



Rear Drum Brake Corner Assembly Technical Specification

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Scope. This document provides the standard technical requirements for the Rear Drum Brake Corner Assembly. This document must only be used when invoked by a program-specific technical specification. References to the program-specific technical specification are included in this document where program-specific requirements are expected to exist.

Note: The program-specific technical specification may include additional program-specific requirements that are not referenced in this document and may supercede any requirements included in this document. In the case of any conflicts between this document and the program-specific technical specification, the program-specific technical specification takes precedence.

Note: The Program-specific Statement of Requirements (SOR) shall determine if this document is issued as one entity for corner level performance or as part of packet of documents that may additionally include specifications for vehicle level performance, component level performance, or both.

This standard establishes requirements for the rear drum brake corner assembly. These requirements apply to the vehicle described in Rear Drum Brake Corner Assembly Program-specific Technical Specification.

1.2 Mission/Theme. The rear drum brake corner assembly reacts with the brake apply and tire/wheel systems to provide the vehicle with smooth, safe deceleration performance under all driving conditions. The rear drum brake corner assembly provides wheel speed information to the chassis electrical system for antilock brake system (ABS), traction control system (TCS) and electronic stability control (ESC) chassis controls. The rear brake corner assembly also may provide warning

of impending lining wearout. The parking brake assembly transforms force and travel from the park brake cable system into torque applied to the rear drum. The rear drum brake corner assembly also provides a visible inspection hole to identify lining wearout.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

FMVSS 135	JASO C419-84
ISO 6312:2001	JASO C441-77

2.2 GM Standards/Specifications.

GMW3059	GMW14925
GMW3238	GMW14936
GMW8518	GMW14937
GMW14089	GMW14984
GMW14264	GMW14985
GMW14350	GMW14987
GMW14351	GMW14988
GMW14394	GMW15183
GMW14558	GMW15193
GMW14559	GMW15272
GMW14573	GMW15363
GMW14591	GMW15385
GMW14763	GMW15400
GMW14924	

2.3 Additional References. Use of the following documents may be required:

2.3.1 Federal/Regional. See the GM Global Legal Database for applicable documents.

2.3.2 Other.

- Approved General Motors Lining List
- Architectural Homeroom Statement of Requirements (SOR) package
- Brake Drum Technical Specification
- Brake System Subsystem Technical Specification (SSTS)
- GMNA Fastener Catalog
- GM Global Legal Database

- Master Process Documents (MPD)
- Production Part Approval Process (PPAP)
- Program-specific Statement of Requirements (SOR)
- Rear Corner Interface Dimension Chart
- Rear Drum Brake Corner Assembly Program-Specific Technical Specification
- Stakeholders: 0C Noise and Vibration, 20.04 Brakes
- Stakeholders: 0D.02:20:9
- Stakeholders: OE:20.04.01.01:3
- Vehicle Technical Specification (VTS)

3 Requirements

3.1 Component Definition. The rear drum brake corner assembly transforms hydraulic pressure and displacement into braking torque transmitted to the tire/wheel system.

3.1.1 Appearance. See program-specific technical specifications.

3.1.1.1 Corrosion. The rear drum brake corner components and assembly must meet the requirements specified in GMW15272 for both functional and cosmetic performance. See program-specific technical specifications.

3.1.2 Content.

3.1.2.1 Physical Content. The rear drum brake corner assembly includes the drum brake assembly, brake drum, brake pads, wheel hub and bearing, and park brake components. The rear drum brake corner assembly may include wheel speed sensors and brake pipes. See program-specific technical specification.

3.1.2.2 Functional Content. The rear drum brake corner assembly creates decelerating torque at each wheel in response to input from the service brake apply system. The rear drum brake corner assemblies transform vehicle kinetic and potential energy into heat. The foundation brakes provide for temporary storage and dissipation of heat. The rear drum brake corner assembly may provide wheel speed information to the chassis electrical system for Chassis control systems. The rear corner assembly also may provide warning of impending lining wearout or provide a means of visual inspection of lining wear. The rear corner assembly also provides a park brake function that is capable of holding the vehicle stationary and is capable of decelerating the vehicle via force and travel input from the park brake cable subsystem, or hydraulic pressure input from the electronic

stability control module, or electrical input from the park brake switch.

