

# MISSOURI



## School Bus Inspection Regulations Manual

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Driver and Vehicle Safety Division  
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**Please adhere to the requirements of *11 CSR-50-2.090 - Inspection Station Operational Requirements* which states:**

**"All current manuals, bulletins or other rules issued by the superintendent of the Missouri State Highway Patrol must be read and initialed by the station owner or operator and each inspector/mechanic, and must be available at all times for ready reference."**

# SCHOOL BUS INSPECTION REGULATIONS

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# **11 CSR 50-2.320 - SCHOOL BUS INSPECTION**

**The standards and procedures for the inspection of a motor vehicle as set out in Motor Vehicle Inspection rules shall apply to Types A-D school buses. In addition, items listed in 11 CSR 50-2.320, School Bus Inspection, will also be inspected on all school buses.**

**Procedures contained in this manual are applicable only to the inspection of school buses. Please consult with the Motor Vehicle Safety Inspection Regulations Manual for regulations pertaining to the inspection of other types of motor vehicles.**



## **Brake Performance (11 CSR 50-2.150)**

A brake performance test shall be performed by an inspector/mechanic on all single unit motor vehicles equipped with mechanical, hydraulic or power assisted hydraulic service brakes. The brake performance test may be conducted by using any one (1) of the following procedures: a decelerometer test, a drive and stop test, a brake testing machine or a dynamometer test. The selected test shall be conducted on the inspection station premises.

*Decelerometer Test.* Mount and level decelerometer on vehicle. At a speed of five to twenty miles per hour (5–20 mph) apply service brake firmly. Observe decelerometer reading.

Reject vehicle if:

- The vehicle is unable to develop deceleration equal to or greater than that listed for its classification as prescribed in Table I.

*Drive and Stop Test.* The inspector/mechanic shall operate the vehicle at a speed of five to twenty (5—20) mph and apply the service brakes firmly.

Reject vehicle if:

- The vehicle's brakes fail to function or if the vehicle pulls significantly to either side.

*Brake Testing Machine.* Drive vehicle onto brake testing machine. Apply brakes firmly at a speed from four to eight (4–8) mph without wheel lock-up. If a computerized brake testing machine is utilized, a copy of the results will be provided to the vehicle owner.

Reject vehicle if:

- The vehicle is not capable of developing evaluated braking force equal to or greater than that shown for its classification as prescribed in Table I. At least three (3) tests should be made before a vehicle is rejected
- Any wheel fails to indicate braking action
- The reading on any one (1) wheel is less than seventy-five percent (75%) of the reading on the other wheel on the same axle
- The braking force of both wheels on one (1) axle is more than seventy-five percent (75%) of the total force of all the wheels.

*Dynamometer Test.* Test in accordance with the manufacturer's instructions.

**Table 1**

<b>Classification of Vehicles</b>	<b>Braking Force as a Percentage of Gross Vehicle or Combination</b>	<b>Deceleration in Feet Per Second</b>
Passenger vehicles with a seating capacity of 10 people or less including driver, not having a manufacturer's gross vehicle weight rating	52.8%	17
Single unit vehicles with a manufacturer's gross vehicle weight rating of 10,000 pounds or less	43.5%	14
Single unit vehicle with a manufacturer's gross weight rating of more than 10,000 pounds	43.5%	14

## **Brake Components (11 CSR 50-2.160)**

### *Hydraulic System*

*Pedal Reserve.* With the vehicle stopped, apply moderate foot force on the brake pedal for at least one (1) minute and observe if the pedal moves slowly toward toe board.

Reject vehicle if:

- Brake pedal moves slowly toward the toe board, indicating fluid leakage, while pedal pressure is maintained for one (1) minute
- Less than one-fifth (1/5) of the total available pedal travel remains
- Less than two-fifths (2/5) of total available pedal travel remains on a school bus
- The brake warning device or light comes on when the brake pedal is depressed. Do not inspect the anti-lock braking system warning device or light

*Power Reserve.* Determine if system is operating by first stopping engine, then depress brake pedal several times to destroy all vacuum in system. Depress pedal with a moderate foot force. While maintaining this force on the pedal, start engine and observe if pedal falls slightly when engine starts. Hydroboost system must have accumulator pressure for two (2) complete brake applications and should have return pressure against foot. If vehicle is equipped with electrohydraulic booster brake system, stop engine, turn ignition to the "on" position, depress brake pedal and observe if electric pump, buzzer and pump indicator lights operate. Inspect school buses manufactured after March 1, 1987, for audible or visible brake warning signals, or both.



Reject vehicle if:

- Service brake pedal does not fall slightly as engine is started while pressure is maintained on pedal
- There is audible leakage in the vacuum system
- Hydroboost brake system does not have two (2) brake applications available
- Electric pump, buzzer and pump indicator lights fail to function on vehicles equipped with electrohydraulic booster brake system
- School bus manufactured after March 1, 1987, is not equipped with proper audible or visible brake warning signals, or both, or signals fail to function.

*Master Cylinder.* Inspect master cylinder for proper fluid, fluid level, fluid leakage and play in push rod. Power master-type systems should have the brake pedal depressed ten to forty (10–40) times or until the pedal is firm, with the ignition off, before inspecting fluid level. Master cylinder reservoirs with distinctly marked minimum levels should be inspected with the cap on. Observe the fluid level to ensure it complies with the manufacturer's suggested minimum level. The cap will then be removed to inspect the gasket for fluid contamination, swelling, cracking, misshape or tears.

Reject vehicle if:

- Master cylinder contains fluid other than brake fluid, if master cylinder leaks, if fluid level is more than three-fourths inch (3/4") below top of reservoir
- Vehicle with disc brakes and dual hydraulic systems show the brake fluid level measuring more than one-half inch (1/2") below the top of the reservoir on master cylinders that have no manufacturer's minimum markings
- Master cylinder brake fluid level is below the manufacturer's minimum fluid level as marked on the reservoir
- There is no play in the push rod with brake pedal not depressed
- Master cylinder gasket is torn or misshaped.

*Drums, Discs and Internal Brake Components.* At least one (1) front or one (1) rear wheel and drum must be removed on each passenger vehicle, one-half (1/2) ton and three-quarter (3/4) ton pickup trucks, or similar type vehicles not equipped with dual rear wheels. Only the wheel must be removed on vehicles equipped with disc brakes. Identification marks shall be made on the wheel and lug before removal so the wheel can be remounted in the same position to insure wheel balance. On drum brake systems, a new cotter pin must always be used when remounting a wheel and drum. The removal of a wheel and/or drum is not required if the brake performance test has been administered using an approved computerized brake testing machine. When an approved computerized brake testing machine is used, and no wheel is removed, the inspector shall mark through the space on the MVI-2 form provided for "Brake Inspected" with the letters "CBTM." When removal of a wheel is required, a wheel appearing to leak brake fluid or grease, shall be the wheel removed to inspect for contamination. Wheels on four (4)-wheel drive vehicles equipped exclusively with drum-type brakes are not required to be removed.

Inspect drums, discs, calipers, linings, pads, wheel cylinders, hoses, lines and other internal brake components.

Reject vehicle if:

- There are substantial cracks on the friction surface extending to open edge of drum or to the edge of a disc
- A brake drum or disc has external cracks
- Friction surface of disc brake pads, rotor, brake linings or brake drum is contaminated with oil, grease or brake fluid
- A brake lining is worn into the friction surface of the brake drum where the brake drum cannot be removed after loosening the adjusting screw (backing off of the self-adjusting mechanism)
- Thinnest point of bonded lining is less than one-thirty-second inch (1/32")
- Rivets are loose or missing or if lining or pad is not firmly attached to shoe
- Riveted lining is worn to less than one-thirty-second inch (1/32") above any rivet head at thinnest point
- Wire is visible on the friction surface of wire-backed linings
- Lining is broken or cracked, does not include heat cracks
- A primary or secondary shoe and lining is improperly installed
- Bonded pads are worn at any one (1) point to less than one-thirty-second inch (1/32")
- Riveted pads are worn at any one (1) point to less than five-thirty-seconds inch (5/32"). If unable to determine if pads are riveted or bonded, pads will be considered to be bonded pads
- A wheel cylinder or caliper leaks a sufficient amount of hydraulic brake fluid to cause droplets. Do not mistake assembly fluid for hydraulic fluid
- Hoses or tubing leak or are cracked, chafed, flattened, restricted, bubbled, improperly installed or insecurely fastened
- Mechanical parts are missing, broken or badly worn
- There is excessive friction in brake pedal, linkage or other components
- Pedal levers are improperly positioned or misaligned
- Brake components are misaligned, binding, obstructed or will not function properly.

## **Air and Vacuum Brake Systems (11 CSR 50-2.170)**

### *Vehicles With a Vacuum Brake System*

On vehicles equipped with a vacuum brake system, the engine should be allowed to run for one (1) minute to build vacuum. Inspect system for collapsed, broken, badly chafed and improperly supported hoses, tubes and loose or broken hose clamps. Depress brake pedal with moderate foot force. While maintaining this force on the pedal, start engine and observe if pedal falls slightly when engine starts. Build full vacuum, then shut off engine and make as many full brake applications as possible. On vehicles with low vacuum indicators, build full vacuum. Shut off engine and reduce vacuum by making a series of moderate brake applications. A flashing or buzzing signal should function when vacuum reaches eight inches (8") mercury.

