NTEA COMMERCIAL VEHICLE

UPFITTING SUMMIT

Q&A with NTEA Truck Engineering & Compliance (TEC) Dept.

October 13th, 2026

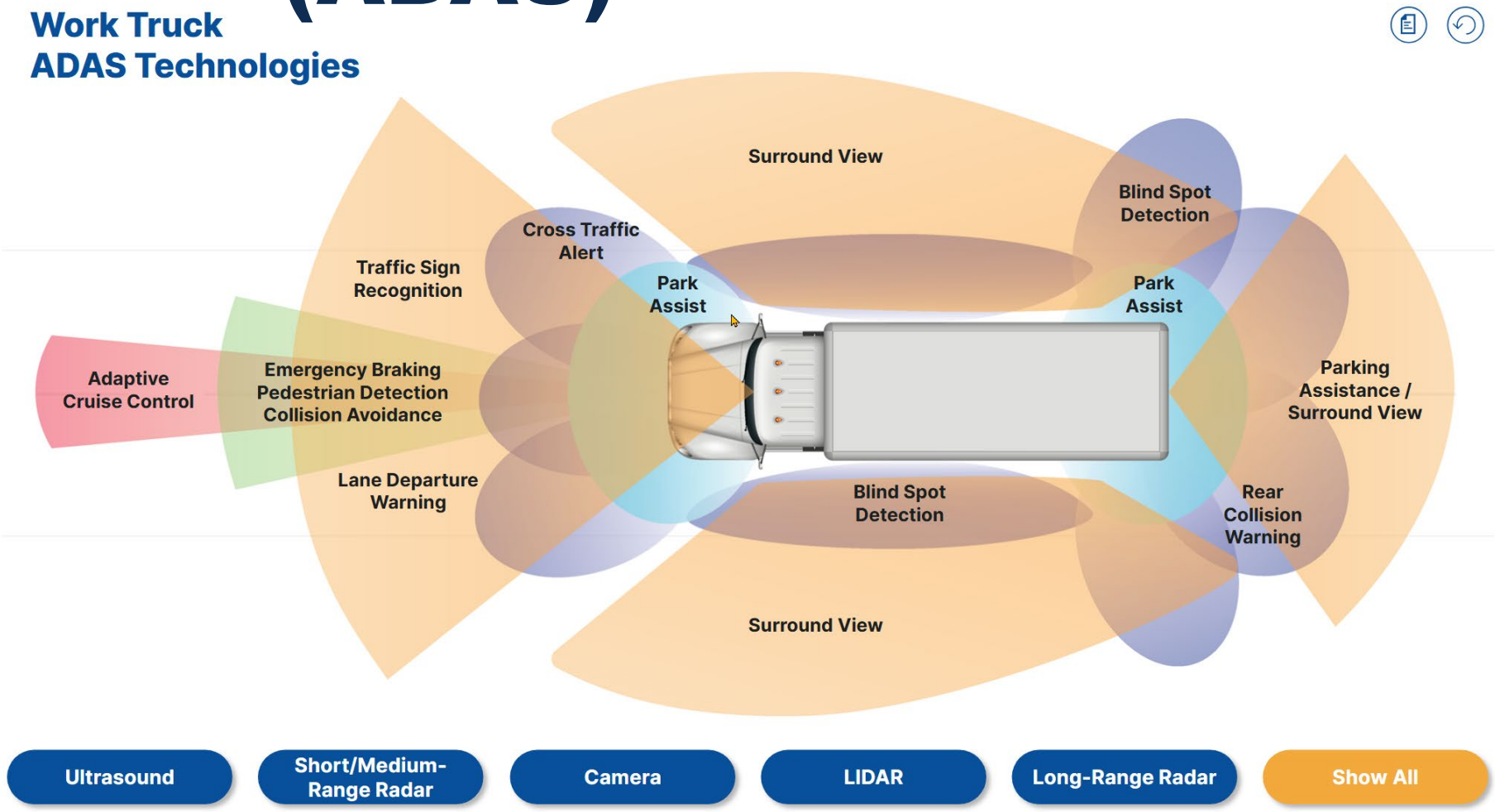
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Agenda:

- ADAS
- Body Mounting
- Navigating an IVD
- Lighting requirements
- Questions?

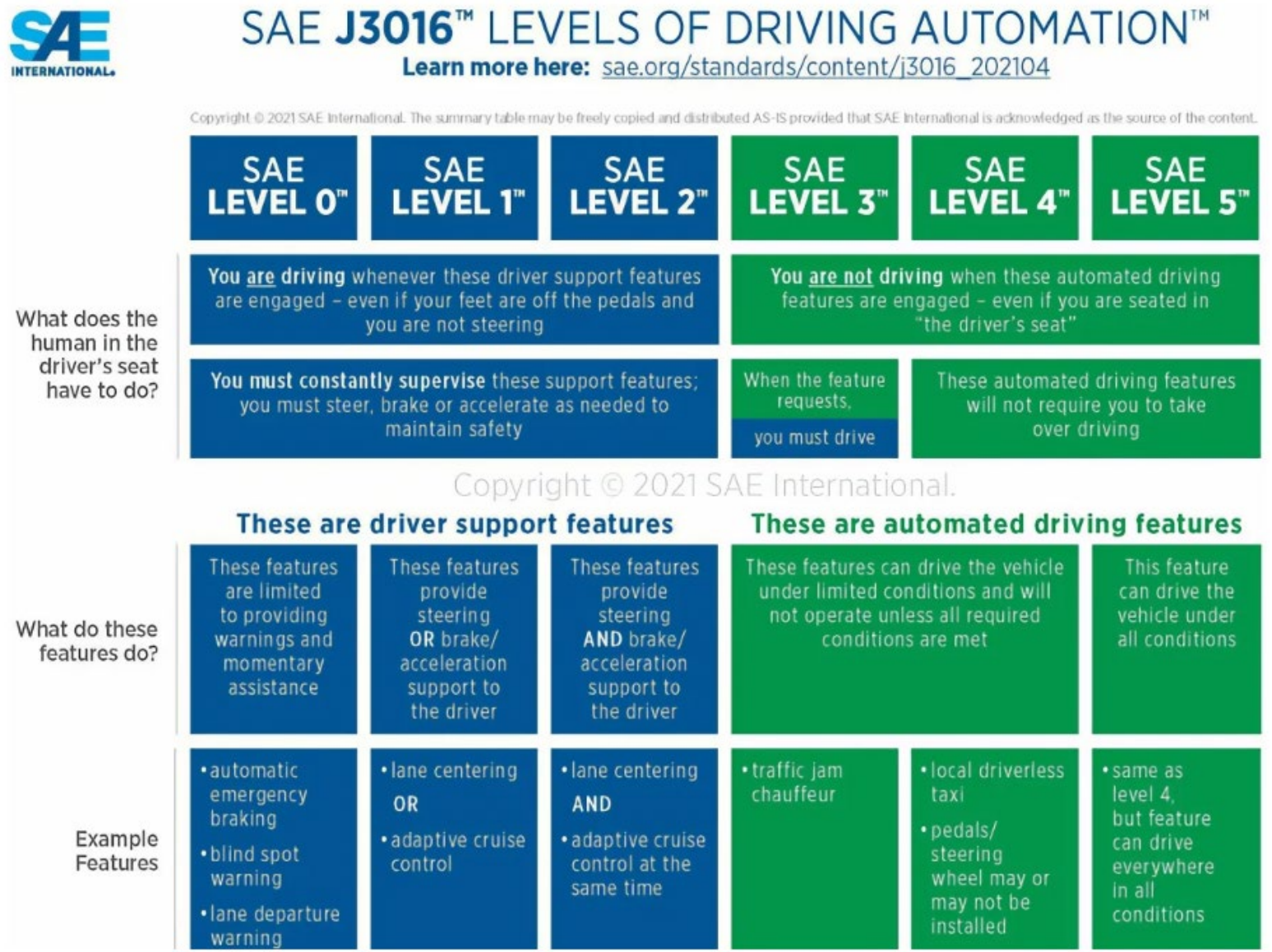
Advanced Driver Assistance Systems (ADAS)

- ADAS paper on NTEA.com
- Requirements for ADAS functions not currently in effect
- FMVSS 127 – Light vehicle AEB, goes into effect 9-1-29
- FMVSS 128 – Heavy vehicle AEB, rulemaking in-progress
- Final-stage/altered vehicles get an extra year



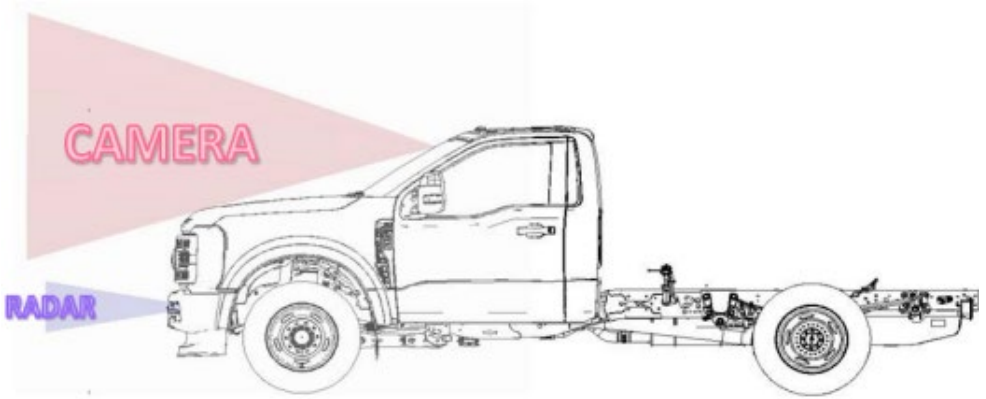
NTEA COMMERCIAL VEHICLE UPFITTING SUMMIT

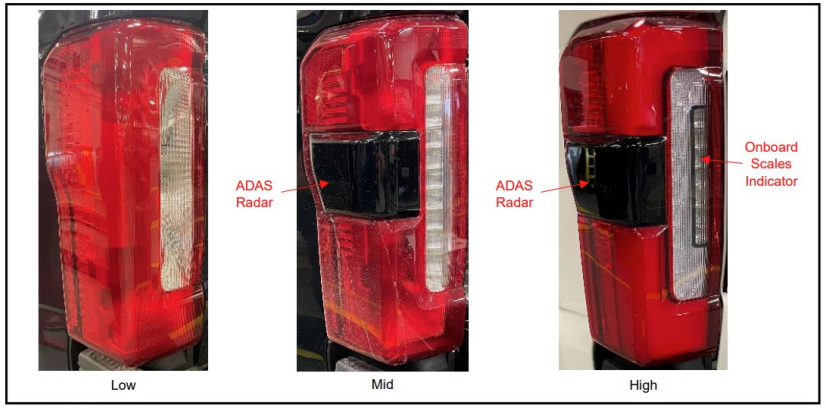
- Levels trending toward more automation/less driver involvement
- Sensory “data fusion” interrelating ADAS functions and using multiple inputs to improve quality of data for automated decision-making