3.1.3 Environmental Definition. The rear drum brake corner assembly will be exposed to the following environmental conditions, (ambient -40 °C to +50 °C) in either customer usage or in the manufacturing and assembly process. The rear drum brake corner assembly shall provide satisfactory performance during and after these exposures. Appropriate laboratory tests may be used to demonstrate this performance.

The minimum temperature is the minimum temperature at which a component will be expected to operate. Assisted vehicle starting shall be permitted. Temporary degradation of the component function shall be permitted, but permanent loss of function shall not result in a walk home situation.

The maximum continuous temperature is the maximum temperature a component will experience on a continuous basis and be expected to maintain design functional life. The vehicle shall be able to experience 1200 h/12 000 cycles per 160 000 km of operation during continuous thermal conditions. Occupant safety shall not be compromised during continuous thermal conditions.

The maximum excursion temperature is the maximum temperature the component will experience on an infrequent basis and be expected to maintain functional life. The vehicle shall be able to experience 60 h/400 cycles per 160 000 km of operation during excursion thermal conditions. Occupant safety shall not be compromised during excursion thermal conditions.

If the vehicle target life is greater than 160 000 km, the hours and cycles should be adjusted accordingly. See program-specific technical specification. [Stakeholders: 0D.02:20:9]

3.1.3.1 Temperature Range. The temperature range of each component during operation and storage shall range from -40 °C to a maximum temperature (TMAX) which is specified to the component below:

Lining: TMAX = 650 °C Excursion

Drum: TMAX = 650 °C

Brake Mechanism:

TMAX = 230 °C Excursion

Bearing: TMAX = 120 °C

TMAX = 180 °C Excursion with no seal damage

Fluid: TMAX = 180 °C for Department of Transportation (DOT)
(DOT 3 fluid)

TMAX = 190 °C (for DOT 4 fluid)

TMAX = 200 °C (for DOT 5 fluid)

3.1.3.2 Humidity Range. The relative humidity range of each component during operation and storage shall range from 0 to 100%.

3.1.3.3 Atmospheric Pressure. The rear brake corner assembly will be exposed to between 330 and 860 mm Hg during operation and storage.

3.1.3.4 Potential Contaminants. The brake corner must either be able to withstand prolonged exposure to contaminants which could be encountered in vehicle use or must be packaged to protect from them. Possible contaminants could include engine oil, transmission fluid, power steering fluid, coolant/antifreeze, brake fluid, windshield washer fluid, ammonia glass cleaner, gasoline, other fuels, transaxle or differential lube, wheel bearing lube, air conditioning refrigerant, water, salt water, snow, ice, acid rain, deicing and dust control chemicals, dirt, dust, grit, sand, mud, road tar, oil, rustproofing/undercoating, ozone. Contact with these contaminants cannot degrade function of the brake corner.

3.1.3.5 Non-operating Environmental Exposure. The brake corner shall meet all operating performance requirements, without loss of function or degradation of service life, under the operating environment defined in 3.1.3.1 after exposure to the following non-operating conditions:

- Component transport by airplane at altitudes up to 13 700 m, with air temperature -50 °C and pressure of 125 mm Hg.
- Free air temperature up to 93 °C.
- Vehicle transport by ground via haul-away carriers and train.
- Vehicle transport via ocean transport – cargo ship (vibration and corrosion).

3.1.4 Interfaces. The program-specific technical specification must reference the necessary Rear Corner Interface Dimension Chart and appropriate drawing files. See program-specific technical specification.

3.1.4.1 Driver Information.

3.1.4.1.1 Lining Wearout Inspection. The rear drum brake corner assembly shall provide a visible inspection hole to identify lining wearout. See program-specific technical specification.

3.1.4.2 Body Structure.

3.1.4.2.1 Cooling Coefficient. The body structure, bumper, fascia, wheel liner, and tire/wheel

subsystems shall provide rear drum cooling coefficients as specified in the program-specific technical specification.

3.1.4.2.2 Air Flow Requirements. When applicable, body structure shall provide an opening to route air flow to the rear brake corner component. See program-specific technical specification.

