Brake Cast Spider Single Anchor Pin ES-150-8D</p>  <p>Air Chamber Bracket Flange Shape for Cast Spider</p> <p>Spider Part No. Location</p> |

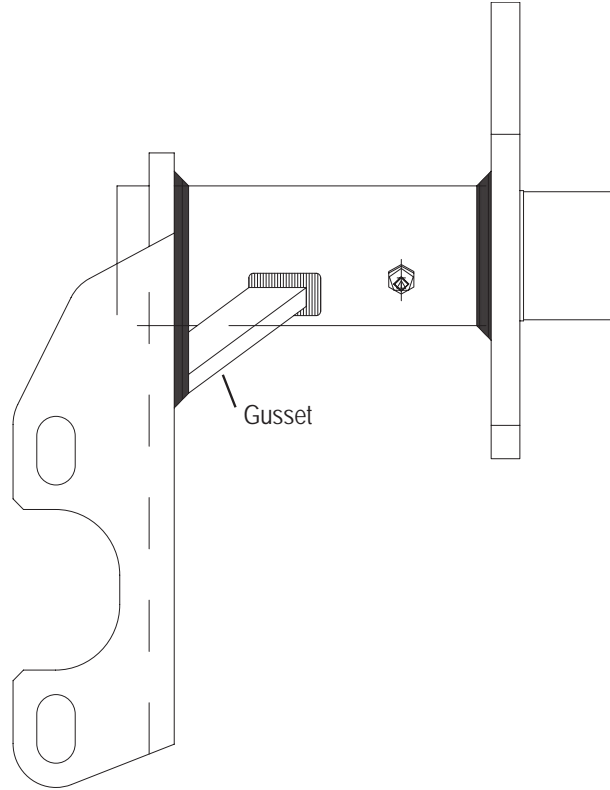
Camshafts

| | |
|---|--|
| <p>Cam Head for EB-180 Brakes</p> <p>1-3/8"</p>  <p>Cam Head for ES-165 and ES-150 Reduced Envelope Brakes</p> <p>1-1/8"</p>  |  <p>Camshaft Part No. Location</p> |
|---|--|

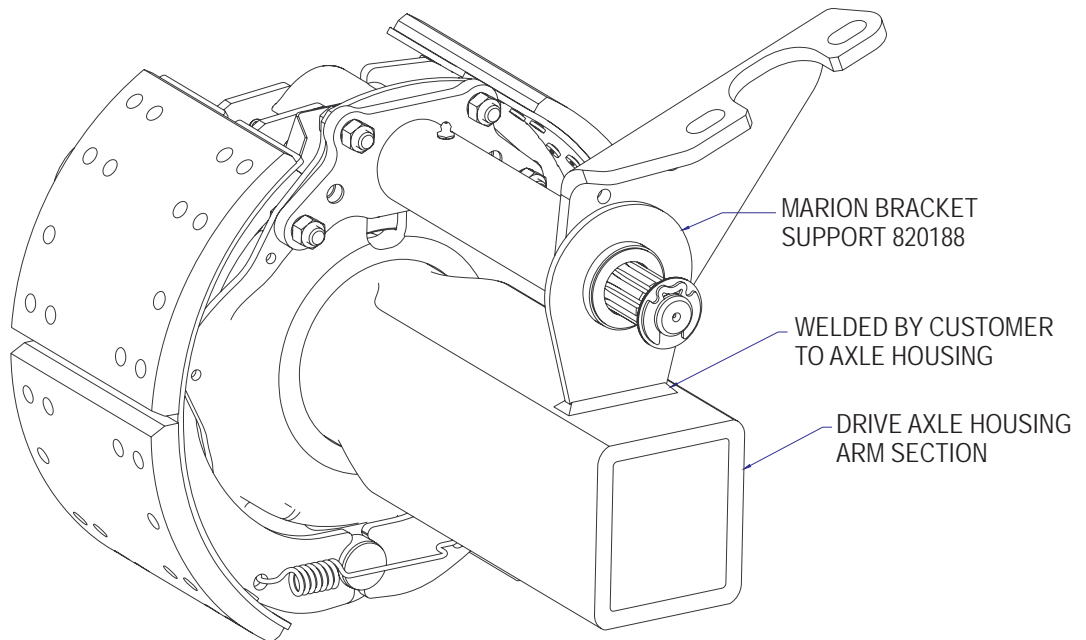
Nomenclature

Air Chamber Bracket with Gusset

Single Gusset



Marion Support



*For more information, talk to your Bendix or Roadranger
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