



Body Builder, General Guidelines and Certification VN, VHD, VAH Section 0

Introduction

The information in this document was developed to assist our customers throughout the body planning and installation process. This information will assist with the required specifications and guidelines for completion for your specific applications.

The information in this document does not include each and every unique situation that you may encounter when working on Volvo vehicles. Volvo Trucks North America cannot possibly know, evaluate, or advise someone on all the types of work that can be done on a Volvo vehicle and all the appropriate ways to do such work. This includes all of the possible consequences of performing such work in a certain manner. Therefore, any situations or methods of working on a Volvo vehicle that are not addressed in this document are not necessarily approved by Volvo Trucks North America.

In the event that you require additional assistance, please contact Volvo Body Builder Support at 877-770-7575.

Unless otherwise stated, following the recommendations listed in this document does not automatically guarantee compliance with applicable government regulations. Compliance with applicable government regulations is your responsibility as the party making the additions/modifications. Please be advised that the Volvo Trucks North America vehicle warranty does not apply to any Volvo vehicle that has been modified in any way, which in Volvo's judgment might affect the vehicles stability or reliability. The information, specifications, and illustrations in this document are based on information that was current at the time of publication. Please note that illustrations are typical and may not reflect the exact arrangement of every component installed on a specific vehicle.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted by any means including (but not limited to) electronically.

Note: The VNM model will be replaced with the new VNR model, which will start production in late August or early September 2017. The VNM model and the new VNR model will share the same cab, chassis, and fuel tank dimensions.

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Glossary

Gross Axle Weight Rating (GAWR)	The maximum rated capacity measured at the ground for a given axle system consisting of the axle, springs, wheels, and tires. May also be influenced by the frame capacity. GAWR is determined by the least rated component in the system.
Gross Vehicle Weight (GVW)	The in-service vehicle weight, including chassis, body, add-on equipment, and cargo.
Gross Vehicle Weight Rating (GVWR)	The manufacturer's maximum rated GVW for any given vehicle. GVWR is frequently the sum of the GAWRs. However, it may be downrated for braking or handling considerations.
Payload Weight	The actual weight of the cargo carried by a vehicle.
Tare Weight	The weight of a truck fully equipped and ready for service, minus any payload. Also called curb weight or empty weight. All trucks begin with a tare weight for the standard chassis, to which weights are added for optional equipment, fuel, body and equipment, plus driver and passengers.

Notes

General Guidelines

Certification Label

The “Certification Label” must be part of the vehicle at all times. It shows the vehicle's serial number, the gross vehicle weight rating (GVWR), and the front and rear gross axle weight ratings (GAWR).

Gross vehicle weight (GVW) is the weight of the original equipped vehicle and all items added to it after it has left the factory. This includes bodies, winches, booms, the driver and all occupants, plus the load the vehicle is carrying. The GVW must not exceed the total of the front and rear axle weight ratings.

The vehicle certification label also shows the tire size and recommended tire inflation pressures for the tires originally supplied with the vehicle. The tires on the vehicle must be of the proper size and must be properly inflated for the load being carried.

Incomplete Vehicle Document

The “Incomplete Vehicle Document” is issued with a temporary certification label, in place of the final certification label, when the vehicle is sent to a body builder for completion.

If several manufacturers are involved in the process of completing the vehicle, each manufacturer must issue a temporary certification label that shows to what legal standard the vehicle currently conforms.

The final manufacturer must issue the permanent certification label certifying that the vehicle conforms to FMVSS standards (as required by 49 CFR Part 567) that are in effect at the time of final manufacture of the incomplete vehicle.


If the vehicle is altered from its original build specifications, the certification label must be updated to reflect the changes (also see Service Bulletin, “Electrical Guidelines”, “Brake Modification Guidelines”, page 6 , “Air-braked Vehicles”, page 6 , and “Air-operated Accessories”, page 7).

MANUFACTURED BY: Volvo Trucks North America, Inc. MONTH AND YEAR OF MANUFACTURE: _____					THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.	
GROSS VEHICLE WEIGHT RATING: _____					VIN _____	
GROSS AXLE WEIGHT RATING:					CLASSIFICATION OF VEHICLE: TRUCK	
	LBS/kg	TIRES	RIMS/WHEELS	PSI/KPA	(COLD INFLATION) Single	FORM NO. 3680 97101-0026/VMS
FRONT:	_____ with	_____	_____	_____	_____	
FIRST INTERMEDIATE:	_____ with	_____	_____	_____	_____	
SECOND INTERMEDIATE:	_____ with	_____	_____	_____	_____	
REAR:	_____ with	_____	_____	_____	_____	
TAG:	_____ with	_____	_____	_____	_____	

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Fig. 1 Typical Vehicle Certification Label (USA)


MANUFACTURED BY: VOLVO TRUCKS NORTH AMERICA, INC.				THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.	
MONTH AND YEAR OF MANUFACTURE: _____				VIN _____	
GROSS VEHICLE WEIGHT RATING (KG/LBS): _____				CALSSIFICATION OF VEHICLE: TRUCK TRACTOR	
GROSS AXLE WEIGHT RATING:				20377823	
	KG/LBS	TIRES	RIMS/WHEELS	COLD INFLATION) KPA/PSI	
FRONT		WITH			
1ST INTERMEDIATE AXLE		WITH			
2ND INTERMEDIATE AXLE		WITH			
3RD INTERMEDIATE AXLE		WITH			
REAR (EACH)		WITH			
TAG AXLE		WITH			