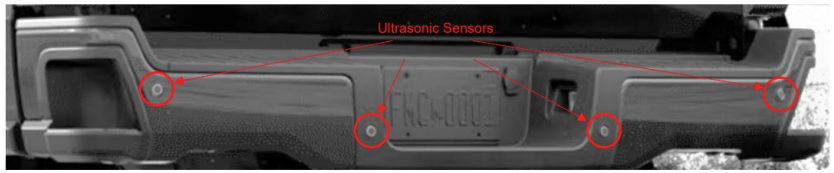
Advanced Driver Assistance Systems (ADAS)

- Sensory devices calibrated in specific locations/orientations to ensure proper function
- Calibration methods/targets/equipment not standardized – OEM/tech supplier
- Result - extremely sensitive to being moved/reoriented





Pickup Taillamp Levels



Advanced Driver Assistance Systems (ADAS)

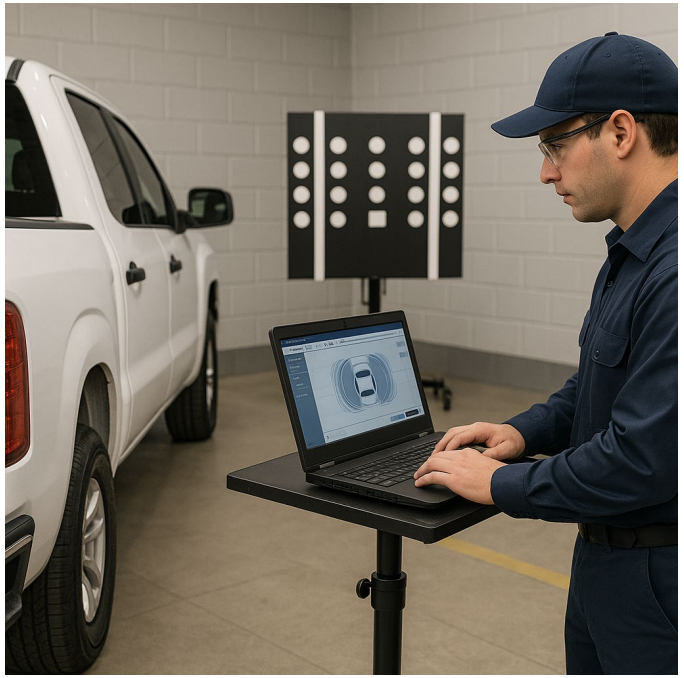
Challenges:

- Conflicts with upfits
- Operational: off/partially off-highway
- Maintenance/repair: recalibration for routine maintenance









Advanced Driver Assistance Systems (ADAS)

- Refer to OEM bulletins/layout books, etc.
- Keep equipment out of camera/sensor FOV
- Use factory box-delete option for pickups

MY2022+ Sprinter – Installation of 360 Degree Camera(JB1)

Cluster A **driver side** nominal camera position

Measured from the reference point of center of rear wheels and ground level, the defined nominal **Driver Side** camera position is listed below as:

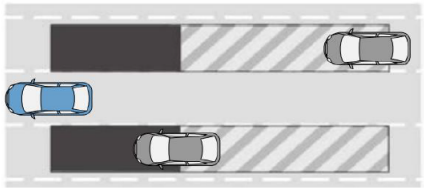
- 1655mm/65.16in from the wheel center of the rear axle(Z-Coordinate)
- 458mm/18.03in inward direction, towards cab-chassis(Y-Coordinate)



III. BLIS CHECK AFTER RETROFIT

1. **BLIS System Interface Check:**
   a. Perform an ignition cycle. The BLIS LEDs in the exterior mirrors (or in A-Pillar in case vehicle has been ordered without mirrors/doors) shall perform a 3 seconds prove-out
   b. Switch BLIS ON and OFF via Center Stack display or Instrument Cluster menu. The BLIS LEDs shall confirm each user action with a twice flash
   c. No faulty message shall appear on Center Stack display or Instrument Cluster.

2. **BLIS Performance Check:**
   (Short **PASS** / **FAIL** real world road evaluation after System Interface Check has been performed)
   a. Start the vehicle. Drive above 10kph (The BLIS feature does not operate in park/P or reverse/R)
   b. Verify that the BLIS LEDs are being switched ON while a different vehicle is in the Blind Spot Zone.
   Note: system is intended to alert only on vehicles. It is not designed to detect parked vehicles, pedestrians, animals, or other infrastructures.
   c. Repeat verification for the following use cases:
      i. Other vehicles overtaking the retrofitted vehicle
      ii. Retrofitted vehicle overtakes another vehicle

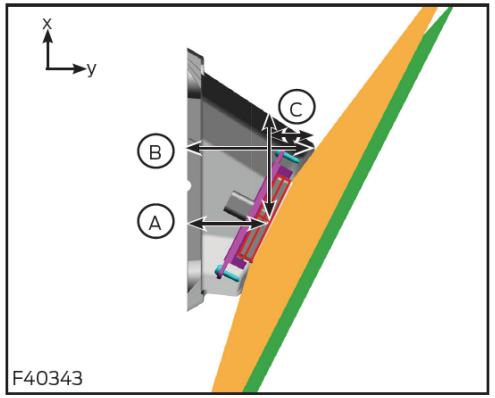


NOTE: THIS INFORMATION HAS BEEN EXTRACTED FROM USERS MANUAL

Radar Location Tolerances

The tolerances of the radar position are shown in the table below 'as calibrated'. 'As calibrated' positions are available in the Calibration Tables for the respective vehicle sections.

For Cutaway, refer to section 4.24.5 Chassis Cab/ Cutaway Calibration Table



Item	Measurement
A	62.86 mm
B	95.20 mm
C	32.38 mm

Plane	Radar Location Tolerance
X	+/- 50 mm
Y	+/- 25 mm
Z	+/- 200 mm

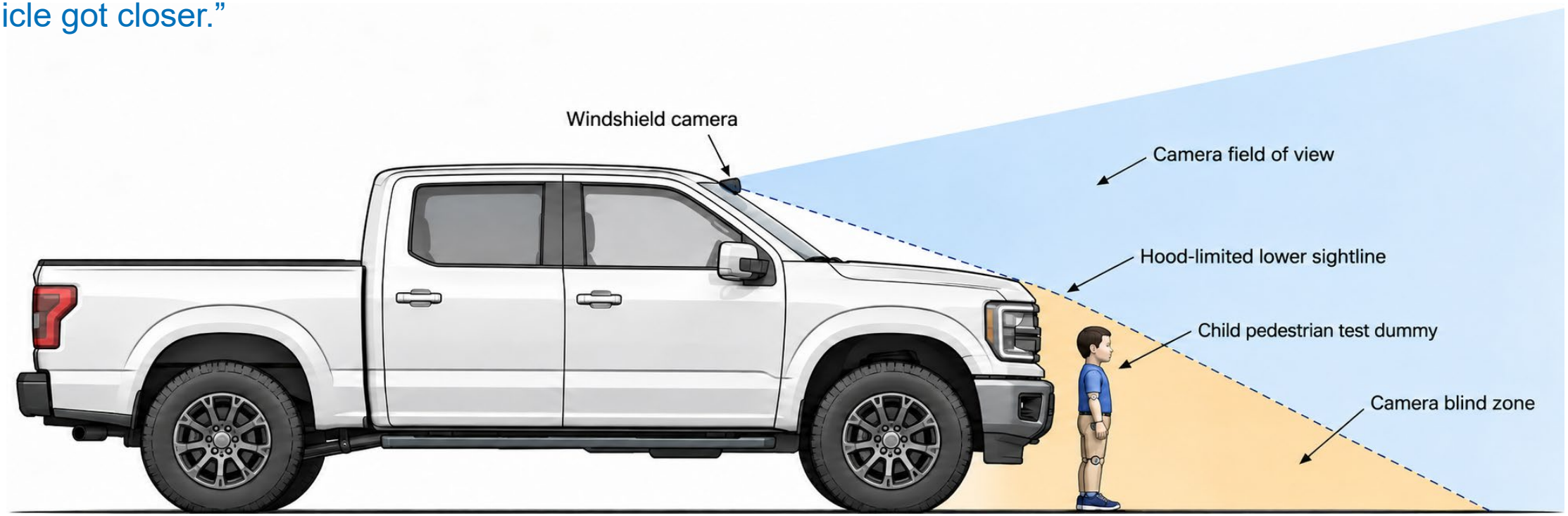
NEWS RELEASE
Insurance Institute for Highway Safety

Cargo vans and work pickups struggle in IIHS crash avoidance tests

October 8, 2026

Pedestrian crash prevention

“Several vehicles, including the acceptable-rated F-350 and Ram 3500, had a harder time detecting and avoiding the child in daylight conditions than avoiding the adult at night. The problem may be related to the shorter height of the child dummy and the tall front ends of the vehicles. That’s because the sensors used for detection are positioned near the rearview mirror. In some instances, the child dummy was detected at a distance but then “disappeared” as the vehicle got closer.”



https://www.iihs.org/news/detail/cargo-vans-and-work-pickups-struggle-in-iihs-crash-avoidance-tests

Body Mounting

Common question:

What are the federal body mounting requirements?