Reject vehicle if:

- Hoses or tubes are collapsed, leaking, broken, badly chafed, improperly supported or loose because of broken clamps
- Service brake pedal does not fall slightly as engine is started while pressure is maintained on pedal
- Vacuum reserve is insufficient to make one (1) full application after engine shutoff
- Indicator fails to function when system is reduced to eight inches (8") mercury.

### *Vehicles With an Air Brake System*

The following will apply to all motor vehicles equipped by the manufacturer with an air brake system. Open all drain cocks in system until pressure gauge reads zero (0). Close drain cocks and run engine at fast idle. Record time to raise air pressure from fifty to ninety pounds per square inch (50–90 psi) on gauge. Observe gauge pressure at which light or buzzer on low pressure indicator goes out or off. Continue running engine and observe gauge pressure when governor cuts out. With engine idling, make a series of brake applications and observe gauge pressure when governor cuts in. With fully charged system, stop engine and record pressure drop in psi per minute with brakes fully applied. With fully charged system, stop engine and record pressure drop in psi per minute with brakes released. Make a series of brake applications until low pressure warning signal operates. With fully charged system, stop engine and make one (1) full brake application. Measure drop in reservoir pressure.

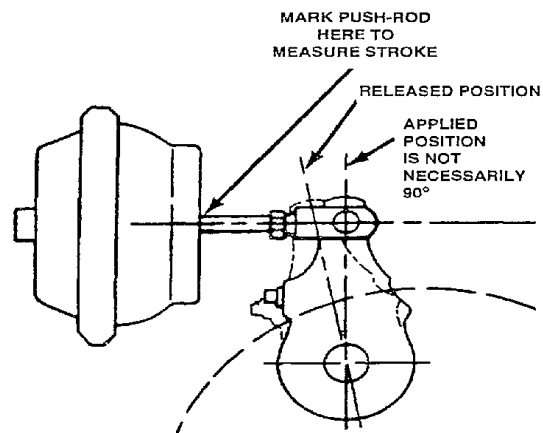
Inspect all air hoses and connections. Inspect lines for contact with frame, axles or exhaust system. Inspect for leaks that may be heard from valves, diaphragms and piston cups. Inspect air safety valve. Inspect condition of compressor drive belts.

Reject vehicle if:

- Time required to build pressure from fifty to ninety (50–90) psi at fast idle is more than five (5) minutes
- Low pressure warning fails to function when pressure is lowered to between fifty to seventy (50–70) psi
- Governor cut-out pressure is higher than one hundred twenty-five (125) psi
- Governor cut-in pressure is lower than eighty (80) psi
- Leakage in psi per minute exceeds three (3) psi for single vehicles and four (4) psi for combination of two (2) vehicles with brakes applied
- Leakage in psi per minute exceeds two (2) psi for single vehicles and three (3) psi for combination of two (2) vehicles with brakes released
- Air reserve is not sufficient to permit one (1) full brake application after engine is stopped
- Reservoir pressure is lowered more than twenty percent (20%) of first reading
- Leaks, breaks, crimps or cracks in the air hoses, tubes or connections are present
- Lines are being rubbed by moving parts or are touching the exhaust system
- Leaks in valves, diaphragms or piston cups can be heard
- Air safety valve does not operate
- Compressor drive belts are badly worn or loose

## *Air Brakes Adjustment*

On vehicles equipped with cam brakes, mark each brake chamber push rod at the face of the brake chamber with the brakes released. Apply the air brakes fully, minimum air pressure eighty-five (85) psi, and measure the distance the push rod travels from the face of the chamber to the mark previously made when the brakes were released. This measurement is the push-rod stroke (Illustrated in Figure 1)



**MEASURING THE CAM BRAKE ADJUSTMENT**

FIGURE 1

Reject vehicle if:

- Push-rod travel exceeds the maximum stroke listed in Table 1

**-TABLE 1-**

<b>CLAMP TYPE BRAKE CHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
6	4-1/2	1-1/4
9	5-1/4	1-3/8
12	5-11/16	1-3/8
16	6-3/8	1-3/4
20	6-25/32	1-3/4
24	7-7/32	1-3/4
30	8-3/32	2
36	9	2-1/4
*****		
<b>LONG STROKE CLAMP TYPE CHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
16	6-3/8	2.0
20	6-25/32	2.0
24	7-7/32	2.0
24*	7-7/32	2.5
30	8-3/32	2.5
<i>* For 3" maximum stroke type 24 chambers</i>		
*****		
<b>TIE ROD STYLE PISTON BRAKE CHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
30	6-1/2 (165mm)	2.5 (64 mm)
*****		
<b>BOLT TYPE BRAKE CHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
A	6-15/16	1-3/8
B	9-3/16	1-3/4
C	8-1/16	1-3/4
D	5-1/4	1-3/4
E	6-3/16	1-3/8
F	11	1-3/8-1/4
G	9-7/8	2
<b>ROTOCHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
9	4-9/32	1-1/2
12	4-13/16	1-1/2
16	5-13/32	2
20	5-15/16	2
24	6-13/32	2
30	7-1/16	2-1/4
36	7-5/8	2-3/4
50	8-7/8	3
*****		
<b>DD-3 BRAKE CHAMBER DATA</b>		
TYPE	OUTSIDE DIAMETER	BRAKE ADJUSTMENT LIMIT
30	8-1/8	2-1/4

## *Commercial Vehicles - Emergency and Parking Brakes*

Every vehicle equipped exclusively with an air brake system and every commercial motor vehicle equipped with a vacuum, air over hydraulic, hydroboost or electrohydraulic booster brake system shall be equipped with parking brakes adequate to hold the vehicle or combination on any grade upon which it is operated under any condition of loading, on a surface free from ice and snow. The parking brake shall be capable of being applied by the driver's muscular effort or by spring action. Their operation may be assisted by the service brakes or other source of power, provided that failure of the service brakes or other power assisting mechanisms will not prevent the parking brakes from being applied. The parking brake shall be so designed that when once applied it shall remain in the applied position despite exhaustion of any source of energy or leakage of any kind.

*Emergency system.* Apply the emergency operating control fully or release air pressure from the spring brake actuators using the manual control valve. Observe locking and holding feature of the actuating mechanism. Observe operating mechanisms for bottoming before brakes are fully applied. Observe if spring brakes apply when control valve is manually operated. Inspect for worn, missing or defective cotter pins, springs, rods, yokes, couplings or anchor pins and cables. Observe if mechanism releases brakes when release control is operated.

Reject vehicle if:

- Operating mechanisms fail to hold brakes in applied position without manual effort
- Operating mechanism bottoms before brakes are fully applied
- Spring brakes fail to apply when control valve is operated
- Mechanical parts are missing, broken or badly worn or pull cables are badly worn, stretched, frayed or not operating freely
- Brakes do not fully release when release control is operated.

## **Lighting and Signaling Equipment (11 CSR 50-2.180 / 11 CSR 50-2.320)**

### *Headlights.*

Headlights shall be mounted one (1) on each side or two (2) on each side, depending upon application, at the same level.

*Beam Indicator.* Every motor vehicle equipped with multiple beam headlights shall be equipped with a beam indicator which shall be lighted only when the high beam is in use.

*Reflectors.* Every 1966 and later model vehicle, except a motorcycle, must be equipped with two (2) red reflectors. A reflector may be in combination with the taillight and must be mounted on the rear, one (1) on each side, at a height not to exceed sixty inches (60") nor less than fifteen inches (15") above the surface upon which the vehicle stands. School buses shall be equipped with two (2) red reflectors on the rear as far apart as possible, with one (1) red reflector on each side as far to the rear as possible and one (1) amber reflector on each side as far forward as possible. School buses over thirty feet (30') in length shall have one (1) additional amber reflector on each side midway between the front and rear side reflector.

*Clearance and Side Marker Lamps.* School buses shall be equipped with clearance and side marker lamps, except school buses less than eighty inches (80") in width.

- Two (2) amber clearance lamps on the front and two (2) red clearance lamps on the rear. Clearance lamps shall be mounted one (1) at each side and as far as practical to indicate the width and height of the vehicle. Clearance lamps may be connected to headlamp switch.
- One (1) amber side marker lamp located on each side at or near the front and one (1) red side marker lamp located on each side at or near the rear. Side marker lamps may be in combination with the clearance lamps.

*Identification Lamps.* School buses shall be equipped with identification lamps, except school buses less than eighty inches (80") in width. Three (3) red lamps shall be mounted in the center rear body and three (3) amber lamps in center front of body. Lamps shall be mounted on the roof and centered in a cluster. Lamps may be connected to headlamp switch.

*Intermediate Side Marker Lamps.* School buses manufactured after July 1972, and over thirty feet (30') in length shall be equipped with an intermediate side marker lamp. One (1) amber side marker lamp located on each side between the front and rear marker lamps. Lamps may be connected to the headlamp switch.

*Stoptlights, Taillights and Signaling Devices.* All motor vehicles, except motorcycles, shall be equipped with at least two (2) taillights, mounted on the rear of the vehicle at the same level with at least one (1) on each side, not less than fifteen inches (15") or more than seventy-two inches (72") above the ground. These lights shall exhibit a plainly visible red light.