MANUFACTURED BY: VOLVO TRUCKS NORTH AMERICA, INC.					
MONTH AND YEAR OF MANUFACTURE: _____				VIN _____	
GVWR / PNBV (KG/LBS): _____				TYPE: TT/CT	
GAWR / PNBE:				20407029	
	KG/LBS	TIRES	RIMS/WHEELS	COLD INFLATION) KPA/PSI	
FRONT		WITH			
1ST INTERMEDIATE AXLE		WITH			
2ND INTERMEDIATE AXLE		WITH			
3RD INTERMEDIATE AXLE		WITH			
REAR (EACH / CHACUN)		WITH			
TAG AXLE		WITH			

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Fig. 2 Typical Complete Vehicle Label

INCOMPLETE VEHICLE MANUFACTURED BY: VOLVO TRUCKS NORTH AMERICA		GROSS VEHICLE WEIGHT RATING: KG/LBS	
MONTH AND YEAR OF MANUFACTURE: _____		FRONT - /	
GROSS VEHICLE WEIGHT RATING (KG/LBS): _____		1ST INTERMEDIATE AXLE - /	
VIN _____		2ND INTERMEDIATE AXLE - /	
		3RD INTERMEDIATE AXLE - /	
		REAR (EACH) - /	
		TAG - /	

INCOMPLETE VEHICLE (VEHICLE INCOMPLETE) MANUFACTURED BY: VOLVO TRUCKS NORTH AMERICA, INC.					
VEHICLE IDENTIFICATION NUMBER: _____		MONTH AND YEAR OF MANUFACTURE: _____		GAWR / PNBE: _____ KG/LBS	
GAWR / PNBE	FRONT	KG/LBS			
GAWR / PNBE	1ST INTERMEDIATE AXLE	KG/LBS			
GAWR / PNBE	2ND INTERMEDIATE AXLE	KG/LBS			
GAWR / PNBE	3RD INTERMEDIATE AXLE	KG/LBS			
GAWR / PNBE	REAR AXLE (EACH / CHACUN)	KG/LBS			
GAWR / PNBE	TAG AXLE	KG/LBS			
				20533722	

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Fig. 3 Typical Incomplete Vehicle Label

Center of Gravity

The vertical center of gravity of the completed vehicle has a direct effect on the vehicle's stopping distance capability. As the vertical center of gravity increases or the wheelbase decreases, additional weight is transferred to the front axle during a stop, adversely affecting the stopping distance.

VTNA requires that trucks built shall have a center of gravity height/wheelbase ratio of 0.50 or less when loaded to a weight not exceeding GVWR* distributed proportionately to, but not exceeding GWVR,* and a center of gravity height not exceeding 1778 mm (70 in.) on single rear axle vehicle or 1905 mm (75 in.) on tandem rear axle vehicles.

As a guide, the vertical center of gravity height of the incomplete vehicle, as manufactured by VTNA, may be assumed to be the distance from the ground to the top of the frame side rail measured at the longitudinal midpoint of the vehicle in the unladen condition for single axle vehicles and laden condition for tandem axle vehicles.

The frame rail height may be calculated from the chassis diagrams in this document. Also, if you are measuring an unloaded chassis, you may assume the loaded frame rail height to be approximately two inches lower than the bare chassis.

Vehicles completed as trucks could require a vertical center of gravity lower than the recommendations above based on the stability considerations of certain vocational body and/or usage situations. The above recommendations consider only vehicle brake performance. If higher vertical center-of-gravity limitations are required for a specific vocational body or application, contact VTNA or submit all chassis specifications along with body and payload information in a request for advice to: Product Information Dept./Sales Engineering.

*GVWR and GAWR are indicated on the cover of the Incomplete Vehicle Document.

Vehicle GVWR and GAWRs

The representation as to conformity of the complete vehicle to FMVSS-121 provided in the Incomplete Vehicle Document has a condition that the GVWR and the GAWR of the completed vehicle shall be identical to the ratings designated on the front cover of the Incomplete Vehicle Document for the vehicle. The brake system on each incomplete vehicle manufactured by Volvo Trucks North America (VTNA) is designed to comply with FMVSS-121 when loaded to a specific completed vehicle GVWR distributed proportionate to specific GAWR. Revised vehicle GVWR or GAWR, or the addition of axles to the vehicle will change loading conditions and can adversely affect compliance to FMVSS-121.

Brake Modification Guidelines

Final stage manufacturers should note that in order to rely on the representations as to conformity to "FMVSS-121, Brake Systems" (as provided in the "Incomplete Vehicle Document" which accompanies each Volvo incomplete vehicle), each of the conditions and instructions of applicable FMVSS-121 statements in the Incomplete Vehicle Document must be followed.

If the final stage manufacturer chooses not to follow each of these instructions and conditions listed in the Incomplete Vehicle Document, he must assume full responsibility for conformity of the vehicle to FMVSS-121.

Final stage manufacturers should also note that instructions provided are for the assistance of final stage manufacturers who choose to certify the completed vehicle to FMVSS-121 independently of and without reliance on the conformity representations provided in the Incomplete Vehicle Document.

Air-braked Vehicles

DANGER

Pneumatic components store compressed air and can separate violently during disassembly or removal. Before servicing any part of the pneumatic (air) system, completely release the air pressure. Failure to do so can result in serious personal injury or death.

Volvo air-brake equipped incomplete vehicle products, to the extent completed, comply with Federal Motor Vehicle Safety Standard 121, Air Brake Systems (specific completed vehicles exempt from the Standard or portions of the Standard are discussed below).

At the time of writing, FMVSS-121 is applicable to all current production air-brake equipped trucks with specific exceptions.

The statements contained in this section regarding FMVSS-121 compliance are accurate at the time of printing. However, these statements are not intended to replace the statements regarding FMVSS-121 in the Incomplete Vehicle Document. Therefore, that manual should be consulted for compliance conditions.

The following are components and characteristics of the completed vehicle which are critical to overall performance of air-braked vehicles. These items should be carefully considered in ordering a vehicle as well as planning vehicle completion by subsequent stage manufacturers to ensure compliance (final certification) of the completed vehicle to FMVSS-121 as well as completed vehicle integrity.