3.1.4.3 Chassis Electronics and Controls. The chassis electronics and controls subsystem will provide electrical power to the rear brake corner assembly for wheel speed sensors. As required, the rear brake corner assembly may provide wheel speed signals from each corner to the chassis electronics and controls subsystem. See program-specific technical specification.

3.1.4.4 Powertrain. See Architectural Homeroom SOR package for the specific program requirements.

3.1.4.5 Rear Suspension.

3.1.4.5.1 Structure Interface. The rear drum brake corner assembly will interface with the suspension and chassis structure as shown in the specified drawing file. See program-specific technical specification.

3.1.4.5.2 Load Capacity. The rear suspension shall provide support and reaction capability for the rear brake corner assembly. The maximum brake torque to be reacted to the rear suspension, in Newton meters (Nm), shall be defined in the program-specific technical specification.

3.1.4.5.3 Suspension Loads. Loads are to be provided as part of architectural homeroom SOR package for the specific program requirements.

3.1.4.5.4 Axle Mounting Boss Stiffness. The minimum axle to brake mounting boss stiffness shall be specified in the program-specific technical specification for:

- In-plane stiffness (parallel to braking loads) - Newtons per millimeters (N/mm).
- Torsional stiffness - Newtons per millimeters (N/mm).

Note: The deflection of the trailing boss must be greater than or equal to that of the leading boss during a brake application in the forward direction. The difference in stiffness between the two bosses shall be less than 5%.

3.1.4.6 Steering. For all-wheel steer vehicles, the rear corner assembly will react all steering loads. Loads are to be provided as part of architectural homeroom SOR package for the specific program.

3.1.4.7 Tire/Wheel/Trim. See program-specific technical specification. The wheel assembly files should include:

- a. Nominal composite wheel profile.
- b. 1 mm radial, 3 mm axial offset minimum allowable clearance to nominal wheel.
- c. 5 mm radial, 6 mm axial offset nominal clearance to nominal wheel profile.

Note: For flatness and concavity requirements of the corner components, see GMW15385 and GMW15400.

3.1.4.7.1 Mounting. Wheel studs must be selected from GM standard fastener catalogue. See program-specific technical specification for mounting configuration.

3.1.4.7.2 Cooling Airflow. See program-specific technical specification.

3.1.4.7.3 Clearance.

3.1.4.7.3.1 Minimum Allowable Wheel Clearance. The maximum envelope of the rear drum brake corner assembly (including build tolerances, lining wear, and deflections) will be less than the minimum envelope of the wheel (including build tolerances, run out, wheel balance weights, tire chains, and deflections under load). The design envelope will be 3.0 mm lateral clearance and 1.0 mm radial clearance between the rear brake corner and the wheel. Layouts shall show the packaging envelope. The supplier shall provide component design information, including the component packaging envelope and all positioning dimensions and tolerances. See program-specific technical specification.

3.1.4.8 Brake Apply.

3.1.4.8.1 Rear Drum Brake Corner/Brake Pipe Connection. The rear drum brake corner assemblies will interface with the brake apply system pipe fittings using a direct connection. Allowance for pipe tube nut and initial length of tube shall be included in the drum brake envelopes shown in the drawing files listed. See program-specific technical specification.

3.1.4.8.2 Brake Fluid. The rear drum brake corner assemblies shall be compatible with DOT 3, DOT 4, and DOT 4+, and DOT 5 brake fluid. See program-specific technical specification.

3.1.4.9 Engine Control Unit Wiring Connector. Appropriate routing, protection and consideration needs to be applied for the wiring and wiring connector for the sensors for the brake control systems. See program-specific technical specification.

3.1.4.10 Rear Foundation Brake Backing Plate.

The rear brake assembly will provide a reaction point for the park brake rear cable conduits. The conduit reaction element will allow end-fitting insertion with less than 50 N. Stiffness of the reaction element will be such that loaded deflections will consume less than 5% of required cable travel. The reaction element will provide a cable exit angle that allows a minimum of 40 mm of clearance between the tire/wheel and rear park brake cables.

The rear drum brake corner assembly will interface with the rear park brake cables to provide proper system function. The internal mechanisms of the parking brake will provide adequate force to fully return the cable system. In order to insure adequate space for a cable return spring, the minimum distance from the reaction bracket to the apply lever shall be 80 mm. This requirement will be waived if the internal mechanisms of the component provide adequate force to fully return the cable system.