Subpart J—Frames, Cab and Body Components, Wheels, Steering, and Suspension Systems

Source: 53 FR 49402, Dec. 7, 1988, unless otherwise noted.

§ 393.201 Frames.

(a) The frame or chassis of each commercial motor vehicle shall not be cracked, loose, sagging or broken.

(b) Bolts or brackets securing the cab or the body of the vehicle to the frame must not be loose, broken, or missing.

(c) The frame rail flanges between the axles shall not be bent, cut or notched, except as specified by the manufacturer.

(d) Parts and accessories shall not be welded to the frame or chassis of a commercial motor vehicle except in accordance with the vehicle manufacturer's recommendations. Any welded repair of the frame must also be in accordance with the vehicle manufacturer's recommendations.

(e) No holes shall be drilled in the top or bottom rail flanges, except as specified by the manufacturer.

§ 393.203 Cab and body components.

(a) The cab compartment doors or door parts used as an entrance or exits shall not be missing or broken. Doors shall not sag so that they cannot be properly opened or closed. No door shall be wired shut or otherwise secured in the closed position so that it cannot be readily opened. Exception: When the vehicle is loaded with pipe or bar stock that blocks the door and the cab has a roof exit.

(b) Bolts or brackets securing the cab or the body of the vehicle to the frame shall not be loose, broken, or missing.

(c) The hood must be securely fastened.

(d) All seats must be securely mounted.

(e) The front bumper must not be missing, loosely attached, or protruding beyond the confines of the vehicle so as to create a hazard.

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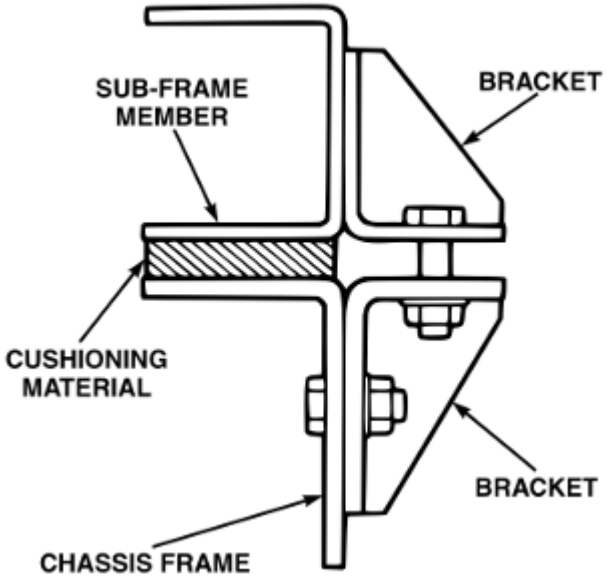
(b) Bolts or brackets securing the cab or the body of the vehicle to the frame shall not be loose, broken, or missing.

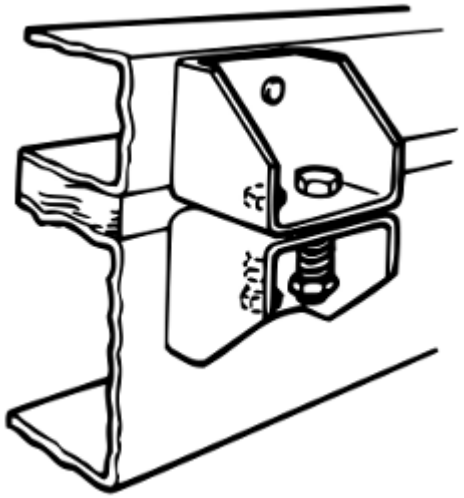
(c) The hood must be securely fastened.

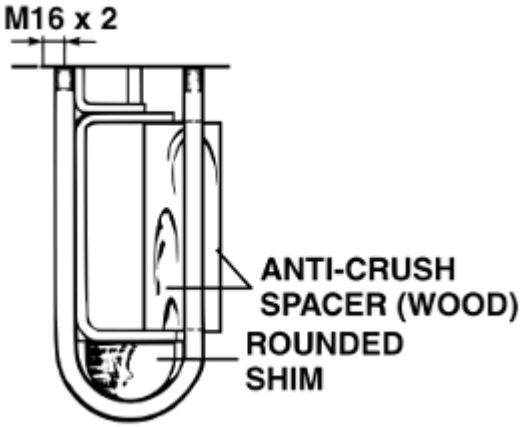
(d) All seats must be securely mounted.

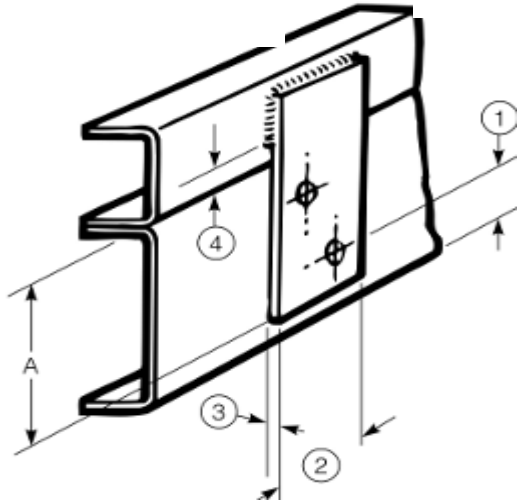
(e) The front bumper must not be missing, loosely attached, or protruding beyond the confines of the vehicle so as to create a hazard.

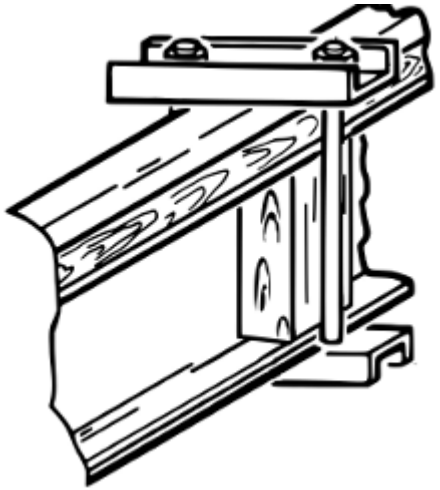
Typical Body Mounting Methods Found in Body Builder Books











NTEA COMMERCIAL VEHICLE UPFITTING SUMMIT

Body Mounting

U-bolts as supplement to shear plates

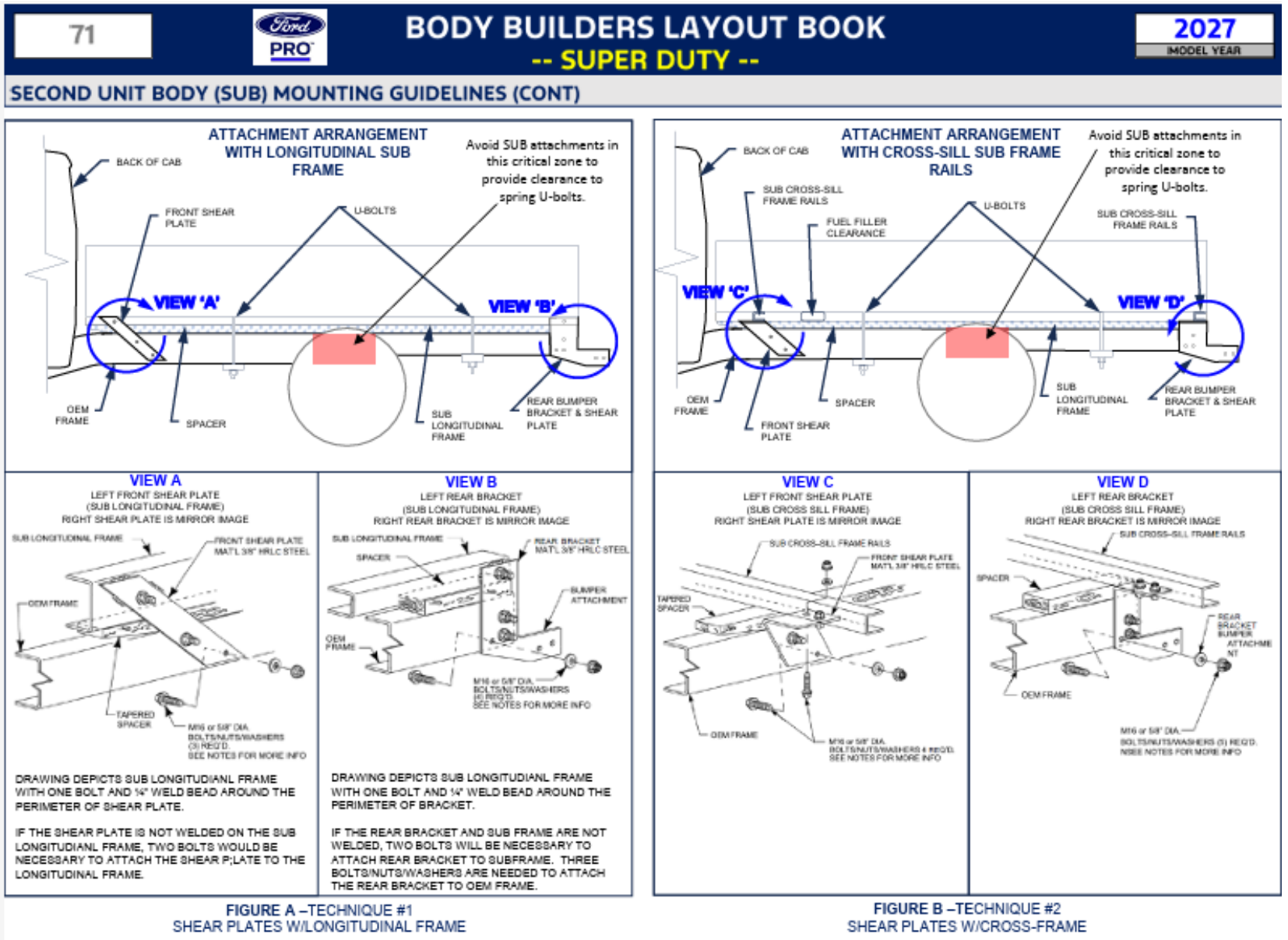
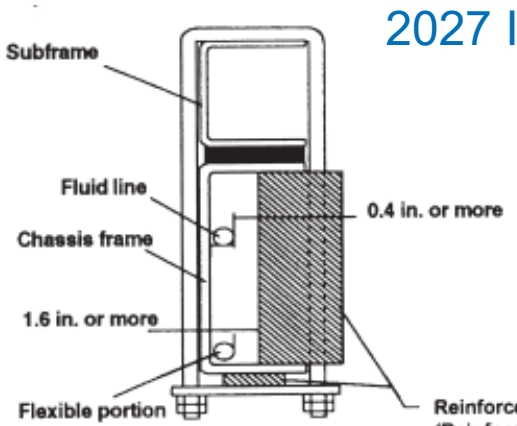