Air-operated Accessories

FMVSS-121 has a pressure build-up requirement which states that the system pressure must build up from 586 to 689 kPa (85 to 100 PSI) in a specific time period under certain conditions. Therefore, the addition of any accessory or its associated plumbing which increases the volume of air subject to the build-up requirement will increase the build-up time and may affect compliance with FMVSS-121.

The representation as to conformity of the completed vehicle to FMVSS-121 provided in the Incomplete Vehicle Document has the following conditions for air operated accessories and its associated plumbing added to a vehicle by a subsequent stage manufacturer.



DANGER

Pneumatic components store compressed air and can separate violently during disassembly or removal. Before removing or replacing any part of the pneumatic (air) system, completely release the air pressure. Failure to do so can result in serious personal injury or death.

- No connections are made into (1) the air line tubing or fittings for the parking brake system; (2) the rear axle system (modulated spring brake system); (3) the air supply and signal lines to the rear chassis relay valve(s); or (4) the air delivery lines to the front axle brakes and quick release valve.
- No connections are made between the check valve and the reservoir port for air supply.
- Additional reservoir volume must be added with pusher and tag axles, Jifflox, etc. Added volume must be equal to 12 times the added brake chambers rated volume.
- Each added reservoir shall be capable of withstanding an internal hydrostatic pressure of five times the compressor cutout pressure — or 3,447 kPa (500 psi), whichever is greater — for 10 minutes.

Air for pneumatic accessories should be sourced directly from an air reservoir. If an unused reservoir tap is not available, fittings added to the system at the reservoir must not restrict air flow to any existing air lines. The following are to be observed when adding air accessories.

Electronic Control Units (ECUs)

ECUs are connected through the Databus. These ECUs consist of sophisticated electronics that can be permanently damaged if not treated properly (such as exposure to high temperatures).

To prevent serious damage to ECUs, please follow these important guidelines:



CAUTION

Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electrical components. Failure to de-energize circuits may result in electronic equipment damage.

Welding

Welding anywhere on the truck chassis requires that certain precautionary measures be taken. This is required to prevent damage to electrical, as well as electronic systems, wiring harness and components.



CAUTION

Welding on trucks can permanently damage the vehicle electrical system/components, due to the voltage and current spikes that normally occur when welding. It is preferable to avoid welding; however, if welding must be done on any structure on or in contact with the vehicle, disconnect the electrical connectors at the rear of the instrument cluster and follow the recommendations below:

Before welding on the vehicle:

- 1 Disconnect the power to the vehicle.
- 2 Disconnect both the positive (+) and negative (-) battery cables. Disconnect the negative cable first. (When reconnecting, connect the positive cable first.)
Note: Disconnect the other ECU grounds from the battery before disconnecting the main ground (to avoid damage to the ECUs).
- 3 Disconnect the engine/starter ground from the chassis.
- 4 Disconnect the power harness and vehicle interface harness at the Engine Electronic Control Unit (EECU).
- 5 Disconnect all electronically controlled modules and devices, including:
 - Governor Controls
 - Shutdown/Warning Electronics
 - Starter and Ignition Controls
 - Engine and Vehicle ECUs
 - Transmission ECU
 - Anti-lock Brake (ABS) ECU
 - Chassis ECU
 - Electronic Speedometer/Tachometer(This prevents the possibility of alternate paths for induced voltage and currents being created and damaging those components.)
- 6 Disconnect the electrical connectors at the rear of the instrument cluster.
- 7 Attach the welder ground cable as close as possible to the weld (no more than 60 cm (24 in.) from the part being welded).
- 8 Do not connect the welder ground cable to the engine ECU or the ECU cooling plate.



CAUTION

DO NOT WELD on the engine or engine components. Welding on the engine or components mounted on the engine can cause serious damage to the Engine ECU and other electrical components.

There are certain basic common sense rules also to be followed when welding, including (but not limited to):

- Welding cables should not be allowed to lie on/near or cross over any electrical wiring or electronic component during the welding procedure.
- After the welding process has been completed and the welded parts have cooled, inspect wiring and components for possible shorts or damage which would allow the possibility of drawing excessive currents or cause short circuits when the batteries are reconnected.

 **DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

 **WARNING**

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up fuel spills immediately.

 **DANGER**

Exhaust gases contain deadly poison. When testing a vehicle with the engine running, conduct the test outdoors or use a properly vented exhaust hose.

 **WARNING**

Keep yourself and your test equipment clear of all moving or hot engine parts. A hot engine can cause serious burns or can permanently damage test equipment.

 **DANGER**

Pneumatic components store compressed air and can separate violently during disassembly or removal. Before servicing any part of the pneumatic (air) system, completely release the air pressure. Failure to do so can result in serious personal injury or death.

Battery Charging and Jump Starting

Jump Starting

It is preferable NOT to jump start vehicles which are electronically controlled. The electronic control units can be damaged by voltage spikes and current surges created by jump starting.

When jump starting, use only extra batteries from another truck or from a battery tray. The nominal voltage of the extra batteries must not exceed the system voltage of the truck (i.e. 12 V).

DO NOT connect the extra batteries in series with the truck batteries.



CAUTION

Do not connect battery charging or jump starting cables to any part of an engine electronic system. This can damage sensitive electrical devices.



CAUTION

DO NOT use a "Hot Shot" type starting cart or a battery charger, as most use extremely high voltages. Use of a "Hot Shot" device or battery charger to jump-start the vehicle will seriously damage the ECUs and other electronic equipment.



DANGER

DO NOT use ether when starting an engine with electric or "flame start" intake air heater. Use of ether can cause an explosion and can seriously damage the engine and components and cause serious personal injury or death.