Every vehicle manufactured after January 1, 1954, must be equipped with mechanical or electrical turn signals and a stoplight if the distance from the center of the top of the steering post to the:

- Left outside limit of the body, cab or load exceeds twenty-four inches (24"); and

- Rear limit of the body or load exceeds fourteen feet (14'). The limit of fourteen feet (14') shall apply to both single and vehicle combinations.

Headlights must be on with the engine running, when inspecting the operation of signaling devices and stoplights. Move turn signal lever up and down and observe function of turn signal lights.

Stoplights installed by the manufacturer or their equivalent in number, size, and intensity shall be in operating condition. Stoplights may be red or amber, except when in combination with the taillight the stoplight must be red. Stoplights must operate when the service brake is applied. Types A2, B, C and D school buses shall be equipped with two (2) red stoplights seven inches (7") in diameter (prior to December 1988, six inches (6") in diameter), or if a shape other than round, a minimum of thirty-eight (38) square inches of illuminated area and two (2) red stop/taillights four inches (4") in diameter, or if a shape other than round, a minimum of twelve (12) square inches of illuminated area. The four-inch (4") stop/taillights shall operate in combination with the seven-inch (7") stoplights on school buses manufactured after December 31, 1988, when the service brake is applied. All stop/taillights must operate if so equipped. Type A1 buses with bodies supplied by chassis manufacturer may have manufacturer's standard stop and tail lamps.

Turn signals installed by the manufacturer or their equivalent in number, size, and intensity shall be in operating condition. The front signal lights may be white or amber and may be in combination with the parking lights. The rear signal lights may be red or amber, except when in combination with a taillight the lens must be red. All school buses shall be equipped with front turn signals as originally equipped by the manufacturer. If additional turn signal lamps are provided (front of body below windshield or top of fender), they shall be connected to the turn signal system without removal or disconnection of originally equipped front turn signals. All buses manufactured after July 1, 1997, shall be equipped with amber side-mounted turn signal lights. The turn signal lamp on the left side shall be mounted rearward of the stop signal arm, and the turn signal lamp on the right side shall be mounted rearward of the service door. Rear turn signals on Type A-2, B, C and D buses must be amber in color and at least seven inches (7") in diameter or, if a shape other than round, a minimum of thirty-eight (38) square inches of illuminated area. Rear turn signals on all Type A-1 conversion buses must be at least twenty-one (21) square inches in lens area and must be in the manufacturer's standard color.

*Front and Rear Red Warning Flashers.* School buses shall be equipped with two (2) seal-beam alternately flashing red lights and two (2) seal-beam alternately flashing amber lights on the front and rear of the vehicle. This eight (8)-lamp system shall be controlled by a manually operated switch. Under no circumstances are these lamps to be connected with the braking system. Lamps must flash at a rate of sixty to one hundred twenty (60–120) cycles per minute. The "on" cycle shall be long enough to permit the filament to come up to full brightness. The lens of each alternately flashing Signaling lamp shall be at least five inches (5") in diameter. The area extending outward approximately three inches (3") from each lens shall be painted black.



*Stop Signal Arm.* School buses shall have a red octagon signal arm, eighteen inches by eighteen inches (18" × 18"), installed on the left outside of the body with the word STOP plainly displayed. All Type C and D buses manufactured after June 30, 2007, shall be equipped with a second stop signal arm of the same size, color, and shape on the left outside of the body near the rear of the bus. Except that the rear stop signal arm shall have no words or images on the forward-facing side, the signal arm may contain a white border with lettering and background of a reflective material meeting United States Department of Transportation standards. The stop signal arm shall contain either one (1) alternately flashing red lamp at the top and one (1) at the bottom visible to the front and rear or light emitting diodes (LEDS) that flash and spell out the word STOP.

Reject vehicle if:

- Not equipped with required lights, reflectors, and signaling devices
- Any lighting device, signaling device or reflector is obstructed
- Any required light, reflector or signaling device fails to function properly  
Do not reject if turn signal fails to self-cancel or will function properly by manually holding the lever in the engaged position
- Any light, reflector or signaling device is not securely mounted or is not mounted in the prescribed area
- Any light, reflector or signaling device shows a color contrary to these regulations
- High beam indicator does not function properly
- Physical damage is present that would obviously cause a headlight beam to be either above or below horizontal or to the left or right of vertical
- Wiring or electrical connectors are defective
- A lens is missing, incorrectly installed, repaired with tape or broken to the extent that moisture or contamination could enter the reflective area or light socket
- The rear stop signal arm contains any words or images on the forward-facing side

## **Steering Mechanisms (11 CSR 50-2.200 / 11 CSR 50-2.320)**

All school buses manufactured after March 1, 1987, must have power steering.

Inspect for power steering.

Reject if:

- A school bus manufactured after March 1, 1987 is not equipped with power steering.

### *Steering Wheel Play*

An inspection for steering wheel play will consist of checking steering sector for looseness and binding condition. If vehicle is equipped with power steering, the engine must be running and the fluid level and belt tension must be adequate before testing. Turn steering wheel through a full right and left turn. If equipped, inspect energy absorbing steering column.

Inspect steering and reject vehicle if:

- Steering gear binds or jams other than at wheel stops
- There is more than two inches (2") of free movement in steering wheels up to and including eighteen inches (18") in diameter or more than three inches (3") in steering wheels over eighteen inches (18") in diameter
- Power steering belt slips, is frayed, if serpentine power steering belt has sections missing, if fluid level is below manufacturer's minimum fluid level, if hoses or connections are leaking, if a power steering unit has been disconnected and has not been converted to manual steering or if any component part is missing, loose or leaking sufficient fluid to cause droplets
- Energy absorbing steering column is collapsed or partially collapsed
- Steering wheel and steering column are not properly secured
- Steering gear box or steering rack assembly is not securely mounted.

### *Front and Rear Wheel Play*

An inspection for front and rear wheel play, which includes steering linkage, pitman arm, idler arm, stabilizer bar(s), connections, link(s), wheel bearings, tie rod ends and adjusting sleeves, can only be made by putting the ball joints under load. To load ball joints, the vehicle must be hoisted:

- Under the frame if the spring or torsion bar is on the lower control
- Under lower control arm, close to ball joint, if spring or torsion bar is on upper control arm
- From the underside of axle if the vehicle is equipped with kingpins or Twin I-Beams with ball joints

Inspect wheel bearings by grasping the tire, by both top and bottom, and rock it in and out. To verify that any looseness detected is in the wheel bearings, notice the movement between the brake drum or disc and the backing plate or splash shield.

Inspect front wheels, king pin (spindle bolts) and idler arm for play. On vehicles with power steering, the engine must be running. Eliminate all wheel bearing movement by first applying the service brake. Grasp front and rear of tire and attempt to turn assembly right and left. Then grasp top and bottom of tire and attempt to rock it in and out. Observe movement at extreme front and rear, both at top and bottom, of tire.

Inspect all steering linkage, pitman arm, stabilizer bar(s), connections, link(s), tie rods and adjusting sleeves for locked joints and looseness by working them up and down and back and forth by hand.

Inspect condition of all upper and lower control arms, pivot shafts, pivot shaft mountings, radius arms, and all bushings.

Reject vehicle if:

- Wheel bearing looseness allows relative movement between drum and backing plate (disc and splash shield) more than one-eighth inch (1/8") measured at the outer circumference of the tire for vehicles ten thousand pounds (10,000 lbs.) Gross Vehicle Weight Rating (GVWR) or less or one-quarter inch (1/4") for vehicles more than ten thousand pounds (10,000 lbs.) GVWR. A wheel bearing falls apart when a wheel is removed to inspect a brake or if the bearing is broken
- Front wheel movement is in excess of one-fourth inch (1/4") for wheels sixteen inches (16") or less, three-eighths inch (3/8") for wheels over sixteen inches (16") to and including eighteen inches (18") and one-half inch (1/2") for wheels over eighteen inches (18"). (An idler arm or king pin must meet this criteria before being rejected.)
- Excessive vertical (up and down) or lateral (side) movement is evident in any of the steering linkage sockets, tapered studs are loose in their mounting holes, any movable joints are locked, any adjusting sleeves are loose, or any joints are not secured with cotter pins or other devices
- A control arm or radius arm is badly bent or broken, or if a pivot shaft or a pivot shaft mounting or any control arm, radius arm, pivot shaft bushing is badly worn or missing
- Stabilizer bar(s), links, connections are badly worn, missing, loose or broken.

### *Springs and Shock Absorbers*

A visual examination must be made of all springs, torsion bars, shock absorbers, bushings, shackles and "U" bolts with the vehicle on a hoist or jack.

Reject vehicle if:

- Springs or torsion bars are loose, broken or spring pieces or torsion bars are missing
- Spring shackles or "U" bolts are worn, missing, or loose
- A shock absorber is missing, disconnected, not securely attached, broken, or if rubber bushings or mounting bolts are worn-out or missing.