FIGURE A –TECHNIQUE #1
SHEAR PLATES W/LONGITUDINAL FRAME

FIGURE B –TECHNIQUE #2
SHEAR PLATES W/CROSS-FRAME

Body Mounting



2027 Isuzu Truck Body Builder Guide

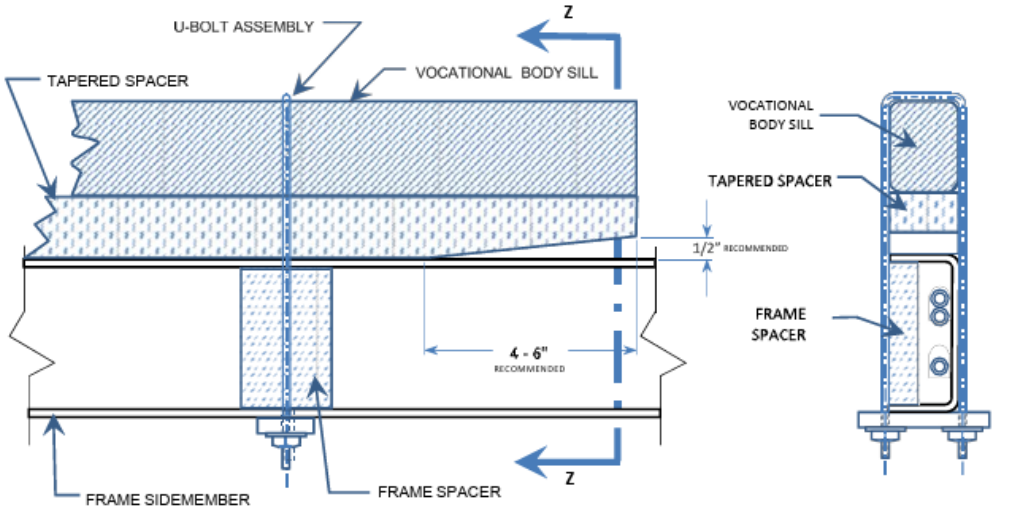
CAUTION:
U-Bolt placement is critical with new emission systems and controls. Extra care must be taken when placing bodies on chassis so as not to damage these components. For the installation positions of the U-bolts, refer to "Prohibited Attachment Areas."

Ford PRO

BODY BUILDERS LAYOUT BOOK
-- SUPER DUTY --

2027 MODEL YEAR

SECOND UNIT BODY (SUB) MOUNTING GUIDELINES (CONT)



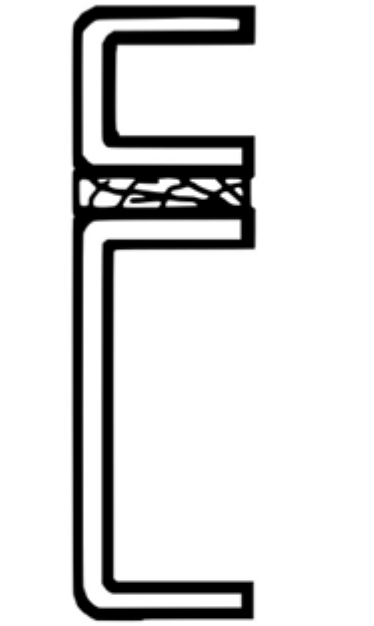
TYPICAL INSTALLATION OF SUB WITH LONGITUDINAL RAIL (VIEW SHOWING INBOARD SIDE RAIL)

Where wrap-around body attachments (such as U-Bolts) are used, the frame side members must have flange reinforcement spacers to avoid flange damage when full torque is applied to the attaching bolts. Spacers are recommended and must be cut out to clear brake-lines, fuel lines, wiring, etc. If metal spacers are used, no welding to the frame side members is permitted. Tapered spacers between the vocational-body sill and the frame side members flanges are recommended. Recommended taper is ½-inch at the frontend, diminishing to the contact 4 to 6 inches rearward. (See sketch for typical installations)

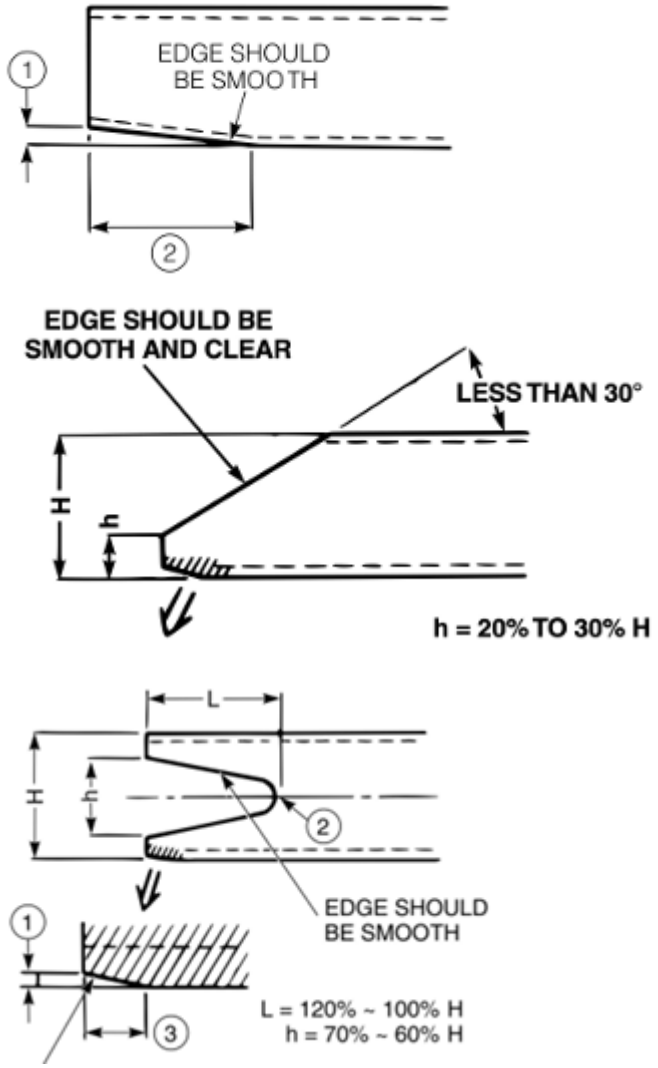
FIGURE C - CHASSIS CAB SUB-MOUNTING SPACER

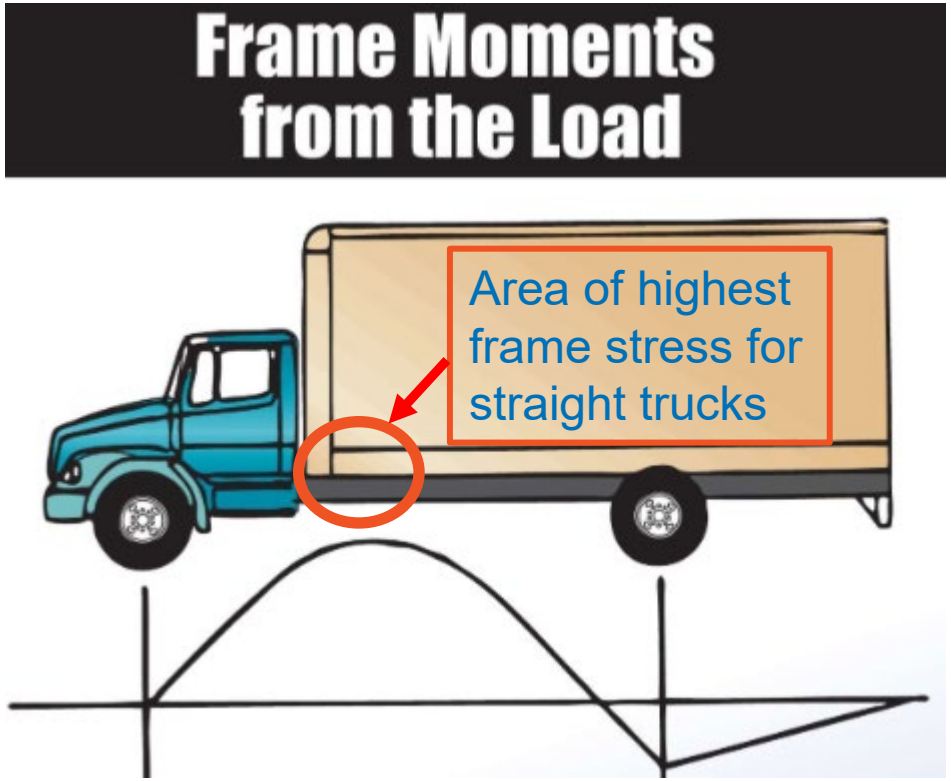
- Reinforcement/Anti-crush blocks needed inside chassis frame C-channel
- Blocks need to located to provide clearance to fuel/brake/electrical lines inside frame channel
- Body spacer and/or body sill tapering