Battery Charging

Before charging, remove the battery box fuse for the Engine Electronic Control Unit (EECU) and Vehicle Electronic Control Unit (VECU). Next, remove any ECU power supply wires that are directly connected to the batteries. This will ensure that these components will not be affected by any transient voltages that may occur during charging.

This precaution is necessary due to the extensive variety of manufacturers of battery charging devices and the wide variance in outputs from these devices.

When charging batteries, ALWAYS disconnect the battery cables and charge each battery separately. This will prevent the voltage coming into the battery from damaging other system circuits.

Adding Electrical Equipment

Carefully determine the proper wire sizing and fuse requirements for each circuit to be added. Relays may be required for circuits with higher current flow.

Wire connections must not disturb or interfere with any existing system(s) or component(s) within the vehicle.

For example, the 400-409 wires MUST NOT be cut or spliced for any connections. **These wires must not be tampered with.**

Data Link Wiring

J1708/J1587 Information Link

If a connection is required to the J1708/J1587 Information Link (i.e. for the Road Relay), use the connector already supplied in the vehicle harness. This circuit is identified by wires 400 and 401; these will always be a twisted pair of black wires.

Note: Wires 400 and 401 are used for the transmission of data for diagnostic messages and gauges. Modifying this circuit can cause these functions to fail.

If a circuit being added will carry high currents or frequencies, route it in a location AWAY from wires 400 and 401 to prevent mutual inductance from interfering with Data Link functions.

J1939/J1922 Control Link

Note: Vehicles with Volvo engines use the J1939 Control Link.

Follow the same guidelines and precautions for the J1939/J1922 Control Link wiring.

No connections may be made to wires 406 (yellow), 407 (green), and 408 (shield). These circuits are used for control of the vehicle. Accelerator pedal, engine brake, and traction control are examples of functions controlled by these circuits.

Note: Wires 406 and 407 carry the high-speed communications between the electronic systems in the vehicle. Wire 408 is an uninsulated wire that wraps around 406 and 407. It absorbs RFI that is produced from the communication circuits 406 and 407.

A “terminating resistor” is wired into the Data Link at the end of the Data Link harness. This has a resistance of 120 Ω and must remain connected for the systems to function properly.

For Volvo engines, a similar terminating resistor is designed into the Engine Electronic Control Unit (EECU) and defines the other end of the Data Link. For non-Volvo engines, the second terminating resistor is external to the EECU.

Note: These two resistors are in parallel, so the total resistance value measured across the Data Link should be 60 Ω .



CAUTION

Do not modify or make connections to wires 406 (yellow), 407 (green), or 408 (shield). Any modifications, connections, or damage to these wires can result in the failure of the vehicle's electronic systems.

Notes

Towing Procedure

General

CAUTION

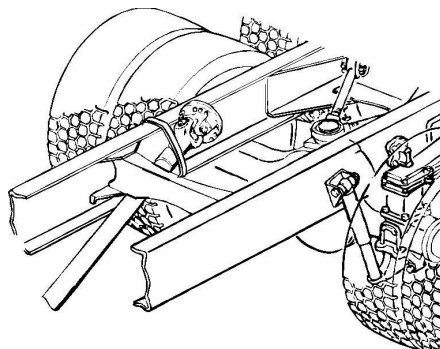
The driveshaft must be removed before towing the vehicle. Failure to remove the driveshaft may result in damage to the transmission.

Remove the driveshaft from the rear axle before moving the vehicle. When the transmission is driven from the rear wheels without the engine running, there is no lubrication in the transmission.

Axle shafts must be removed if the vehicle is to be towed at speeds over 40 km/h (25 mph) or for a long distance. Openings should be covered to prevent loss of oil and entry of dirt and grit. Where oil-lubricated bearings are used, openings should be thoroughly sealed with metal discs and new gaskets before towing.

WARNING

If a vehicle with air suspension is lifted by the rear frame member, there is a risk that the air springs will separate from the spring plates. When towing has been completed, never use your hands to reposition the air springs. There is a great risk that your hand will be caught between spring and plate causing personal injury.



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WARNING

Do not tow a vehicle backwards when equipped with roof air fairings. The fairings act as an air scoop and may break off. Failure to follow this warning may lead vehicle damage and personal injury.

WARNING

Vehicles with air fairings or large superstructures are tall. Make sure that the total height of the vehicle, when it is raised up behind the wrecker, does not exceed the maximum allowed height for local underpasses. Failure to follow this instruction may lead to vehicle damage and personal injury.

The vehicle may now be towed. It is recommended that a wrecker with a lift bar is used since the service brakes will not function. The system must be filled with air to release the parking brake.

Note: The power steering does not function when towing a vehicle with a disabled engine.

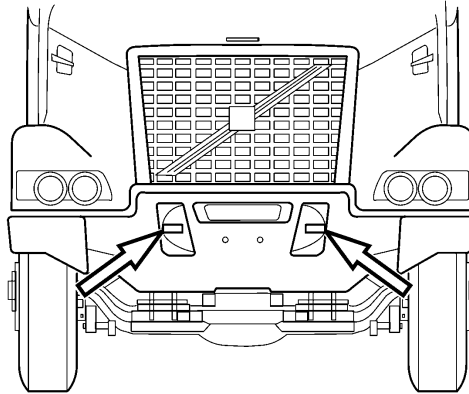
Towing Instructions



CAUTION

If the vehicle becomes disabled, it is very important to tow it properly. Failure to do so can cause damage to the frame and body parts. Follow the instructions below to avoid damage.

In the event that the vehicle is not accessible to place the wrecker lift bar under the front axle, use the tow hooks in the front of the vehicle. The front tow hooks are used as a point at the front of the vehicle where the vehicle can be pulled.