### *Ball Joints*

An inspection for ball joint wear can only be made when the joints are unloaded, except those ball joints having a wear indicator. An inspection of a ball joint which has a wear indicator must be made while the ball joint is under load with the weight of the vehicle on its wheels. To unload ball joints, the vehicle must be hoisted:

- Under lower control arm if spring or torsion bar is on lower control arm. The lower ball joint is the load-carrying ball joint and the upper ball joint is the nonload-carrying ball joint.
- Under frame if spring or torsion bar is on upper control arm. The upper ball joint is the load-carrying ball joint and the lower ball joint is the nonload-carrying ball joint.

In checking the condition of an unloaded ball joint, a ball joint gauge need not be used if the inspector is absolutely certain that the ball joint movement does not exceed the prescribed tolerances. A vehicle will not be rejected unless the vertical (up and down) or horizontal (side-to-side) movement in the load-carrying ball joint has been accurately measured by a ball joint gauge and the measurement exceeds the prescribed tolerances. A vehicle requiring a special tool or method to measure ball joint movement will not be rejected unless the ball joint is obviously dangerous. Inspector/mechanics will either contact the Motor Vehicle Inspection Division at the nearest troop headquarters or visit the Missouri State Highway Patrol website to obtain manufacturer's specifications on ball joints. If the ball joint movement exceeds the prescribed tolerances, the measured movement shall be listed with the defective part on the MVI-2 form (see 11 CSR 50-2.120).

Unless a dial indicator or a gauge of the type which screws into a grease fitting is used, it is recommended that the most accurate method of determining vertical (up and down) movement of the ball joint using a gauge which has a roller and pointer, is to remove the dust cup from the spindle and place the pointer rollers of the ball joint gauge on top of the spindle nut. In the event that the rollers of a particular brand gauge are too large to rest on top of the spindle nut, the rollers should then be positioned against the bottom of the spindle nut. To measure horizontal (side) movement, place rollers of gauge against tire sidewall and work wheel in and out.

Inspect ball joints with wear indicator. Wipe the grease fitting and boss free from dirt and grease. Observe if boss is flush or inside the cover surface.

Inspect ball joints without wear indicator by hoisting and unloading the ball joint. Position a pry bar under the front tire and wheel and with pressure sufficient only to lift the weight of the wheel assembly, move the wheel up and down and observe movement. Under no circumstances should there be more upward lifting force exerted than necessary to determine the actual movement of the ball joint stud within the housing. Grasp the tire and wheel assembly at the eleven (11) and five (5) o'clock positions. Work the wheel in and out to detect any looseness. Move hands to the one (1) and seven (7) o'clock positions and repeat.

Inspect ball joints. For ball joints on Twin I-Beam axles, eliminate all wheel bearing play by applying the service brake. Raise the vehicle by hoisting under the I-Beam axle beneath the spring. Grasp the lower edge of the tire and move the wheel in and out. While the wheel is being moved, observe the lower spindle arm and the lower part of the axle jaw. Grasp the upper edge of the tire and move the wheel in and out. While the wheel is being moved, observe the upper spindle arm and the lower part of the axle jaw. Movement of .031" (thirty-one thousandths inch) or greater between the lower or upper portion of the I-Beam and ball joint indicates that a measurement should be made at the circumference of the wheel adjacent to the ball joint that exhibits movement.

Reject vehicle if:

- The grease fitting boss on the wear indicator type ball joint is flush or inside the cover surface
- MacPherson Strut Suspension System has severely worn or missing thrust bearing or mounting bushings. If piston rod is bent or unit is not securely mounted to vehicle

- There is free play in any direction in a nonload-carrying ball joint, unless a manufacturer's ball joint tolerances indicate minimum allowable movement. If vertical (up and down) movement in a load-carrying ball joint exceeds prescribed tolerances
- Horizontal (side) movement at tire sidewalls is in excess of prescribed tolerances
- Twin I-Beam axle has movement greater than .031" (thirty-one thousandths inch) when measured at the outer circumference of the wheel
- Any joints are not secured with cotter pins or other devices, or if ball stud is loose in the mounting hole.

### **Horn (11 CSR 50-2.210)**

Every motor vehicle shall be equipped with a horn directed forward, or whistle in good working order, capable of emitting a sound adequate in quantity and volume to give warning of the approach of the vehicle to other users of the highway and to pedestrians.

Reject vehicle if:

- Vehicle is not equipped with a horn
- Horn is not audible under normal conditions
- Horn button or switch is not firmly mounted providing a good ground, or if horn is actuated by grounding two (2) naked wires or a similar method
- Horn button or switch is not readily accessible from driver's position.

### **Mirrors (11 CSR 50-2.320)**

#### *Interior Mirrors on School Buses*

School buses shall be equipped with an interior rearview mirror. Types B, C and D school buses manufactured after March 1, 1987, shall have an interior mirror at least six inches by thirty inches (6" × 30"). It must be metal backed and framed, with rounded corners and protected edges. Type A school buses manufactured after March 1, 1987, shall be equipped with an interior mirror at least six inches by sixteen inches (6" × 16").

#### *Exterior Mirrors on School Buses*

All school buses shall be equipped with flat rearview, convex rearview and convex crossview mirrors on the left and right sides of the bus. (Buses manufactured prior to March 1, 1987, do not require left and right convex rearview mirrors).

Convex crossview mirrors on the right side of buses may be either a single or double mirror that provides the driver a clear view of the right front and side of the bus. Convex crossview mirrors shall be a minimum of seven and one-half inches (7 1/2") in diameter.

School buses manufactured after July 1, 1993, shall be equipped with a rearview mirror system that provides the driver a clear view of the rear tires at ground level on the left and right sides of the bus.

School buses manufactured after July 1, 1993, shall be equipped with a crossview mirror system that provides the driver a clear indirect view of an area at ground level from the front bumper forward and the entire width of the bus to a point where the driver can see by direct vision. The crossview system shall also provide the driver a clear indirect view of the area at ground level around the left and right front corners of the bus, to include the tires and service entrance on all types of buses to a point where it overlaps with the rearview mirror system.

Inspect all mirrors.

Reject vehicle if:

- Not equipped with required mirrors
- A mirror is not mounted on stable support or is improperly mounted
- Forward vision is unsafely obstructed by mirror assembly
- A mirror is cracked, pitted, obstructed, or clouded to the extent that vision is obscured
- Mirror does not provide a clear view of highway to rear because of cracks, pitting, clouding, discoloration or improper mounting
- Mirror is broken or has sharp edges exposed
- Mirror is very difficult to adjust or will not maintain a set adjustment

### **Windshield Wipers (11 CSR 50-2.230)**

All front windshield wipers as equipped by the manufacturer shall be in operating condition. Inspect for operation, damaged or torn rubber blades, and for proper contact of blades with windshield. Raise wiper arm slightly away from windshield and release.

Reject vehicle if:

- Windshield wipers fail to function
- Rubber wiping element is damaged or torn
- Part of blades or arms are missing or are severely damaged
- The blades fail to contact the windshield firmly.

## **Tires (11 CSR 50-2.240 / 11 CSR 580-2.320)**

Inspect all school bus tires except the spare tire for knots, exposed cord, tread depth, mismatching of tire types and for tire markings such as "reject" or "for non-highway use". Inspect Type A2, B, C, or D school bus for dual rear tires. Inspect all school buses for regrooved, recapped or retreaded tires on front wheels. Inspect all school bus tires for same size and type on a given axle.

Reject vehicle if:

- The tread depth is less than four-thirty-seconds inch ( $4/32$ "") for the front tires or less than two-thirty-seconds inch ( $2/32$ "") of the rear tires when measured at any point on a major tread groove
- A tire is worn at any location other than the wear indicator to the point where there is no tread configuration
- A Type A2, B, C or D school bus is not equipped with dual rear tires
- The tire size of any dual is mismatched by more than one-half inch ( $1/2$ "") in height.
- Regrooved, recapped or retreaded tires are used on the front wheels
- The tires on a given axle are of a different size or type
- A vehicle has a radial and a nonradial tire on the same axle
- Any tire is flat or has a noticeable leak (e.g., can be heard or felt)
- Tire has any wearing, cuts or separation that exposes the cord when the tire is inflated or if the tire has any knots
- There is a localized worn spot that exposes the cord
- A tire is marked reject, rejected, not for highway use, farm use only, for nonhighway use, for race track use only, or marked with similar terms, or if determined beyond a reasonable doubt that these markings have been removed. This does not include tires labeled with the word blemish

## **Wheels (11 CSR 50-2.250)**

Inspect all wheels except the spare tire wheel for damage and the condition of any visible wheel bolts, nuts or lugs, or mismatching of hub assembly. Hub caps need not be removed to inspect wheel bolts, nuts or lugs except on the wheel which is removed for brake inspection.

Reject vehicle if:

- There are loose, missing or damaged wheel studs, bolts, nuts or lugs
- Rims and lock rings on the wheel of a commercial vehicle are mismatched
- Rims or lock rings are bent, sprung, cracked or otherwise damaged
- Stud holes are out-of-round
- There are cracks between the hand holes or stud holes of a disc wheel
- A casting is cracked or there is evidence of wear in the clamping area of a cast wheel
- A wheel and hub assembly are mismatched or if the lug holes and lug bolts are mismatched, which prohibits the tightening and proper seating of the lug nuts, or the hub flange fails to make full contact with the wheel pad.