Body Mounting



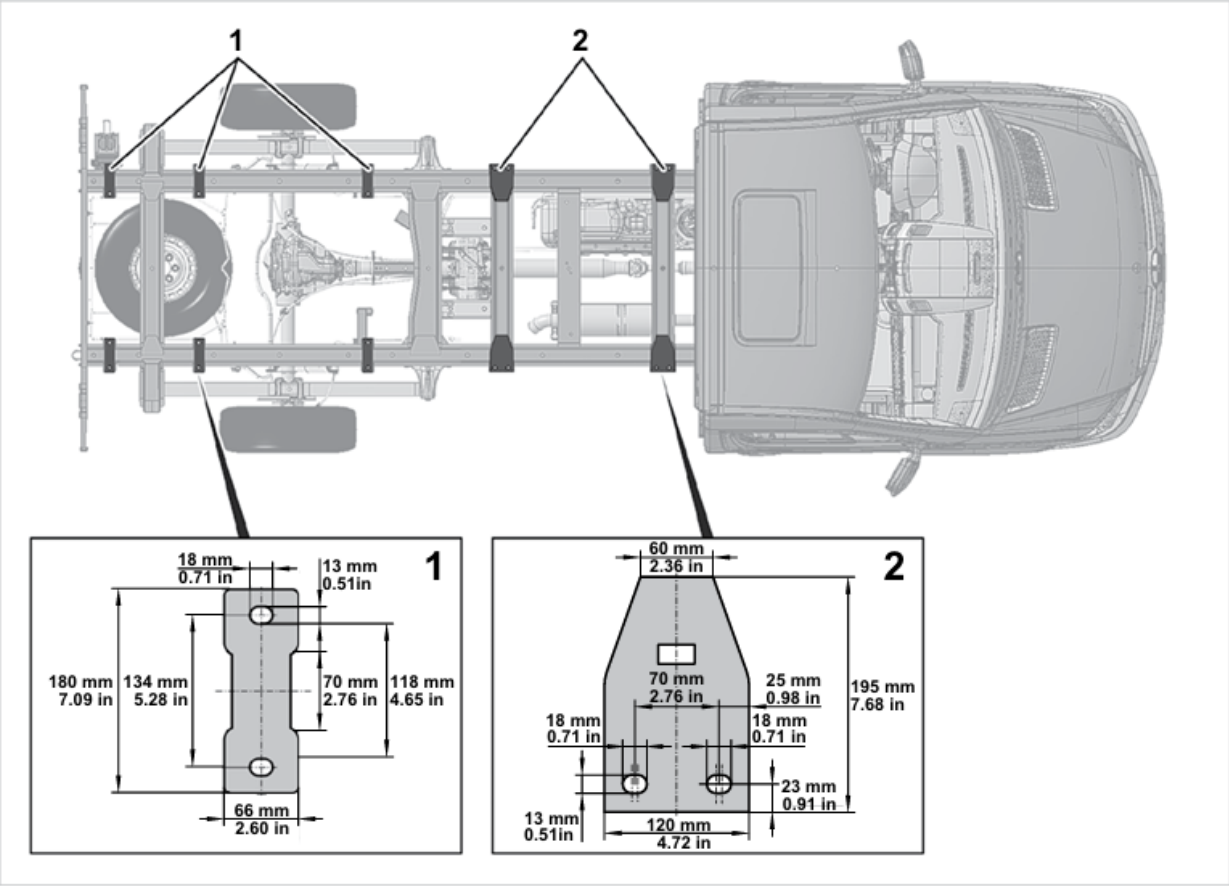
CHANNEL
SUB-FRAME
WITH SILL PLATE

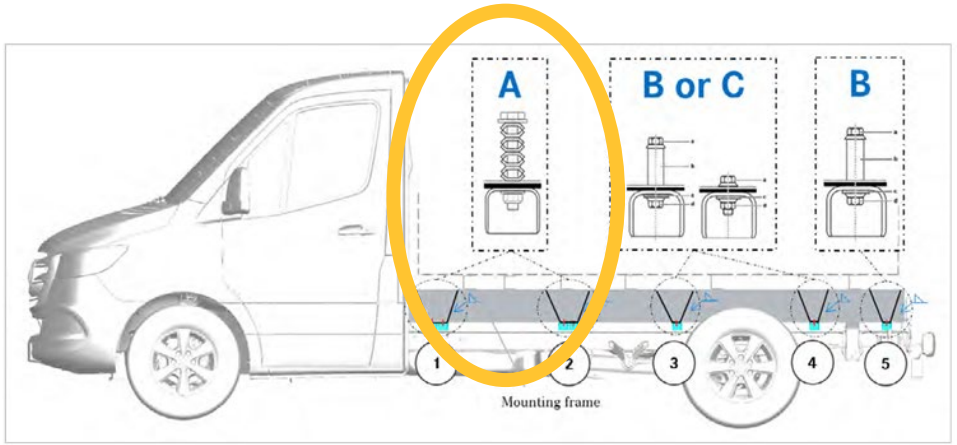




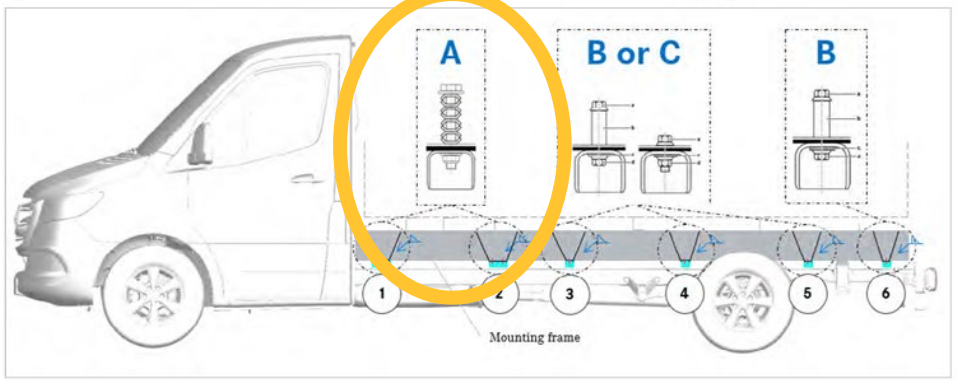
Body Mounting

Specific body mounts/locations for unibody van chassis’





Sprinter cab chassis with 144” wheelbase – recommended attachment to the chassis frame/longitudinal members



Sprinter cab chassis with 170” wheelbase – recommended attachment to the chassis frame/longitudinal members

An elastic connection should be used for the first and second mounting consoles to prevent stress peaks in the transition area between the rear of the cab and the longitudinal members (see pictures on following page).

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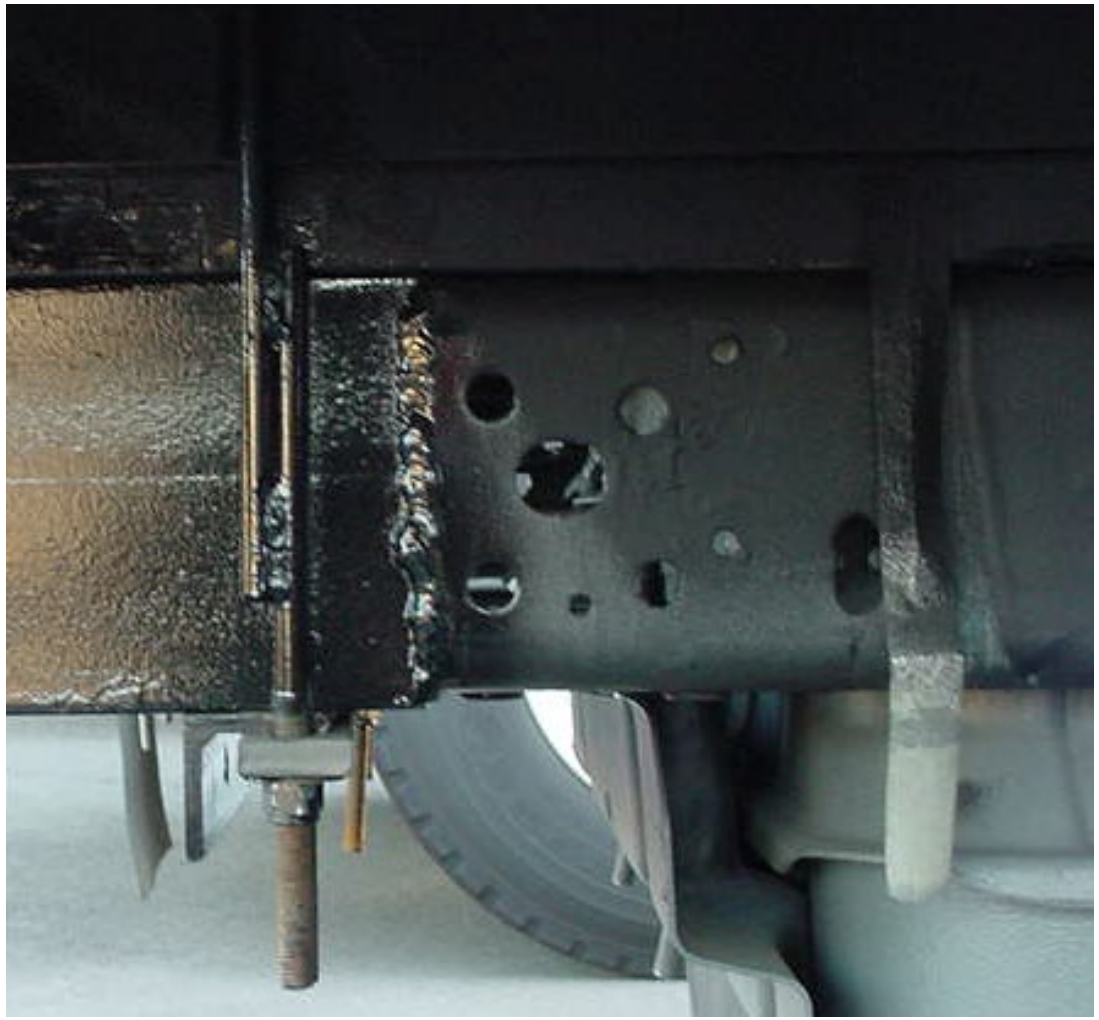
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Truck Frame Fundamentals Series
TE101
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Body Mounting

- Additional body and mounting considerations for 10,000 LB GVWR and below because of multiple FMVSS standards apply that can have specific OEM requirements
- In particular, F/MVSSS 212/219 and 301

- DOCUMENT FOR INCOMPLETE VEHICLE APPLICABLE TO 2026 MODEL YEAR SILVERADO / SIERRA LIGHT & HEAVY DUTY FULL-SIZE TRUCKS & TAHOE SUV

CMVSS 301 and FMVSS 301 – FUEL SYSTEM INTEGRITY Refer to Vehicle Types, GVWRs, and Applicable Statements that follow

B. The (intermediate and) final stage manufacturer conforms to the following:

1. A box, platform, or other rear structural assembly must be installed on the back of the vehicle.
2. The rear assembly structure must provide comparable stiffness to the pickup box sold as original equipment as part of the complete vehicle version of this product.
3. The method of rear assembly structure mounting and mount properties (material and structural) are similar to those used to attach the pickup box sold as original equipment as part of the complete vehicle version of this product.
4. The dimension and mass as well as other restrictions (excluding the Maximum Frontal Area) found in MVSS 301 Table A, are not exceeded.