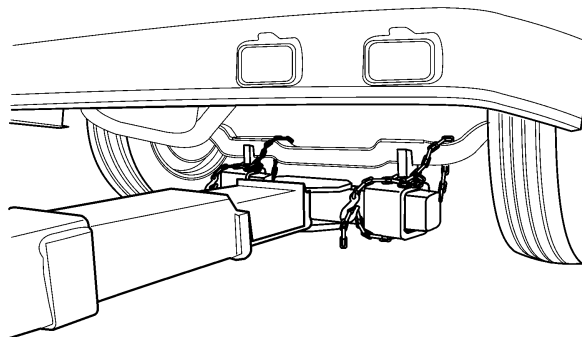


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When the vehicle is situated properly, lift the front and position the lift bar under the front axle and secure. Using the front axle for towing minimizes the risk of damage to the vehicle body, frame, and suspension.

If necessary, the driveshaft and axle shaft can be removed for towing.

Note: When the driveshaft or axle shafts are reinstalled, make sure the nuts are tightened to the correct torques. Also make sure the axle shafts are installed in the proper sides, with the left shaft in the left side and the right shaft in the right side.



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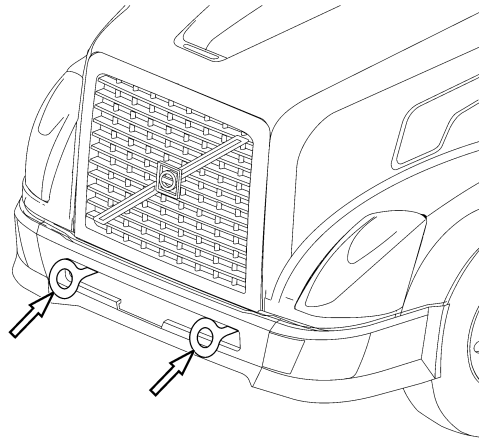
CAUTION

If the vehicle becomes disabled, it is very important to tow it properly. Failure to do so can cause damage to the frame and body parts. Follow the instructions below to avoid damage.



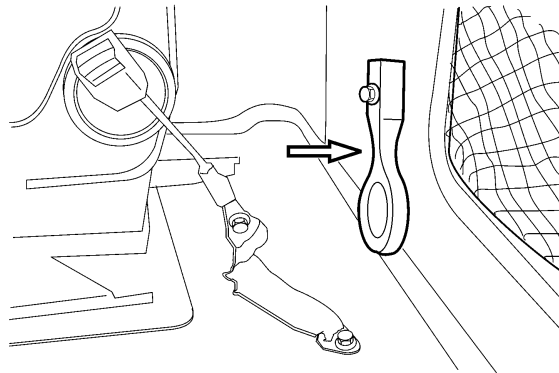
DANGER

Do not use the tow eyes for raising the front of the vehicle; the tow eyes can break. Do not crawl under a vehicle suspended by tow eyes. Failure to follow these instructions can result in serious personal injury or death.



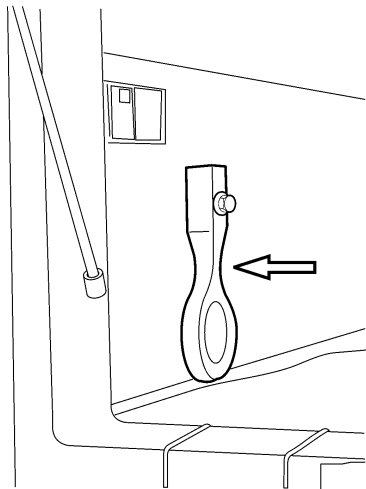
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On day cab models, the tow eyes are stored bolted to the back of the cab wall.



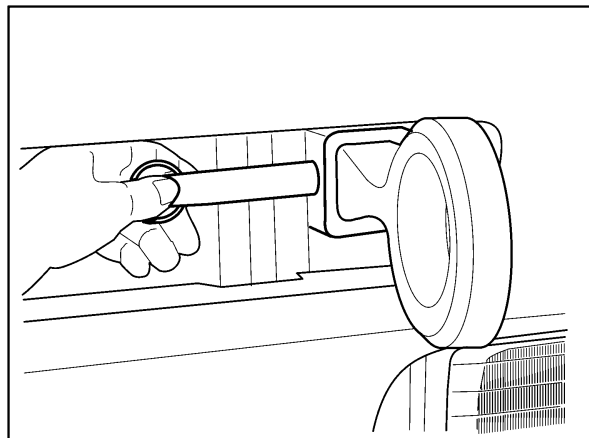
W9000941

On sleeper cab models, the tow eyes are stored bolted to the back wall of the luggage compartment wall.



W9000942

The tow eyes are held in place when mounted on the front of the vehicle by tractor pins. These pins are stored in the tow eye mounting holes when not being used.



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The vehicle may now be towed. It is recommended that a wrecker with a lift bar is used since the service brakes will not function. The system must be filled with air to release the parking brake.

Note: The power steering does not function when towing a vehicle with a disabled engine.



CAUTION

It is recommended that the front bumper be removed when lifting with the front tow eyes/hooks. Failure to remove the front bumper can cause possible component damage.

Acceptable loads per hook:

- Straight pull: Less than or equal to 18,143 kg/hook (40,000 lb).
- Vertical pull: Less than or equal to 5170 kg/hook (11,400 lb).
- 45° cone (combination loads): Less than or equal to 7239 kg (15,960 lb).

Towing a Vehicle Equipped with an I-Shift Transmission



CAUTION

You must tow a vehicle equipped with an I-Shift transmission according to the guidelines below. Failure to do so can result in damage to transmission components.

When towing the vehicle, the output shaft of the transmission must not be allowed to spin or turn. If the vehicle is towed with the drive wheels still in contact with the road surface, the vehicle axle shafts or driveline must be removed or disconnected.