## **Exhaust System (11 CSR 50-2.260 / 11 CSR 50-2.320)**

All motor vehicles shall be equipped with a properly attached exhaust pipe, muffler and tailpipe.

All items must be inspected with the motor running. Holes in the system made by the manufacturer for drainage are not cause for rejection. Do not block or place anything over the end of the tailpipe to check for leaks.

School buses shall be equipped with a properly attached exhaust system. The exhaust system shall include the manifold, manifold gasket, flange gasket, exhaust pipe, muffler, supporting hardware and tailpipe. The exhaust system shall be properly insulated from the fuel tank and tank connections by a securely attached metal shield at any point where it is twelve inches (12") or less from the tank or tank connections, except for diesel-powered buses.

The tailpipe shall be constructed of a corrosion-resistant tubing material at least equal in strength and durability to sixteen (16)-gauge steel tubing. The tailpipe shall be of sufficient length to exit at the rear of the bus or at the left side no more than eighteen inches (18") forward of the rear wheel house opening, and shall be flush with or may extend not more than two inches (2") beyond the perimeter of the body or bumper.

Type A and B buses may be equipped with the manufacturer's standard tailpipe. Exhaust shall not exit beneath a fuel fill on Type C and D buses. The exhaust system on vehicles equipped with a power lift unit may be routed to the left of the right frame rail for the installation of a power lift unit on the right side of the bus.

Reject vehicle if:

- A manifold, manifold gasket, flange gasket or a connection of any other component is loose or leaking
- Holes are present in the exhaust pipe, muffler, tailpipe or if there are leaking patches or seams (Patches made with an arc or acetylene weld are accepted.)
- The tailpipe end is pinched or broken off from rear support bracket
- Any part of the system is supported by wire or if any component is not securely attached by supporting hardware, such as bolts, brackets, clamps or hangers
- The vehicle has no exhaust pipe, muffler or tailpipe
- Any part of the system passes through the occupant compartment
- The tailpipe fails to discharge exhaust from the rear or left side of vehicle or if it exits beneath a fuel fill on Type C and D buses
- The tailpipe of a school bus is not a sixteen (16)-gauge steel or equivalent
- The tailpipe is not flush with or extends more than two inches (2") beyond the perimeter of the body or bumper.
- Tailpipe is located so that a person may be burned on entering or leaving passenger compartment



## **Glazing (Glass) (11 CSR 50-2.270)**

All 1936 and later model motor vehicles which were originally equipped with glass must have approved safety glass in all doors, windows and windshields.

Automotive safety glass is marked with the manufacturer's trademark and the words "American Standard" or the letters "AS" followed by a number indicating the position in which the glass may be used. Safety glass bearing the following identification may be used in the designated locations:

- AS1 anywhere in a motor vehicle
- AS2 anywhere except windshields
- AS3 or AS4 anywhere on school buses except windshields and side windows to immediate right and left of driver location
- AS3 and above is permitted at certain other specified locations, such as rear windows of trucks and convertibles

### *Types of Damage or Defect*

- Outright breakage: Glass that is severely cracked, shattered or broken to expose sharp edges or missing pieces
- Distortion: A manufacturing defect or other defect that causes a distorted view
- Star break: Vented breaks with cracks radiating from point of impact
- Bull's-eye and half moon: Nonvented circular or half-circular chips not dislodged from glass
- Stone nicks or chips: Small chips dislodged from the glass

Inspect glazing. The driver's vision area is that area within the normal sweep of the wiper blades above a line measured four inches (4") from the bottom of the windshield. In addition, inspect operation of window at driver's left.

Reject vehicle if:

- Required glazing is not present or improper glazing materials are used
- Window at driver's left cannot be readily opened to permit arm signals. (Do not reject if the vehicle is equipped with properly operating turn signals and stoplight)
- After-market vision reducing material or other conditions that obscure the driver's vision is on the windshield
- The windshield has any distortion, or cracks exceeding three inches (3") in length, within the driver's vision area
- The windshield has any unrepaired star breaks, bull's-eyes, half moons, stone nicks or stone chips within the driver's vision area, or has any star breaks, bull's-eyes, half moons stone nicks or stone chips more than two inches (2") in diameter at any area outside the driver's vision area
- Outright breakage, missing pieces or any break exposing sharp edges is present at any location

## **Air Pollution Control Devices (11 CSR-2.280)**

The inspection of air pollution control devices installed by the manufacturer will apply to 1968 and later model vehicles. This does not apply to diesel fuel vehicles or to vehicles operating exclusively on propane fuel or compressed gas. Vehicles converted with option to operate on compressed natural gas or propane are permitted to remove or modify the thermostatic air cleaner if the modifications performed meet United States Environmental Protection Agency Mobile Source Enforcement Memorandum Number 1A.

Effective July 1, 1992, all light-duty vehicles which are passenger vehicles with a Gross Vehicle Weight Rating (GVWR) below six thousand pounds (6,000 lbs.) and commercial vehicles with a GVWR below eight thousand five hundred pounds (8,500 lbs.), which receive a replacement engine, in regard to all emissions related parts, engine design parameters and engine calibrations, must comply with the certified configuration of the same or newer model year as the vehicle chassis.

Effective July 1, 1992, diesel powered vehicles may receive a replacement gasoline engine if the resulting engine-chassis configuration is equivalent to a certified configuration of the same model year or newer as the chassis and that chassis has been certified with a gasoline engine.

Effective July 1, 1992, heavy-duty vehicles which are passenger vehicles with a GVWR in excess of six thousand pounds (6,000 lbs.) and commercial vehicles with a GVWR in excess of eight thousand five hundred pounds (8,500 lbs.) may receive a replacement heavy-duty engine if the resulting vehicle is identical to a certified configuration of the same model year or newer. Under no circumstances may a heavy-duty engine ever be installed in a light-duty vehicle.

All 1968 and later model vehicles which received a replacement engine before July 1, 1992, must be equipped with all the air pollution control devices installed by the manufacturer on that particular engine.

Reject vehicle if:

- A replacement engine is not equivalent to the certified configuration of the engine-chassis
- Heavy-duty engine is used in a light-duty chassis.

### *Crankcase Ventilation*

The ventilation system of the crankcase is commonly known as the positive crankcase ventilation (PCV) system. The engine should be warm and running at idle during inspection of the vent system.

Inspect plumbing connections for tightness and proper routing. Disconnect PCV valve from engine. Shake briskly and listen for a rattling sound. Place finger or thumb over end of valve and feel for vacuum suction.

Reject vehicle if:

- Plumbing is loose, broken, leaking or improperly routed
- No vacuum suction is present or valve does not rattle when shaken
- Any part of the system is missing or disconnected.

### *Air Injection System*

The air injection system provides air to the exhaust manifold or catalytic converter. The system may or may not be equipped with an external air pump.

With engine stopped, inspect tension of air pump drive belt. Inspect hose connections at air pump, anti-backfire valve, check valves and air distribution manifolds.

Reject vehicle if:

- Belt slips or is frayed, if serpentine air pump belt has sections missing, if connections are loose, broken or leaking
- Any part of the injection system is missing or disconnected.

### *Engine Modification Type*

An engine modification control system may be most easily identified as one without an air pump.

With engine stopped, inspect ignition wiring and vacuum hose connections.

Reject vehicle if:

- Wires or connections are loose, broken or leaking
- Any part of system is missing

### *Thermostatic Air Cleaner*

The thermostatic air cleaner provides heated air to the carburetor during cold-engine operation. Inspect exhaust manifold shroud, preheat tube, vacuum diaphragm air cleaner and vacuum hoses.

Reject vehicle if:

- Connections are broken or disconnected
- Any part of system is missing

### *Spark Control System*

The spark control system controls the advance and retard of the ignition spark. Inspect distributor, vacuum control valve, electrical control switch, wiring and vacuum hoses.

Reject vehicle if:

- Wiring or vacuum lines are broken, leaking or improperly routed
- Any part of the system is missing or bypassed.

### *Exhaust Gas Recirculation*

The exhaust gas recirculation system supplies metered exhaust gas to the intake manifold. Inspect exhaust gas recirculation valve, temperature control valve and vacuum lines for proper routing.

Reject vehicle if:

- Components are broken, leaking or improperly routed
- Any part of system is missing.

### *Oxygen Sensor System*

The oxygen sensor system measures the quantity of oxygen present in the exhaust system and supplies a signal to the carburetor or fuel injection system. Inspect oxygen sensor, located in exhaust manifold, temperature sensor, crankshaft sensor, microprocessor and wiring for proper routing.

Reject vehicle if:

- Any component is leaking, bypassed, modified or disconnected
- Any part of the system is missing.

### *Evaporative Emission System*

The evaporative emission system restricts the release of fuel vapors by storing and metering the fuel vapors into the fuel intake system. Inspect the fuel tank vent line, overfill limiting valve, charcoal canister and purge line for proper mounting, leaks and proper routing.

Reject vehicle if:

- Components are leaking, improperly routed or mounted
- Any part of the system is missing or disconnected

### *Catalytic Converters*

All 1981 and later model vehicles which were equipped by the manufacturer with a catalytic converter(s) must be equipped with the original equipment manufacturer converter(s) or United States Federal Environmental Protection Agency-approved replacement converters. These devices are located in the exhaust system, usually in front of the muffler. Inspect catalytic converter.