3.1.5 Usage Definition. The customer usage data given in this section are for high levels of usage in 160 000 km of retail customer driving. (Trucks may require higher mileage. See program-specific specification.)

Note: Low levels of usage may be more appropriate for certain failure mechanisms, such as corrosion.

Components may be exposed to water-based fluid spray due to vehicle usage. Components may be exposed to water submersion during special vehicle usage, e.g., boat launches, from towed trailers, and/or fording. The vehicle may be subjected to underhood wash including engine degreaser. The vehicle may be subjected to home or hand wash, drive-through or wand washing throughout its life. The wheel bearing assemblies will be exposed to the corrosive environment, which occurs in the Scandinavian countries, the North East United States of America and South East Canada. The environment is composed of temperature, humidity, salt, splash, mud, and component usage. Corrosion will be evaluated on durability vehicles completing ten year corrosion schedule. Test procedures will be listed in the vehicle program Vehicle Technical Specification (VTS). See the program-specific technical specification.

3.1.5.1 Antilock Brake System Applications.

The ABS system will operate up to 2 h total duration. The longest individual ABS application is expected to be 27 s, equivalent to ABS activation from 100 to 0 km/h on a 0.1 coefficient surface. The ABS will be activated up to 5000 times.

3.1.5.2 Traction Control System Applications.

The traction control system (TCS) will operate up to 6 h total duration. The TCS will be activated up to 3000 times.

3.1.5.3 Line Pressure Distribution. The rear drum brake corner assembly will have a hydraulic pressure distribution listed in Table A1. See program-specific technical specification.

3.1.5.4 Fade Assist System. See program-specific technical specification.

3.1.5.5 Electronic Stability Control Applications. See program-specific technical specification.

3.1.5.6 High-Level Park Brake Force Distribution. The rear corner park brake force distribution is listed in Table 1. Also, the park brake assembly must be able to withstand a one-time specified high level force input from the cable system without loss of function. See program-specific technical specification for the level of this input.

Note: The torque level achieved for each portion of the test must be for the worst case performing brake (-3 sigma). Testing must be performed such that 95% reliability is demonstrated at a confidence of 50%.

Table 1: Park Brake Force Distribution

Number of Park Brake Applies	Torque Level Achieved
100 000	To hold 30% grade

3.2 Product Characteristics. See the program-specific technical specification for exceptions to the requirements in this section.

3.2.1 Performance Requirements. The following performance characteristics apply to the rear brake corner assembly. These requirements are in addition to requirements contained in other applicable technical specifications.

Rear drum brake corner components shall meet the performance requirements for all regions defined in the program-specific technical specification when accounting for regional differences in pad material. Rear brake corner components shall be able to meet the performance requirements of different regions with linings selected from the Approved General Motors Lining List.

Supplier shall provide the GM engineer with test data that verifies the worst case (± 3 sigma)

assembly performance will meet the requirements as stated below.

3.2.1.1 Output Characteristics. The rear corner assembly shall meet the following requirements when tested per GMW14925, unless otherwise specified. The range of results represented in five samples tested shall meet the defined requirements. Reference GMW14925 for data processing and reporting method.

3.2.1.1.1 Hold Off. The corner shall develop braking torque at ≤ 350 kPa.

3.2.1.1.2 Apparent Friction. The apparent friction (μ) for any proposed lining must be reviewed and approved by GM engineering. All linings to be used must be selected from the approved General Motors Lining List. Apparent friction requirements are tested per GMW14925 and other specified procedures on five (5) samples. See Table A2 for the apparent friction conditions and requirements.

3.2.1.1.3 Hysteresis. The rear corner assembly torque hysteresis shall meet the requirements when tested to GMW14925. See Table 2 for conditions and requirements.

Table 2: Hysteresis Conditions and Requirements

	Conditions	Hysteresis (%)
0.1	Green	$\leq 5\%$
0.2	Burnished	$\leq 5\%$
0.3	Post FMVSS 135 Fade	$\leq 8\%$

3.2.1.1.4 Apparent Piston Travel. The apparent piston travel – millimeters (mm) at the rear drum assembly shall meet the requirements during the second warm ramp apply per GMW14925. See Table 3 for conditions and requirements.