Notes

Design and Function

Weight Distribution

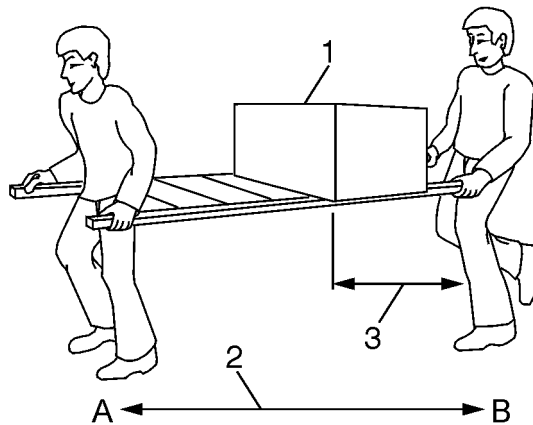
Determining the weight distribution of a truck is an important calculation. It can indicate whether a truck is legally loaded, and can show whether any dangerous overloading might occur.

Weight distribution calculations are not difficult to perform; an understanding of the theory involved will make it easier to perform the calculations and correctly analyze each application.

Theory

The theory of weight distribution can be illustrated as follows:

Two men are painting a house. To get all of the material to the job in one trip, they put the paint and brushes in a box, set it on a ladder, and each pick up an end.



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Fig. 4 Weight Distribution Theory

- 1 Load
- 2 Total length
- 3 Distance from center of load to "B"

The ladder is 10 feet long. The box of supplies weighs 50 lb. The center of the box is located 3 feet from the man at position B. Intuitively, we know that man "B" is carrying more of the load because he is closer to it than man "A." The amount of weight being carried by man "A" can be determined using the following formula:

$$\text{Weight at man "A"} = \frac{\text{Total weight} \times \text{Distance from weight to man "B"}}{\text{Distance from man "A" to man "B"}}$$

$$\text{Weight at man "A"} = \frac{50 \text{ lb} \times 3 \text{ feet}}{10 \text{ feet}}$$

Weight at man "A" = 15 lb.

The weight carried by man "B" is obtained by subtracting the weight at man "A" from the total weight.

Weight at man "B" = Total weight – weight at man "A"

Weight at man "B" = 50 lb – 15 lb

Weight at man "B" = 35 lb

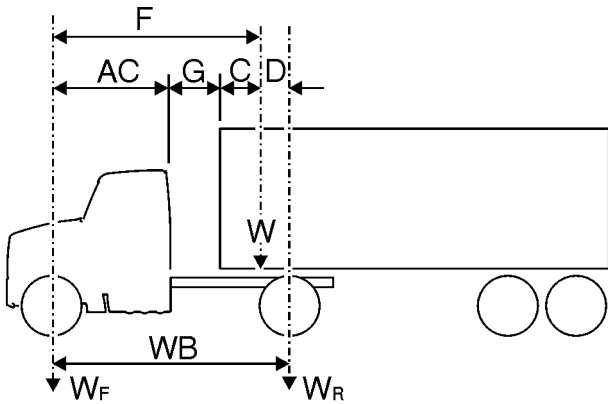
The percentage of weight transferred to each man can also be calculated.

% of weight at man "A" = $\frac{3}{10} \times 100\% = 30\%$

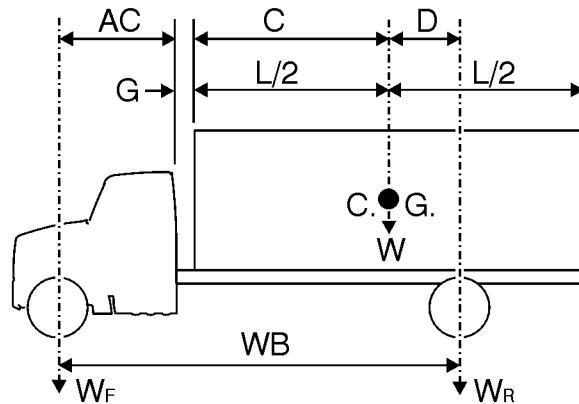
The percentage of weight transferred to man "B" is found by subtracting the % weight at man "A" from 100%: $100\% - 30\% = 70\%$.

$$\% \text{ of Weight at man "A"} = \frac{\text{Distance from weight to man "B"}}{\text{Distance from man "A" to man "B"}} \times 100$$

Weight Distribution Formulas



W9000364



W9000365

AC Front axle to back-of-cab

G Gap between cab and body or trailer

CG Center of gravity of body and payload

C Front of body to CG, or front of trailer to kingpin

D Distance CG or fifth wheel is ahead of rear axle

F Distance CG or fifth wheel is behind front axle

L Body length

WB Wheelbase

W Weight of body plus payload, or kingpin load

W_F Portion of W transferred to front axle

W_R Portion of W transferred to rear axle

Basic Formulas

a	$W \times D = W_F \times WB$	or
b	$WB = F + D = AC + G + C + D$	
c	$W = W_F + W_R$	
d	Percent of W transferred to front axle =	$\frac{D}{WB} \times 100$
e	Percent of W transferred to rear axle =	$\frac{F}{WB} \times 100$

Sample Calculations

$$W_F = \frac{W \times D}{WB}$$

$$W_R = \frac{W \times F}{WB}$$

or

$$W_R = W - W_F$$

$$W_F = W - W_R$$

Weight Distribution Formulas (Text Descriptions)