Reject vehicle if:

- Catalytic converter is bypassed or modified, is not securely attached, has leakage or is patched by other than an arc or acetylene weld
- A 1981 or later model vehicle is not equipped with a catalytic converter, as equipped by the manufacturer and as specified on the emission label

## **Fuel System (11 CSR 50-2.320)**

Inspect the fuel tank(s), fuel lines and connections, filler tube, and filler tube cap on gasoline or diesel fueled vehicles.

Reject vehicle if:

- Fuel tank(s) is not securely attached
- Filler tube cap is missing or does not fit
- There is fuel leakage at any location

Inspect compressed fuel systems or the liquified petroleum gas (LPG) system.

Reject vehicle if:

- Fuel tank is not securely attached to the outside of the frame rail by a system other than welding. If saddle clamps are used, on buses after December 31, 1989, either at the time of assembly or replacement, each tank must be attached with a minimum of two (2) clamps which are a minimum of three eighths inch by two inch (3/8" x 2") steel.
- The safety relief venting system is absent, damaged, or designed so that escaping gas is directed other than upwards within forty-five degrees (45°) of the vertical (outside the bus body)
- The safety relief venting system does not have a functional pressure sensitive closing device (cap)
- The fuel tank(s) or any part of the fuel system is the lowest point of the vehicle
- There are leaks at any location
- There is no Missouri Department of Agriculture decal on LPG systems.

## **Seat Belts (11 CSR 50-2.310 / 11 CSR 50-2.320)**

All school buses shall be equipped with a seat belt for the driver. Seat belt retractors shall be provided on school buses manufactured after January 1, 1973. School buses manufactured after March 1, 1987, equipped with a Type 2 lap belt/shoulder harness seat belt shall be equipped with an emergency locking retractor for the continuous belt system.

A seat belt is any strap, webbing or similar device including all necessary buckles, fasteners, motors, tracks and all hardware designed for installing that seat belt in a motor vehicle by the manufacturer or its equivalent. Seat belts are classified as:

- Type 1 seat belt assembly is a lap belt for pelvic restraint
- Type 2 seat belt assembly is a combination of pelvic and upper-torso restraint
- Type 2a shoulder belt is an upper-torso restraint for use in conjunction with a lap belt as a type 2 seat belt assembly. Some type 2a shoulder belts are motorized.

Inspect seat belt.

Reject vehicle if:

- Proper retractor is not present
- Seat is covered so as to prohibit the use of required belts
- A belt, buckle, bracket or motor is inoperative which prohibits designed function
- Belt webbing is frayed, split or torn.

## **Bumpers (11 CSR 50-2.311 / 11 CSR 50-2.320)**

### *Front Bumper*

School buses shall be equipped with a front bumper, which may include an energy absorbing bumper. All school buses manufactured after March 1, 1987, shall be equipped with a front bumper made of pressed steel at least three-sixteenths inch (3/16") thick and not less than eight inches (8") wide, unless using an energy absorbing bumper. Type A buses may be equipped with the manufacturer's standard front bumper.

### *Rear Bumper*

Types A2, B, C and D school buses shall be equipped with a rear bumper of pressed steel at least three-sixteenths inch (3/16") thick and eight inches (8") wide (nine and one-half inches (9 1/2") if manufactured after January 1, 1997). The bumper shall wrap around the back corners of the school bus and extend forward at least twelve inches (12"). The bumper shall extend at least one inch (1") beyond the rearmost part of the body surface and shall be properly attached to prevent the hitching of rides. Type A1 school buses may be equipped with the manufacturer's standard rear bumper.

Inspect the bumpers.

Reject vehicle if:

- Not equipped with required bumpers
- A bumper is loosely attached, improperly mounted or exceeds the allowable height limit
- A broken or torn portion is protruding, creating a hazard
- The improper attachment permits the hitching of rides
- The bus is equipped with a trailer hitch or similar device which will permit hitching of rides

## Lettering and Signs (11 CSR 50-2.320)

School buses shall have on the front and rear or on signs attached to them the words SCHOOL BUS plainly visible in black letters at least eight inches (8") in height. School buses shall have displayed on the rear in plain and distinct black letters the following: STATE LAW: STOP WHILE BUS IS LOADING AND UNLOADING. The letters in the words STATE LAW: STOP shall be at least five inches (5") and the letters in the other words at least three inches (3") in height. District-owned school buses shall display on each side the name and number of the school district in black letters at least three inches (3") in height. Buses manufactured prior to October 1, 1981, may display the school district name and number with national school bus yellow lettering. Privately-owned school buses shall display on each side, in a conspicuous location, the name and address of the owner in black letters at least two inches (2") in height with a stroke of not less than one-quarter of an inch (1/4") wide. Signs or stickers on the rear of the bus not relating to school bus flashing signal lamps, railroad stop procedures or other similar safety messages are prohibited.

A special purpose pictorial sign identifying a school bus for younger pupils, and/or a lettered sign identifying the route, and/or name or school destination in colors other than national school bus yellow and black may be used. When a pictorial or lettered sign is used it shall be mounted below the right front window behind the service door. The sign does not have to be exactly below the right front window as long as it is in the general area. Signs placed below the second or third window would be acceptable. The sign shall not exceed four hundred thirteen (413) square inches and be attached in a manner that does not pose a safety hazard to pupils. No special purpose pictorial sign or lettered sign may be placed in any school bus window.

Signs that relate to the proper procedure for closing the emergency door may be placed on the emergency door.

Inspect bus for lettering.

Reject vehicle if:

- Vehicle does not display the proper lettering
- Sign is improperly located, incorrect size or poses a safety hazard
- Signs or stickers are non-safety related



## **Heating and Defrosting System (11 CSR 50-2.320)**

Inspect the heating and defrosting systems for proper operation.

Reject vehicle if:

- Any part of the heating or defrosting systems fail to function properly or have leakage

## **Service Door (11 CSR 50-2.320)**

The service door shall be of the split-type, the sedan type or the jack-knife type. The split-type door includes any sectioned door which divides and opens inward or outward. If one (1) section of a split-type door opens inward and the other opens outward, the front section shall open outward. Flexible material must be applied to the vertical closing edges on split-type or folding-type entrance doors, except on Type A buses. On all buses, the service door shall be designed to be operated by the driver, and so designed to prevent accidental opening. When the hand lever is used, no parts shall come together so as to shear or crush fingers.

Reject vehicle if the:

- Door and opening device do not function properly
- Flexible material on the vertical closing edges of the service door is excessively loose, torn or missing

## **Emergency Door(s), Exits and Buzzer (11 CSR 50-2.320)**

All school buses shall be equipped with an emergency door or exit located in the rear and may be equipped with additional emergency doors and exits. The emergency door shall be designed to be opened from inside and outside. The device used to open the door from the outside shall be designed to prevent hitching to, but one which permits opening when necessary. The rear emergency door latch shall be equipped with an interior handle that lifts upward to release and all emergency doors and exits shall be equipped with a suitable electric switch connected with a buzzer audible in the driver compartment. The switch shall be installed in a manner that any movement of the slide bar or release mechanism will immediately sound the buzzer.

All emergency doors and exits shall be identified by the words EMERGENCY DOOR or EMERGENCY EXIT both inside and outside the bus in letters two inches (2") high. The words EMERGENCY DOOR shall be placed at the top of or directly above the emergency door, or on the door in the metal panel above the top glass both inside and outside the bus. The words EMERGENCY EXIT shall be placed at the top of or directly above or at the bottom of the emergency window exits both inside and outside the bus. The designation for roof exits shall be located on the inside surface of the exit, or within twelve inches (12") of the roof exit opening. A metal guard shall be placed over the door control on the inside of a rear door. The passageway to the emergency door shall be at least twelve inches (12") wide on all school buses. A lock may be placed on an emergency door or exit. However, the engine starting and operating system must not function if any emergency door or exit is locked from either inside or outside of the bus.

Inspect all emergency door(s) and exits for operation by opening and closing and for proper lettering.

Reject vehicle if:

- Doors or exits bind or catch when opening
- Passageway to the emergency door is blocked or restricted in any way to less than twelve inches (12") in width
- Any emergency door or exit release mechanism fails to work properly, from the inside and outside of the bus
- Slide bar on Types B, C and D buses has less than one inch (1") stroke length
- Emergency door buzzer fails to sound or is not audible in the driver's compartment when the slide bar is moved
- Any emergency or roof exit buzzer fails to sound or is not audible in the driver's compartment when the release mechanism is activated
- Words EMERGENCY DOOR or EMERGENCY EXIT are not properly displayed
- Bus engine will start with emergency door(s) or exits locked

## **Emergency Equipment (11 CSR 50-2.320)**

All school buses must be equipped with a dry chemical or Halon 1211 type fire extinguisher and a first-aid kit. After July 1, 1977, the fire extinguisher must have an Underwriters' Laboratories, Inc. rating of not less than 10-B:C or higher classification. School buses manufactured after March 1, 1987, shall be equipped with a fire extinguisher approved by Underwriters' Laboratories, Inc., with a total rating of 2 A 10-B:C or greater. Both must be mounted in the driver's compartment. All school buses must be equipped with either three (3) red electric lanterns and two (2) red flags or three (3) red emergency reflectors and two (2) red flags or three (3) bidirectional emergency reflective triangles.