DOCUMENT FOR INCOMPLETE VEHICLE APPLICABLE TO 2026 MODEL YEAR
SILVERADO / SIERRA LIGHT & HEAVY DUTY FULL-SIZE TRUCKS & TAHOE SUV

CMVSS 301 and FMVSS 301 – FUEL SYSTEM INTEGRITY Refer to Vehicle Types, GVWRs, and Applicable Statements that follow

C. This incomplete vehicle, when completed, will conform to CMVSS 301 and FMVSS 301 Fuel System Integrity if: ……

2. The **dimension and mass** as well as other restrictions (excluding the Maximum Frontal Area) found in MVSS 301 Table A, are not exceeded.

3. The final stage manufacturer completes **the fuel filler neck and fuel level sender installation**(s) according to “Best Practices” or “Special Applications (if applicable)” sections found within the Body Builder Manuals on the GM Upfitter Integration website located at www.gmupfitter.com

4. During all barrier impact tests: a. **No component installed by any intermediate or final stage manufacturer impinges or causes distortion to the fuel system** with sufficient energy to puncture or separate the fuel system. b. **No vehicle modification by any intermediate or final stage manufacturer results in any portion of the vehicle impinging upon or causing distortion to the fuel system** with sufficient energy to puncture or separate the fuel system. Care should be taken that the structural integrity of the vehicle is restored following any modification of the structure. c. **Any body installed by an intermediate or final stage manufacturer is mounted securely to absorb loads and prevent movement relative to the frame which could cause any fuel system component to be punctured, separated or otherwise damaged when tested to applicable procedures of CMVSS 301 or FMVSS 301**.

§ 571.301 Standard No. 301; Fuel system integrity.

S3. ***Application.*** This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks and buses that have a GVWR of 4,536 kg or less and use fuel with a boiling point above 0 °C, and to school buses that have a GVWR greater than 4,536 kg and use fuel with a boiling point above 0 °C.

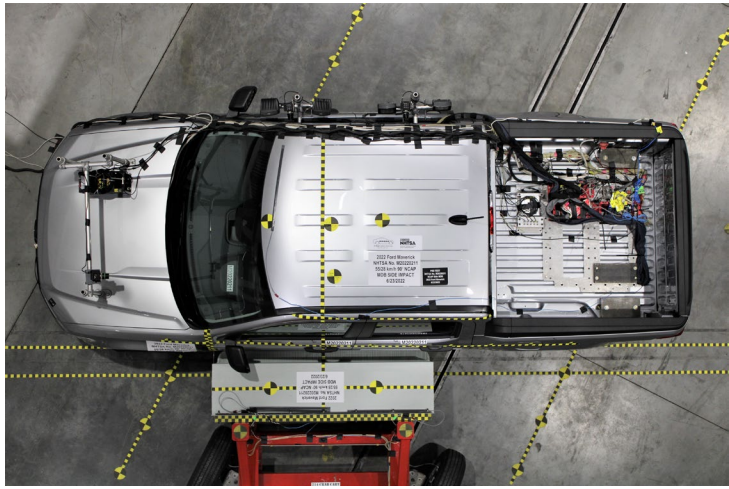
S6.1 ***Frontal barrier crash.*** When the vehicle travelling longitudinally forward at any speed up to and including 48 km/h (~30 mph) impacts …..



S6.2 ***Rear moving barrier crash.*** When the vehicle is impacted from the rear by a moving deformable barrier 80 ± 1.0 km/h (~50 mph) with a 70 percent overlap….



S6.3 ***Side moving barrier crash.*** When the vehicle is impacted laterally on either side by a moving deformable barrier at 53 ± 1.0 km/h (~33 mph)…



For all 3 tests: fuel spillage shall not exceed the limits of S5.5.

Body Mounting



Figure A-6: Pre-Test Left Side View



Figure A-13: Pre-Test Left Rear 3/4 View



Figure A-27: Pre-Test Overhead Vehicle and MDB View



Figure A-25: Pre-Test MDB Top View

- 70 percent overlap of rear impact cart to vehicle.
- Cart off-set to the side of the vehicle with the fuel tank, fill neck and lines.

NHTSA REPORT NUMBER: 301R-CAL-15-006

REPORT NUMBER: 301R-CAL-15-006

SAFETY COMPLIANCE TESTING FOR FMVSS 301R
FUEL SYSTEM INTEGRITY – REAR IMPACT

Ford Motor Co.
2015 Ford F-150

NHTSA NUMBER: C20150203

PREPARED BY:
CALSPAN CORPORATION
TRANSPORTATION TEST OPERATIONS
P.O. BOX 400
BUFFALO, NEW YORK 14225

January 9, 2016

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration Enforcement
Office of Vehicle Safety Compliance
Mail Code: NVS-220
1200 New Jersey Avenue, SE
Washington, DC 20590

Source: National Highway Traffic Safety Administration, FMVSS 301 Compliance Test C20150203



Figure A-8: Post-Test Left Side View



Figure A-14: Post-Test Left Rear 3/4 View



Figure A-28: Post-Test MDB Top View

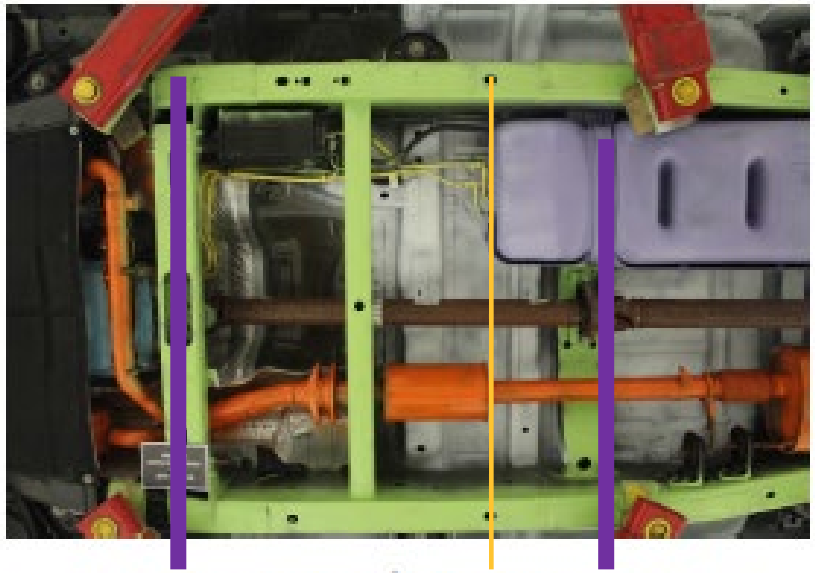


Figure A-31: Pre-Test Mid Underbody View

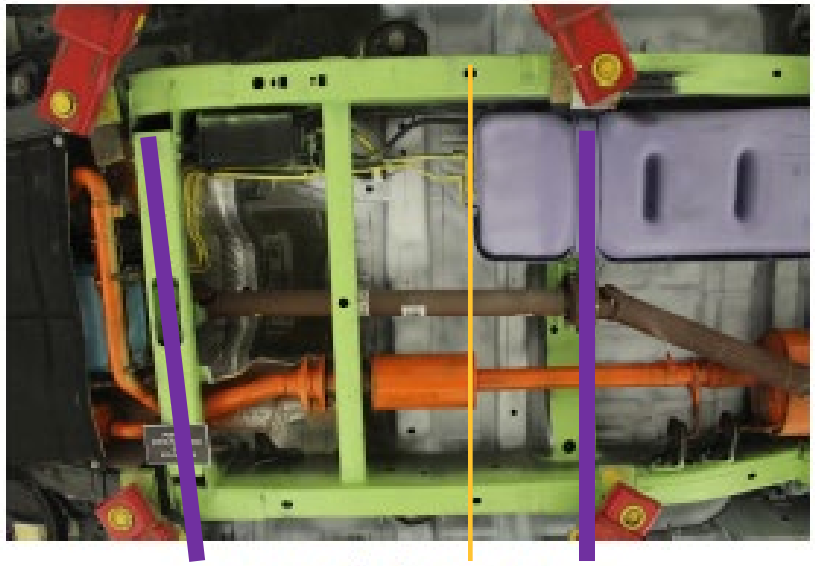


Figure A-32: Post-Test Mid Underbody View

BEFORE



Figure A-33: Pre-Test Rear Underbody View

AFTER



Figure A-34: Post-Test Rear Underbody View

Body Mounting

- "Spit test" after crash to check for fuel leakage.
- BTW – it passed



Figure A-41: Rollover 270° View



Figure A-38: Rollover 90° View



Figure A-42: Rollover 360° View



Figure A-40: Rollover 180° View

Body Mounting

Key takeaways:

- Proper body mounting matters!
- Always review OEM body builder body mount guidance and IVD statements, as well as any guidance from the body manufacturer.
- On vehicles with a GVWR of 10K lbs. or less, body mounting factors into F/CMVSS compliance for crashworthiness, especially for F/CMVSS 301.

What is pass-through certification?

Pass-through certification occurs when a manufacturer of a multi-stage vehicle remains within the instructions provided by the chassis manufacturer in its IVD, to the extent possible.

Additionally, pass through compliance for individual F/CMVSS may be available from component/system suppliers.