Weight transferred to Front Axle =	$\frac{(\text{Total Weight}) \times (\text{Distance CG is ahead of Rear Axle})}{\text{Wheelbase}}$
Distance CG must be placed ahead of Rear Axle =	$\frac{(\text{Weight transferred to Front Axle}) \times (\text{Wheelbase})}{(\text{Total Weight})}$
Wheelbase =	$\frac{(\text{Total Weight}) \times (\text{Distance CG is ahead of Rear Axle})}{(\text{Weight to be transferred to Front Axle})}$
Total Weight =	$\frac{(\text{Weight to be transferred to Front Axle}) \times (\text{Wheelbase})}{(\text{Distance CG is ahead of Rear Axle})}$
Weight transferred to Rear Axle =	$\frac{(\text{Total Weight}) \times (\text{Distance CG is behind Front Axle})}{(\text{Wheelbase})}$
Distance CG must be placed behind Front Axle =	$\frac{(\text{Weight transferred to Rear Axle}) \times (\text{Wheelbase})}{(\text{Total Weight})}$
Wheelbase =	$\frac{(\text{Total Weight}) \times (\text{Distance CG is behind Rear Axle})}{(\text{Wheelbase})}$
Total Weight =	$\frac{(\text{Weight to be transferred to Rear Axle}) \times (\text{Wheelbase})}{(\text{Distance CG is behind Front Axle})}$

Note: Total Weight must always equal Weight transferred to Rear Axle plus Weight transferred to Front Axle.

Formulas for Lift Axles

Pusher Axles

Pusher Up

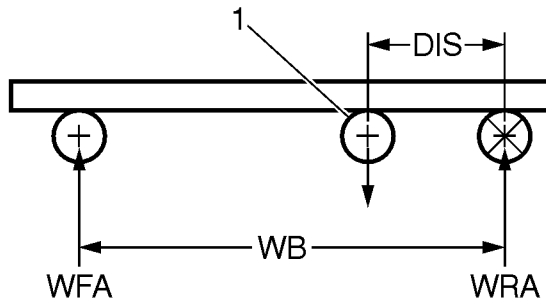
$$WFA = \frac{DIS}{WB} \times \text{Pusher Tare Weight}$$

$$WRA = \text{Tare Weight} - WFA$$

Pusher Down

$$WFA = \frac{-(DIS)}{WB} \times \text{Pusher Pressure}$$

$$WRA = \frac{-(WB - DIS)}{WB} \times \text{Pusher Pressure}$$



W9000387

Fig. 5 Pusher Axle

Notes

Tag Axles

Tag Up

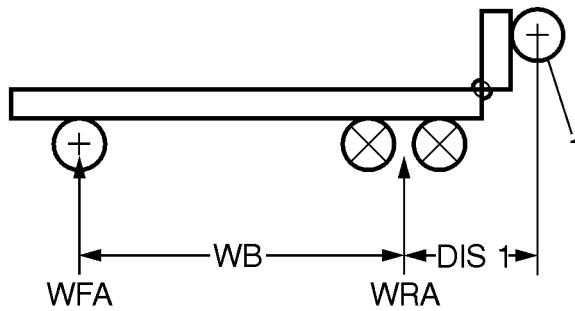
$$\text{WRA} = \frac{\text{WB} + \text{DIS}}{\text{WB}} \times \text{Tare Weight}$$

$$\text{WFA} = \text{Tare Weight} - \text{WFA (will be Negative Number)}$$

Tag Down

$$\text{WRA} = \frac{-(\text{WB} + \text{DIS})}{\text{WB}} \times \text{Tag Pressure (Negative Pressure)}$$

$$\text{WFA} = \frac{\text{DIS}}{\text{WB}} \times \text{Tag Pressure (Positive Number)}$$



W9000389

Fig. 6 Tag Axle

Notes

Boost-A-Load Axles

Boost Up

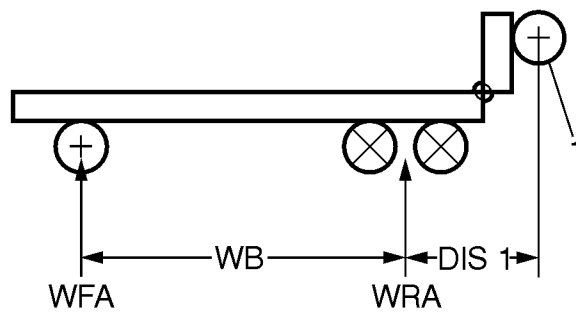
$$WRA = \frac{(WB + DIS\#1)}{WB} \times \text{Tare Weight}$$

$$WFA = \text{Tare Weight} - WFA \text{ (will be Negative Number)}$$

Boost Down

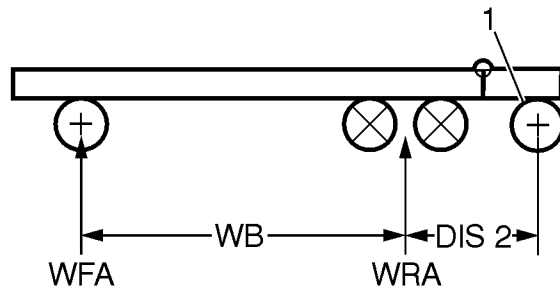
$$WRA = \frac{-(WB + DIS\#2)}{WB} \times \text{Boost Axle Pressure (Negative Number)}$$

$$WFA = \frac{(DIS\#2)}{WB} \times \text{Boost Axle Pressure (Positive Number)}$$



W9000389

Fig. 7 Boost Axle



W9000390

Customer Information Worksheet

CUSTOMER	BRANCH OR DEALER		DATE
ADDRESS	QUANTITY	MODEL	ORDER NO.