Reject vehicle if not equipped with:

- A proper fire extinguisher which is easily removable and properly charged
- A proper first-aid kit
- The proper emergency warning devices

## **Seats (11 CSR 50-2.320)**

Seats on school buses shall face forward. Buses equipped to accommodate wheelchairs may have longitudinal seating if equipped with restraining devices. School buses manufactured after March 1, 1987, which are equipped to accommodate wheelchairs must have forward facing seats and wheelchair positions. They shall be fastened securely to the school bus body. Jump seats or portable seats are not permitted.

Inspect the seats.

Reject vehicle if:

- The seat is not fastened securely to the floor;
- The seat cushions are not properly attached to the seat frame;
- Any seat has an exposed spring, sharp edge, protruding object or other hazardous condition
- Seats do not face forward

## **Step Treads/Aisle Mats/Runners (11 CSR 50-2.320)**

*Type A School Buses Only*

Type A school buses need only be equipped with the manufacturer's original equipment as far as step treads, aisle mats or runners are concerned.

Reject vehicle if:

- Not as originally equipped

*Types B, C and D School Buses Only*

The surface of step treads shall be of nonskid material. The aisle mats or runners shall be of an aisle-type fire-resistant rubber or equivalent, nonskid, wear-resistant and ribbed. The mats or runners shall be permanently bonded to the floor.

Inspect the general condition of step treads at the service door entrance and the aisle mats/runners.

Reject vehicle if:

- Treads on the steps are not of nonskid material or if the surface material is loose
- Mats or runners are loose, torn, curled, not permanently bonded to the floor, or are not of proper material

**Hand Hold Grips and Handrails (11 CSR 50-2.320)**

Inspect the hand grips. Inspect the handrails for proper clearance by drawing a one-half inch (1/2") hex nut with a one-eighth inch (1/8") drawstring between the mounting points of the handrail and bus body.

Reject vehicle if:

- The hand hold grips are missing, damaged or not securely mounted
- If the one-half inch (1/2") hex nut attached to one (1) end of a one-eighth inch (1/8") drawstring catches on the handrail and lodges between the handrail mounted bracket and the sheet metal body of the bus or the drawstring catches during the handrail test.

**Color (11 CSR 50-2.320)**

The school bus body shall be painted a uniform national school bus yellow, except the roof which may be white and the flat top surface of the hood which may be non-reflective black. The body exterior paint trim, bumper and lettering shall be black.

The chassis grille shall be national school bus yellow, black, white or chrome. Reflective material meeting Federal Highway Administration standards may be installed on the front or rear bumper, or both rear of bus body, school bus lettering, sides of bus and stop arm.

Reject vehicle if:

- Any portion of vehicle, lettering or reflective material is of the wrong color

## **Crossing Arm (11 CSR 50-2.320)**

After August 1, 1998, every school bus operated to transport students in the public school system, which has a gross vehicle weight rating (GVWR) of more than ten thousand (10,000) pounds, the engine mounted entirely in front of the windshield and the entrance door behind the front wheels shall be equipped with a crossing control arm. The arm shall be constructed of noncorrosive and nonferrous material, mounted on the right side of the front bumper of the bus, extending a minimum sixty-six inches (66") when extended and activated by the same controls which activate the mechanical and electrical signaling devices.

Inspect the crossing arm.

Reject the vehicle if:

- Bus is not equipped as required
- Crossing arm is not constructed of a noncorrosive or nonferrous material
- Arm is not mounted in the proper location
- Arm does not extend as close to perpendicular to the bumper as possible when opened
- Arm has sharp edges or projections that could cause hazard or injury to students
- Arm does not extend a minimum of sixty-six inches (66") when fully extended
- Arm does not operate properly when the stop signal arm and overhead warning flashers are activated
- The manual bypass switch allows for more than one override of the system's functions

## **Frame (11 CSR 50-2.320)**

Inspect the bus frame.

Reject if:

- There are any unrepaired visible cracks.

## **Compartment Condition (11 CSR 50-2.320)**

The compartment will be in good repair, with no sharp-edged tears or holes in the compartment walls, floors, doors or ceiling. Inspect the compartment.

Reject vehicle if:

- Compartment contains any sharp-edged tears or holes in the compartment walls, floors, doors or ceiling

## **Special Education Buses (11 CSR 50-2.321)**

### *Power Lift*

Power lift shall be located on the right side of the bus body within the perimeter of bus body and in no way attached to the outside of the bus.

Lift must be equipped with controls to allow operation of the lift from either the inside or outside of the bus. Buses manufactured after October 1, 1981, must be equipped with a mechanism to allow for manual manipulation in the event of a power failure or a single component mechanical failure.

Lift platform shall be fitted with full-width shields and restraining device(s) on the outer (curb) edge.

School buses manufactured after March 1, 1987, equipped to accommodate individuals with special transportation needs must have a lift opening and platform sufficient to accommodate a thirty-inch (30") wheelchair.

Inspect the power lift for proper location, attachment and operation.

Reject vehicle if:

- Lift is not in proper location or attached properly
- Not equipped with a mechanism that allows for at least one (1) manual operation
- Shields or restraining devices are not fitted on lift
- Lift opening and platform are not of sufficient width

### *Aisles*

On buses manufactured after October 1, 1981, the aisle leading to the emergency door from the wheelchair area shall be at least thirty inches (30") wide to permit passage of a maximum size wheelchair.

Reject vehicle if:

- Aisles are not of sufficient width

### *Restraint Systems*

School buses manufactured after March 1, 1987, designed to transport individuals with special transportation needs shall contain wheelchair securement devices attached to the floor or walls, or both, to allow securement of wheelchairs in a forward facing position. These devices must require human intervention to unlatch or disengage and contain tightening clamps on front and rear assemblies.

School buses designed to accommodate individuals with special transportation needs shall contain a system of positive occupant restraint that secures the occupant.

Reject vehicle if:

- Proper restraining devices are not installed

#### *Special Service Entrance Doors*

Doors on 1981 and later models shall be equipped with a device that will actuate an audible or flashing signal located in the driver's compartment when doors are not securely closed and ignition is on.

A switch shall be installed so that the lifting mechanism will not operate when the lift platform doors are closed.

Reject vehicle if:

- Not equipped with a warning signal
- Not equipped with the proper switch

#### *Identification*

Buses with power lifts used for transporting children with physical disabilities may display the universal handicap symbols below the window line. The emblem shall meet United States Department of Transportation standards.

Reject vehicle if:

- Symbols are improperly displayed
- Symbols are incorrect size

## **Out-of-Service Criteria (11 CSR 50-2.320)**

The following items will result in school buses being placed out-of-service until needed repairs are made. These criteria will be used only by Missouri State Highway Patrol personnel and are not applicable at official inspection stations:

- If there is a major exhaust leak in the exhaust system which dumps exhaust in front of the rear axle
- If there are major steering or suspension defects
- If there are major brake defects
- If the stop signal arm is inoperative
- If the front or rear tires have knots or exposed cord or the tread depth is less than four-thirty-seconds inch ( $4/32$ " ) on the front tires or less than two-thirty-seconds inch ( $2/32$ " ) on the rear tires when measured at any point on a major tread groove
- If any tire is flat or has a noticeable leak (e.g., can be heard or felt)
- If any emergency door is inoperable from either the inside or outside or any other emergency exit fails to open
- If the red overhead warning flashers are inoperative
- If the one-half inch ( $1/2$ " ) hex nut attached to one (1) end of a one-eighth inch ( $1/8$ " ) drawstring catches on the handrail and lodges between the handrail mounting bracket and the sheet metal body of the bus or the drawstring catches during the handrail drawstring test
- If not equipped with crossing arm as required or if the crossing arm does not operate when the stop signal arm and overhead warning flashers are activated
- If fuel is leaking from any part of the fuel system
- If the frame has any unrepaired visible cracks