Table 3: Apparent Piston Travel Conditions and Requirements

	Conditions	Travel (mm)
0.1	Burnished; 500 kPa	≤ 1.10
0.2	Burnished; 5000 kPa	≤ 2.20
0.3	Burnished; 12 000 kPa	≤ 3.20
0.4	Post FMVSS 135 Fade; 500 kPa	≤ 1.10
0.5	Post FMVSS 135 Fade; 5000 kPa	≤ 2.20
0.6	Post FMVSS 135 Fade; 12 000 kPa	≤ 3.20

mm = millimeters

3.2.1.1.5 Apparent Friction versus Temperature. See program-specific technical specification.

3.2.1.1.6 High Speed Brake Abuse. The rear drum assembly shall meet the requirements when tested per GMW14984 and GMW14394. Review test results with GM Engineering.

3.2.1.1.6.1 Apparent friction should not decrease more than 30%.

3.2.1.1.6.2 Apparent piston travel should not increase more than 35%.

3.2.1.1.6.3 Heat checking is permitted. No cracks at the edge or through the drum are permitted.

3.2.1.2 Drag Torque. The rear drum shall meet the brake drag requirements, following the pressure apply conditions listed, per GMW14351 with minimum running clearance. See Table 4 for conditions and requirements. [Stakeholders: OE:20.04.01.01:3]

Table 4: Drag Torque Conditions and Requirements

	Conditions	Drag Torque (Nm)
0.1	Drag Torque at 1000 kPa Pressure Apply	≤ 0.8
0.2	Drag Torque at 2500 kPa Pressure Apply	≤ 1.0
0.3	Drag Torque at 5000 kPa Pressure Apply	≤ 1.5
0.4	Drag Torque at 10 000 kPa Pressure Apply	≤ 4.0

Nm = Newton meters

3.2.1.2.1 Running Clearance Drag. The running clearance between the drum and the shoes shall be optimized to satisfy drag, fluid displacement, and park brake lever travel requirements. In any case it can be less than 0.2 mm.

3.2.1.3 Brake Noise.

3.2.1.3.1 Dynamometer Low Frequency Brake Groan. See Architectural Homeroom SOR to determine specific suspension packages and applications. See program-specific technical specification for requirements.

3.2.1.3.2 Dynamometer High Frequency Brake Squeal Matrix. All brake corner assemblies tested shall meet the requirements when tested per GMW14591. A minimum of three samples must be tested. See Table 5 for conditions and

requirements. Also see program-specific technical specification.

Table 5: Brake Squeal Conditions and Requirements

	Brake Noise Sound Pressure Level (dB(A)).	Maximum Percent Noisy Stops Warm Section	Maximum Percent Noisy Stops Cold Section
0.1	70	10.0%	10.0%
0.2	80	3.0%	3.0%
0.3	90	0.8%	0.8%
0.4	100	0.2%	0.2%

dB(A) = A-weighted decibels

3.2.1.3.3 Modal Separation. Tangential, racking and axial modes in drum should not align with each other. Components within the corner assembly and interfacing components shall also have modes separated. Consult GM Computer Aided Engineering Group. Also see the Brake Drum Technical Specification GMW15385 for detailed description. See program-specific technical specification.

3.2.1.3.4 Natural Frequency. Measure and document the natural frequencies of the brake drum. Also determine the percent critical damping of each frequency. See program-specific technical specification.

3.2.1.4 Brake Roughness.

3.2.1.4.1 Corrosion Cleanability. Following the Surface Roughness Method per GMW14987, the maximum brake torque variation shall be less than 20%. After five brake applies, the brake torque variation shall be less than 10%.

3.2.1.4.2 Thermal Roughness. Brake torque variation shall be less than 10% during GMW14985.

3.2.1.5 Lining Wear Rate. The average lining wear during stops at the listed initial drum temperatures, as measured during GMW14394, shall meet the requirements in Table 6. This requirement may be validated by a vendor test approved by GM that demonstrates that the brake system meets the wear requirements in the VTS or Brake System Subsystem Technical Specification (SSTS).