All Final Stage Certification starts with the incomplete vehicle document

- The incomplete vehicle document (IVD) is one of the most important documents in the certification process for final-stage manufacturers.
- Chassis manufacturers (incomplete manufacturers) are required to supply an IVD (sometimes known as an incomplete vehicle manual or IVM) with each new incomplete vehicle.

Incomplete vehicle document

The IVD:

- Includes a listing of each applicable safety standard in effect at the time of incomplete vehicle manufacture followed by a conformity statement
- Provides information and guidelines necessary for analysis of each safety standard
- Assists downstream manufacturers in determining what can or cannot be done in order to maintain conformity

Incomplete vehicle document

In the U.S., IVD statements are designated as type 1, type 2 or type 3 statements:

- Type 1 – Vehicle meets specific FMVSS requirements as manufactured as long as it isn't modified in a way that affects performance
- Type 2 – Vehicle will meet specific FMVSS as long as certain conditions are met
- Type 3 – Incomplete vehicle manufacturer cannot determine, based on components fitted onto the incomplete vehicle, that the vehicle will meet FMVSS requirements, and the chassis manufacturer makes no representation of conformity

SOURCE: TITLE 49, UNITED STATES CODE, CHAPTER 301, § 30102

Type 1 statement

104 The statement below is applicable to all incomplete vehicle types:

This vehicle when completed, will conform to Standard 104, Windshield Wiping and Washing Systems, if no alterations are made to the windshield, the windshield wiping and washing system including the electrical circuit from the windshield wiping and washing motors to the power source, and if no obstructions are added that restrict or otherwise redirect fluid flow from the washer nozzles to the windshield.

Type 2 statement

108 The statements below are applicable to the Chassis Cab:

This vehicle, when completed, will conform to Standard 108, Lamps, Reflective Devices, and Associated Equipment, if all the required lighting equipment as indicated in Table H on the next page (identified by the codes R and S) is designed and installed in accordance with the requirements of Standard 108 and the directions contained in this compliance manual.

Type 3 statement

111 **The statement below is applicable to all incomplete vehicle types with a GVWR of 4536 kg [10,000 lb.] or less:**

Conformity with Standard 111, S6.2 Rear visibility, as relates to rearview image devices, cannot be determined based upon the components supplied on this incomplete vehicle

Combination Type 1 and 2

105 The statement below is applicable to all incomplete vehicle types:

This vehicle, when completed, will conform to Standard 105, Hydraulic and Electric Brake Systems, if:

- No alterations, modifications, or replacements are made to the following:
  - Service or parking brake system
  - Antilock brake system
  - Vacuum system
  - No loads are added to the Front End Accessory Drive (FEAD) on SRW vehicles with 7.3L Gas engines.
  - Wheels and tires
  - Brake system indicator lamp and wiring
  - Brake system reservoir labeling; label is not to be obstructed by additional under hood components
  - Suspension ride height or spring rate
- The service brake pedal assembly and park brake switch operation is not restricted by any alteration or added components.
- No part of add-on equipment, i.e., toolboxes, flatbed attaching brackets, etc., can interfere with proper movement of parking brake cables or airflow to rear brake assemblies.
- The maximum GAWR's and GVWR, as identified on the cover of this document, are not exceeded.
- The Vertical Center of Gravity of the completed vehicle (CG_v) in any loading condition must fall within the range defined by the equations in Table 1 for the applicable chassis configuration.

It is recommended that the Vertical Center of Gravity of the completed vehicle (CGv) not exceed 48 inches from the ground in any loading condition.

TABLE 1
CENTER OF GRAVITY LIMITATIONS FOR COMPLETED VEHICLES

GVWR	Chassis Configuration	FMVSS 105 Completed Vehicle CG_v Range (1)(2)		FMVSS 126 Completed Vehicle CG_v Maximum (in) (1)	FMVSS 212/219 FMVSS 301 SUB CG_{vb} Maximum (in) (3)
		Maximum (in)	Minimum (in)		
10,000 lb. or less	Regular Cab	$(3.85 * CG_h) - (1.43 * WB)$	$(3.85 * CG_h) - (2.51 * WB)$	42.6	17.6
	Super & Crew Cab				24.0
Over 10,000 lb.	All	$(4.55 * CG_h) - (1.43 * WB)$	$(4.55 * CG_h) - (3.21 * WB)$	N/A	N/A

(1) Completed Vehicle Vertical CG (CG_v) as measured from the ground
(2) Completed Vehicle Horizontal CG (CG_h as measured from the Centerline of the Front Axle, and Wheelbase (WB) must be expressed in Inches when used in the equations.
(3) Second Unit Body (SUB) Vertical CG (CG_{vb}) as measured from the top of the Frame Rails 12-18 inches behind the cab.

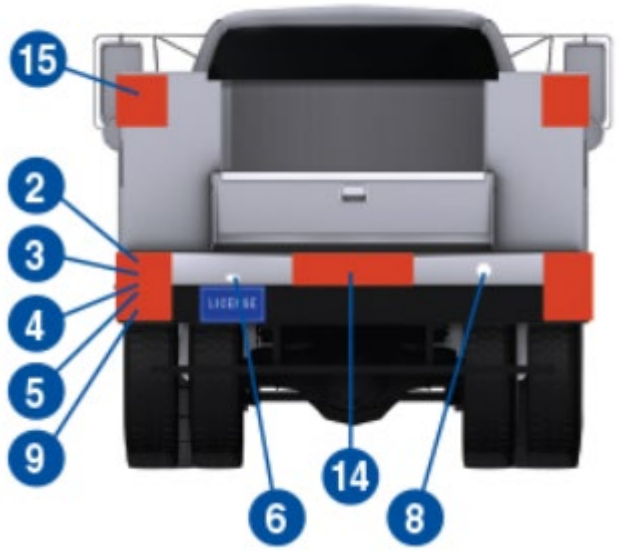
How certification can be affected

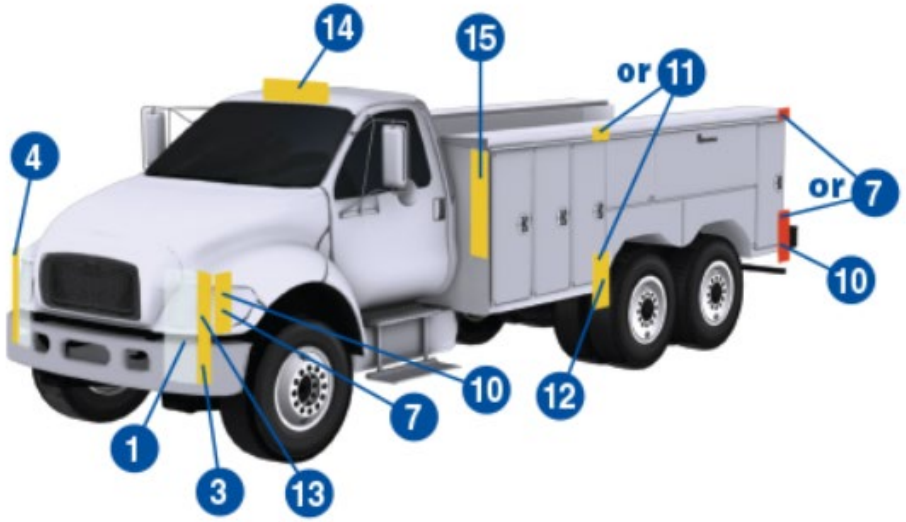
Vehicle parameter	Potential performance affected (not all inclusive)
Maximum horizontal and vertical center of gravity	Stopping distance (F/CMVSS 105, 121 and 135), vehicle stability (F/CMVSS 126)
Frontal area	Fuel economy and emissions
Weight	F/CMVSS 105, 121 and 135 – Brake systems F/CMVSS 108 – Lamps, reflective devices F/CMVSS 110 – Tire selection F/CMVSS 126 – Electronic stability control F/CMVSS 208 – Occupant crash F/CMVSS 216a – Roof crush resistance F/CMVSS 301 – Fuel system integrity Other F/CMVSS Fuel economy Emissions

Compliance challenges with common trends - Lighting

- Additional Equipment Location
- Visibility requirements
- Lighting masking
- Brake Actuated Pulsating Stop Lamps

F/CMVSS 108





Important — please read

- All lamps and reflective devices shall be mounted permanently to a permanent part of the vehicle.
- All heights measured from ground to center of lamp or reflective device at curb weight.
- Auxiliary lights cannot interfere with required lighting.
- Any lamps in pairs should be symmetrical and located as far apart as practicable.
- No part of the vehicle shall prevent any device from meeting its requirement unless an additional lamp or reflective device meeting the requirement is installed.
- The face of any device installed on the front, rear or side should be respectively perpendicular or parallel to the vehicle's centerline unless it is photometrically certified at the installed angle.