**MILLIMETERS TO INCHES**  
**1 Millimeter = 0.03937008 Inches**

**INCHES TO MILLIMETERS**  
**1 Inch = 25.4 Millimeters**

Millimeters	Inches	Millimeters	Inches	Inches	Millimeters	Inches	Millimeters
1	0.039	50	1.97	1	25.40	50	1270.00
2	0.079	51	2.01	2	50.80	51	1295.40
3	0.118	52	2.05	3	76.20	52	1320.80
4	0.157	53	2.09	4	101.60	53	1346.20
5	0.197	54	2.13	5	127.00	54	1371.60
6	0.236	55	2.17	6	152.40	55	1397.00
7	0.276	56	2.21	7	177.80	56	1422.40
8	0.315	57	2.24	8	203.20	57	1447.80
9	0.354	58	2.28	9	228.60	58	1473.20
10	0.394	59	2.32	10	254.00	59	1498.60
11	0.433	60	2.36	11	279.40	60	1524.00
12	0.472	61	2.40	12	304.80	61	1549.40
13	0.512	62	2.44	13	330.20	62	1574.80
14	0.551	63	2.48	14	355.60	63	1600.20
15	0.591	64	2.52	15	381.00	64	1625.60
16	0.630	65	2.56	16	406.40	65	1651.00
17	0.669	66	2.60	17	431.80	66	1676.40
18	0.709	67	2.64	18	457.20	67	1701.80
19	0.748	68	2.68	19	482.60	68	1727.20
20	0.787	69	2.72	20	508.00	69	1752.60
21	0.827	70	2.76	21	533.40	70	1778.00
22	0.866	71	2.80	22	558.80	71	1803.40
23	0.906	72	2.83	23	584.20	72	1828.80
24	0.945	73	2.87	24	609.60	73	1854.20
25	0.984	74	2.91	25	635.00	74	1879.60
26	1.024	75	2.95	26	660.40	75	1905.00
27	10.63	76	2.99	27	685.80	76	1930.40
28	1.102	77	3.03	28	711.20	77	1955.80
29	1.142	78	3.07	29	736.60	78	1981.20
30	1.181	79	3.11	30	762.00	79	2006.60
31	1.220	80	3.15	31	787.40	80	2032.00
32	1.260	81	3.19	32	812.80	81	2057.40
33	1.299	82	3.23	33	838.20	82	2082.80
34	1.339	83	3.28	34	863.60	83	2108.20
35	1.378	84	3.31	35	889.00	84	2133.60
36	1.417	85	3.35	36	914.40	85	2159.00
37	1.457	86	3.39	37	939.80	86	2184.40
38	1.496	87	3.43	38	965.20	87	2209.80
39	1.535	88	3.46	39	990.60	88	2235.20
40	1.575	89	3.50	40	1016.00	89	2260.60
41	1.614	90	3.54	41	1041.40	90	2286.00
42	1.654	91	3.58	42	1066.80	91	2311.40
43	1.693	92	3.62	43	1092.20	92	2336.80
44	1.732	93	3.66	44	1117.60	93	2362.20
45	1.772	94	3.70	45	1143.00	94	2387.60
46	1.811	95	3.74	46	1164.40	95	2413.00
47	1.850	96	3.78	47	1193.80	96	2438.80
48	1.890	97	3.82	48	1219.20	97	2463.80
49	1.929	98	3.86	49	1244.60	98	2489.20
50	1.969	99	3.90	50	1270.00	99	2514.60

## COMMON FRACTIONS REDUCED TO DECIMALS

1/2'S	4THS	8THS	16THS	32NDS	64THS	
					1	0.015625
				1	2	0.03125
					3	0.046875
			1	2	4	0.0625
					5	0.078125
				3	6	0.09375
					7	0.109375
		1	2	4	8	0.125
					9	0.140625
				5	10	0.15625
					11	0.171875
			3	6	12	0.1875
					13	0.203125
				7	14	0.21875
					15	0.234375
	1	2	4	8	16	0.250
					17	0.265625
				9	18	0.28125
					19	0.296875
			5	10	20	0.3125
					21	0.328125
				11	22	0.34375
					23	0.359375
		3	6	12	24	0.375
					25	0.390625
				13	26	0.40625
					27	0.421875
			7	14	28	0.4375
					29	0.453125
				15	30	0.46875
					31	0.484375
1	2	4	8	16	32	0.500
					33	0.515625
				17	34	0.53125
					35	0.546875
			9	18	36	0.5625
					37	0.578125
				19	38	0.59375
					39	0.609375
		5	10	20	40	0.625
					41	0.640625
				21	42	0.65625
					43	0.671875
			11	22	44	0.6875
					45	0.703125
				23	46	0.71875
					47	0.734375
	3	6	12	24	48	0.750
					49	0.755625
				25	50	0.78125
					51	0.796875
			13	26	52	0.8125
					53	0.828125
				27	54	0.84375
					55	0.859375
		7	14	28	56	0.875
					57	0.890625
				29	58	0.90625
					59	0.921875
			15	30	60	0.9375
					61	0.953125
				31	62	0.96875
					63	0.984375
2	4	8	16	32	64	1.00

# STEERING MECHANISM VISUALS

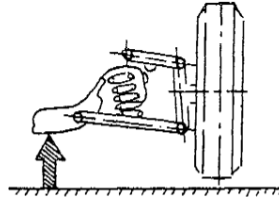


FIGURE 1  
INSPECTION FOR WHEEL BEARING ADJUSTMENT, WHEEL PLAY AND STEERING LINKAGE WITH SPRING ON LOWER CONTROL ARM

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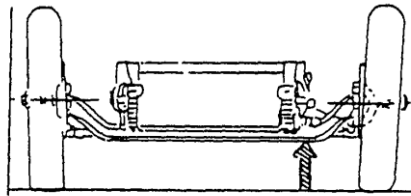


FIGURE 3  
INSPECTION FOR WHEEL BEARING ADJUSTMENT, WHEEL/KING PIN (SPINDLE BOLT), AND LINKAGE PLAY WITH FRONT AXLE. (Raise until wheel clears one side at a time.)

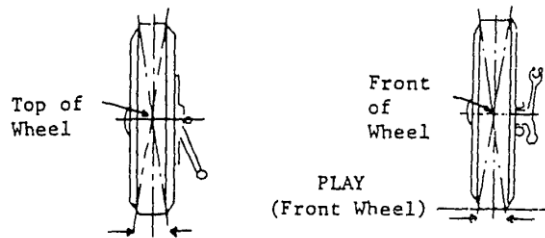


FIG. 4 WHEEL PLAY FIG. 5

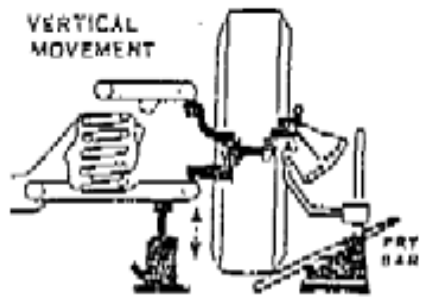


FIGURE 6  
INSPECTION FOR BALL JOINT WEAR WITH  
SPRING ON LOWER CONTROL ARM.

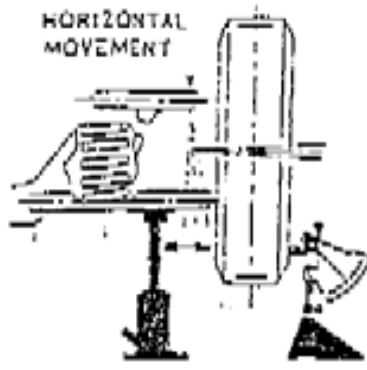


FIGURE 8

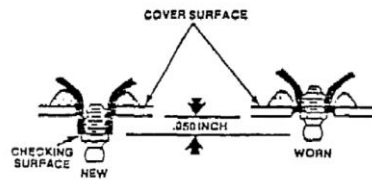
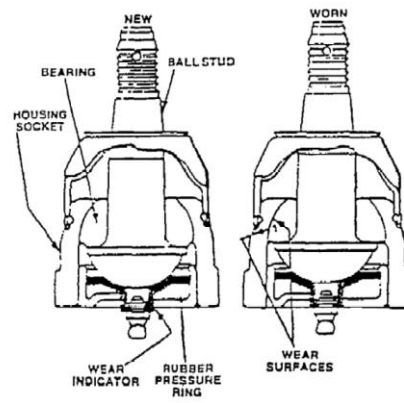


FIGURE 10

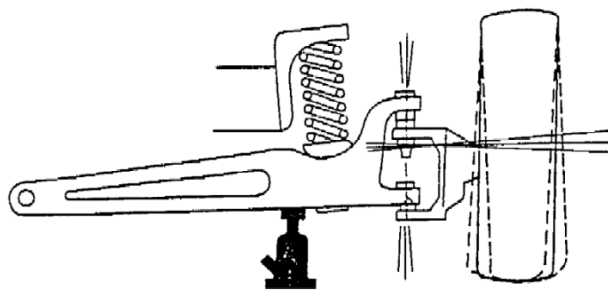


FIGURE 17

TWIN I-BEAM FRONT AXLE  
EQUIPPED WITH BALL JOINTS



## **SCHOOL BUS SAFETY INSPECTION GUIDE**

**In addition to the inspection of the mechanism and equipment required for all motor vehicles per sections 307.350 to 307.390, RSMo, the following safety items are to be included in the safety inspection of every school bus per section 307.375, RSMo.:**

1. All mirrors, including crossview, inside and outside;
2. The front and rear warning flashers;
3. The stop signal arm;
4. The crossing control arm on public school buses required to have them pursuant to section 304.050;
5. The rear bumper to determine that it is flush with the bus so that hitching of rides cannot occur;
6. The exhaust tailpipe shall be flush with or may extend not more than two inches beyond the perimeter of the body or bumper;
7. The emergency doors and exits to determine them to be unlocked and easily opened as required;
8. The lettering and signing on the front, side and rear of the bus;
9. The service door;
10. The step treads;
11. The aisle mats or aisle runners;
12. The emergency equipment which shall include as a minimum a first aid kit, flares or fuses, and a fire extinguisher;
13. The seats, including a determination that they are securely fastened to the floor;
14. The emergency door buzzer;
15. All hand hold grips; and
16. The interior glazing of the bus.