Required on all vehicles

	Lamp or reflective device	Location	Height	Color	Number
1	Head lamp (not required on trailer)	Front[1]	22–54" 55.9–137.2 cm	White	2 or 4
2	Tail lamp	Rear[1]	15–72" 380–1828 mm	Red	2 or more
3	Turn signal lamp	Front[1]	15–83" 380–2108 mm	Amber	2 or more
		Rear[1] (not required on trailer if front turn signals are double-faced and visible from the rear)	15–83" 380–2108 mm	Red or amber	2 or more
4	Hazard lamp (same lamp as turn signal)	Front[1]	15–83" 380–2108 mm	Amber	2 or more
		Rear[1]	15–83" 380–2108 mm	Red or amber	2 or more
5	Stop lamp	Rear[1]	15–72" 380–1828 mm	Red	2 or more
6	License plate lamp	Rear, at license plate	No requirement	White	1 or more
7	Side marker lamp	Side, near front	15" min. 380 mm min.	Amber	1 each side
		Side, near rear (not required on trailer)	15" min.* 380 mm min.	Red	1 each side
8	Backup lamp (not required on trailer)	Rear	No requirement	White	1 or more
9	Rear reflector	Rear[1]	15–60" 380–1524 mm	Red	2 or more
10	Side reflector	Side, near front	15–60" 380–1524 mm	Amber	1 each side
		Side, near rear (not required on trailer)	15–60" 380–1524 mm	Red	1 each side
11	Intermediate side marker lamp (if vehicle overall length is 30' / 9.1 m or greater)	Side, near center (side, near the midpoint between front and rear side marker lamps)	15" min. 380 mm min.	Amber	1 each side
12	Intermediate side reflector (if vehicle overall length is 30' / 9.1 m or greater)	Side, near center (side, near the midpoint between front and rear side reflectors)	15–60" 380–1524 mm	Amber	1 each side
13	Parking lamp (only if vehicle is less than 80"/2032 mm wide)	Front[1] (not required on trailer)	15–72" 380–1828 mm	Amber or white	2 or more

Required on all vehicles 80" (2032 mm) or wider

14	Identification lamp	Front, spaced 6–12" or 152–300 mm on center (not required on trailer)	As high as practicable[2]	Amber	3
		Rear, spaced 6–12" or 152–300 mm on center (not required on truck-tractor)	As high as practicable	Red	3
15	Clearance lamp	Front, at widest point to indicate overall width of vehicle[3, 4]	As high as practicable	Amber	2
		Rear, at widest point to indicate overall width of vehicle[3, 4] (not required on truck-tractor)	As high as practicable	Red	2

Required on trucks, buses and multipurpose passenger vehicles less than 80" (2032 mm) in overall width and with a GVWR of 10,000 lbs. (4536 kg) or less

16	Center high mounted stop lamp (CHMSL)	Rear, on vertical centerline of the vehicle	34" min. 864 mm min.	Red	1

- CHMSL cannot be combined with any other lamp or reflective device other than with a cargo lamp.
- CHMSL cannot be combined optically with any cargo lamp.

Required on trailers 80" (2032 mm) or more in overall width with a GVWR of more than 10,000 lbs. (4536 kg)

17	Conspicuity systems	On sides and rear of trailer	15" min./60" max. 380 mm min./ 1524 mm max.	Red and white	See Section 8.2 of FMVSS 108
		Rear upper corners of trailer	As high as practicable	White	1 each side See Section 8.2 of FMVSS 108

- Edge of red sheeting cannot be closer than 3" (75 mm) to the edge of any luminous lens area of any amber lamp.
- Edge of white sheeting cannot be located closer than 3" (75 mm) to the edge of any luminous lens.
- Trailers equipped with conspicuity systems conforming to Section 8.2 need not be equipped with reflectors.

Required on truck-tractors

18	Conspicuity systems	Rear upper corners of cab	As high as practicable	White	1 each side See Section 8.2 of FMVSS 108
		Rear, on fenders, mudflap brackets or within 11.8" (300 mm) below top of mudflaps	As horizontal as practicable, not higher than 60" (1524 mm) from the ground	Red and white	1 each side See Section 8.2 of FMVSS 108

- If the vehicle is certified with temporary mudflap support brackets, the strips shall be mounted on the mudflaps or on plates transferable to permanent mudflap support brackets.
- For truck-tractors without mudflaps, the strips may be mounted outboard of the frame on brackets behind the rear axle or on brackets ahead of the rear axle and above the top of the tires at unladen vehicle height, or they may be mounted directly or indirectly to the back of the cab as close to the outer edges as practicable, above the top of the tires, and not more than 60" (1524 mm) above the road surface at unladen vehicle height.
- For strips mounted on the back of the cab, no more than 25% of their cumulative area may be obscured by vehicle equipment as determined in a rear orthogonal view.

[1] One on each side of vertical centerline, at same height, as far apart as practicable.
[2] 80" (1524 mm) maximum on rear of trailers 80" (2032 mm) or more in width.
[3] Front identification lamps may be mounted either on the cab roof above the windshield or on top of the body.
[4] Clearance lamps may be installed at a location other than on the front or rear if necessary to indicate the overall width of a vehicle or for protection from damage during normal operation of the vehicle; and, at such a location, they need not meet the photometric output at any test point that is 45 degrees inboard.

F/CMVSS 108 Lighting Visibility

S6.1.3 ***Mounting location.***

S6.1.3.1 Each lamp, reflective device, and item of associated equipment must be securely mounted on a rigid part of the vehicle, other than glazing, that is not designed to be removed except for repair, within the mounting location and height limits as specified in Table I, and in a location where it complies with all applicable photometric requirements, effective projected luminous lens area requirements, and visibility requirements with all obstructions considered

S6.2 ***Impairment***

S6.2.2 If any required lamp or reflective device is obstructed by motor vehicle equipment (e.g., mirrors, snow plows, wrecker booms, backhoes, winches, etc.) including dealer installed equipment, and cannot meet the applicable photometry and visibility requirements, the vehicle must be equipped with an additional lamp or device of the same type which meet all applicable requirements of this standard, including photometry and visibility

F/CMVSS Lighting Visibility

ECFR CONTENT

Table V-b - Visibility Requirements of Installed Lighting Devices - Lens Area Visibility Option

Lighting device	Corner points[1] [2]				Required visibility
	Motorcycle		All other		
Turn signal lamp[3]	15° UP-20° IB	15° UP-45° OB	15° UP-45° IB	15° UP-45° OB	Unobstructed minimum
	15° DOWN-20° IB	15° DOWN-45° OB	15° DOWN-45° IB	15° DOWN-45° OB	effective projected
Stop lamp	15° UP-45° RIGHT[4]	15° UP-45° LEFT[4]	15° UP-45° IB	15° UP-45° OB	luminous lens area
	15° DOWN-45° RIGHT[4]	15° DOWN-45° LEFT[4]	15° DOWN-45° IB	15° DOWN-45° OB	of 1,250 sq mm in any
Taillamp	15° UP-45° RIGHT[5]	15° UP-45° LEFT[5]	15° UP-45° IB	15° UP-45° OB	direction throughout
	15° DOWN-45° RIGHT[5]	15° DOWN-45° LEFT[5]	15° DOWN-45° IB	15° DOWN-45° OB	the pattern defined by
Parking lamp	No Requirement	No Requirement	15° UP-45° IB	15° UP-45° OB	the specified corner
	No Requirement	No Requirement	15° DOWN-45° IB	15° DOWN-45° OB	points.

[1] IB indicates an inboard direction (toward the vehicle's longitudinal centerline) and OB indicates an outboard direction.

[2] Where a lamp is mounted with its axis of reference less than 750 mm above the road surface, the vertical test point angles located below the horizontal plane subject to visibility requirements may be reduced to 5° down.

[3] Where more than one lamp or optical area is lighted at the front on each side of a multipurpose passenger vehicle, truck, trailer, or bus, of 2032 mm or more overall width, only one such area need comply.

[4] If a multiple lamp arrangement is used for a motorcycle stop lamp, the inboard angle for each lamp shall be 10 degrees.

[5] If a multiple lamp arrangement is used for a motorcycle tail lamp, the inboard angle for each lamp shall be 45 degrees.

F/CMVSS Lighting Visibility – Option 2

ECFR CONTENT

Table V-c - Visibility Requirements of Installed Lighting Devices - Luminous Intensity Visibility Option

Lighting device	Corner points[1] [2]				Required visibility Minimum luminous intensity in any direction throughout the pattern defined by the specified corner points.
	Motorcycle		All Other		Candela
Turn signal lamp	15° UP-20° IB	15° UP-80° OB	15° UP-45° IB	15° UP-80° OB	0.3
	15° DOWN-20° IB	15° DOWN-80° OB	15° DOWN-45° IB	15° DOWN-80° OB	
Stop lamp	15° UP-45° RIGHT[4]	15° UP-45° LEFT[4]	15° UP-45° IB	15° UP-45° OB	0.3
	15° DOWN-45° RIGHT[4]	15° DOWN-45° LEFT[4]	15° DOWN-45° IB	15° DOWN-45° OB	
Taillamp[3]	15° UP-80° RIGHT[5]	15° UP-80° LEFT[5]	15° UP-45° IB	15° UP-80° OB	0.05
	15° DOWN-80° RIGHT[5]	15° DOWN-80° LEFT[5]	15° DOWN-45° IB	15° DOWN-80° OB	
Parking lamp	No Requirement	No Requirement	15° UP-45° IB	15° UP-80° OB	0.05
	No Requirement	No Requirement	15° DOWN-45° IB	15° DOWN-80° OB	

[1] IB indicates an inboard direction (toward the vehicle's longitudinal centerline) and OB indicates an outboard direction.

[2] Where a lamp is mounted with its axis of reference less than 750 mm above the road surface, the vertical test point angles located below the horizontal plane subject to visibility requirements may be reduced to 5° down

[3] Inboard and outboard corner points are 80° for a single taillamp installed on a motorcycle

[4] If a multiple lamp arrangement is used for a motorcycle stop lamp, the inboard angle for each lamp shall be 10 degrees.

[5] If a multiple lamp arrangement is used for a motorcycle tail lamp, the inboard angle for each lamp shall be 45 degrees.

F/CMVSS 108 strobe light/ warning lights potentially masking required lamps



F/CMVSS Lighting Requirements and Auxiliary Equipment Issues





F/CMVSS Lighting Requirements and Auxiliary Equipment Concerns





F/CMVSS Lighting Requirements and Auxiliary Equipment Solutions





Request for brake actuated Pulsating Stop Lamps

- FMCSA allows the operator to petition for the allowance of pulsating stop lamps.
- NHTSA does not allow for pulsating stop lamps under FMVSS 108 only steady burning.
  - “FMCSA acknowledges the concern of NTEA that FMCSA has the authority to grant the temporary exemption only to motor carriers and not to commercial motor vehicle manufacturers or vehicle alterers.”
  - “THE PRODUCT MUST BE INSTALLED ONLY BY THE OWNER OF THE VEHICLE.IN ACCORDANCE WITH FEDERAL LAW(49 U.S.C. 30112(a)(1) AND 49 U.S.C. 30122),THE PRODUCT MAY NOT BE INSTALLEDBY ANY MANUFACTURER, DISTRIBUTOR, DEALER,RENTAL COMPANY, OR MOTOR VEHICLEREPAIR BUSINESS.”

Thank you!

Q’s?