STRAIGHT TRUCKS

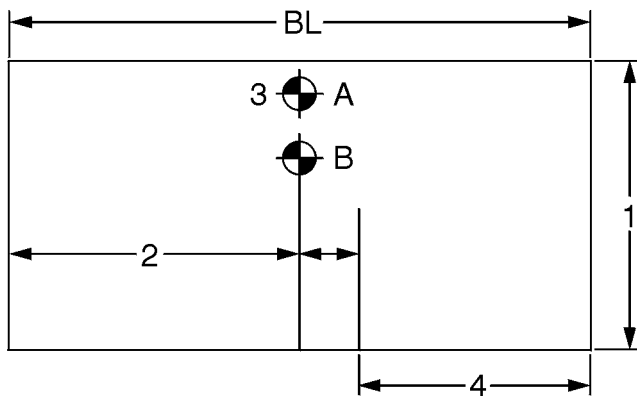
Body Make: _____ Model: _____ Length: _____

Body Type: [...] Dump [...] Flat [...] Van [...] Tank [...] Mixer [...] Block [...]
 Specialty _____
 [...] Rear Refuse Loader [...] Front Refuse Loader [...] Side Refuse Loader [...] Rolloff

Body Weight: _____ lb Center of Gravity Location: _____

Additional Equipment: [...] Snow Plow [...] Tailgate [...] Boom [...] Frame-mounted Water Tank
 [...] PTO [...] Tag/Pusher Axle [...] Wet (Hydraulic) Kit

Equipment Weight: _____ lb Center of Gravity Location*: _____



Body Height: 1 _____
 *Center of Gravity
 Body (B) 2 _____
 Payload (A) 3 _____
 Overhang Required 4 _____

W9000385

ALL TRUCKS

Commodity _____ Payload Weight : _____ lb
Hauled:

Operating Conditions: [...] Increasing Loads [...] Decreasing Loads
[...] One Way [...] Both Ways [...] Fully Loaded _____
Average Trip: _____ miles Number Round-trips Per Day: _____
Average Number of Stops: _____ Average Idling Time: _____

Road Surface/Grades: [...] Concrete [...] Asphalt [...] Packed Dirt [...] Gravel
[...] Sand [...] Mud [...] Loose Dirt
Maximum Starting Grade _____% Maximum Highway Grade _____%

Speed: Cruise Speed Desired on Highway _____ mph Top Speed (Unloaded) _____ mph

Operating Area: [...] Interstate [...] Primary Roads [...] Other Roads
States Operating _____
Length Restrictions _____

Climate: Outside High Temp _____ Low _____ Altitude _____ ft

Weight Limits: Front _____ lb Rear _____ lb Tag/Pusher _____ lb
Total _____ lb GVW/GCW Requested _____ lb

Other Restrictions / Conditions

TRACTORS

Type of Service: [...] Tractor Semi/Trailer [...] Tractor Double Trailers [...] Tractor Triple Trailers
[...] Straight Truck/PUP Trailer

Trailer: Make _____ Model _____ Length _____ ft
[...] Dry Van [...] Refrigerated [...] Flatbed [...] Tank [...] Dump

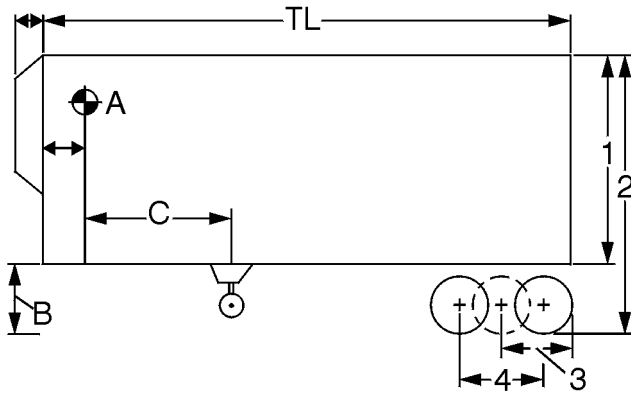
Capacity _____ [...] Gallons [...] Cu. Yards

Height _____ in. Width _____ in. Weight _____ lb

Kingpin Location _____ in. (front)

Landing Gear Location _____ in. (front)

Rear Trailer Axles _____ in. (rear)



W9000386

Trailer Height 1 _____
Overall Height 2 _____
Trailer Axle Setting 3 _____
Trailer Axle Spacing 4 _____

Notes

Conversion Factors

Convert From:		To:		Multiply By:
Area				
Square Inch	in ²	Square millimeter	mm ²	645.16
Square foot	ft ²	Square meter	m ²	0.0929
Square millimeter	mm ²	Square Inch	in ²	0.0016
Square meter	m ²	Square foot	ft ²	10.7643
Flow (Volume Per Unit Time)				
Gallon (U.S.) per minute	gpm	Cubic meter per second	m ³ /s	0.00006
Gallon (U.S.) per minute	gpm	Liter per minute	L/min	3.7854
Cubic meter per second	m ³ /s	Gallon (U.S.) per minute	gpm	15850.3
Liter per minute	L/min	Gallon (U.S.) per minute	gpm	0.26417
Length				
Inch	in.	Millimeter	mm	25.4
Foot	ft	Meter	m	0.3048
Yard	yd	Meter	m	0.09144
Millimeter	mm	Inch	in	0.0394
Meter	m	Foot	ft	3.2808
Meter	m	Yard	yd	1.0936
Mass				
Pound	lb	Kilogram	kg	0.4536
Ton (U.S.)		Ton (metric, 2,204.6 lbs)		0.9072
Kilogram	kg	Pound	lb	2.2046
Ton (metric)		Ton (U.S.)		1.1023
Power				
Horsepower (550 ft-lb f/sec)	hp	Kilowatt	kW	0.7457
Kilowatt	kW	Horsepower (550 ft-lb f/sec)	hp	1.3910
Pressure				
Pound-Force per square inch	psi	Kilopascal	kPa	6.8948
Kilopascal	kPa	Pound-Force per square inch	psi	0.145
Temperature				
Degree Fahrenheit	°F	Degree Celsius	°C	5/9 (°F - 32)
Degree Celsius	°C	Degree Fahrenheit	°F	(9/5 °C) + 32
Velocity				
Miles per hour (U.S.)	mph	Kilometer per hour	km/h	1.6093
Kilometer per hour	km/h	Miles per hour (U.S.)	mph	0.6214

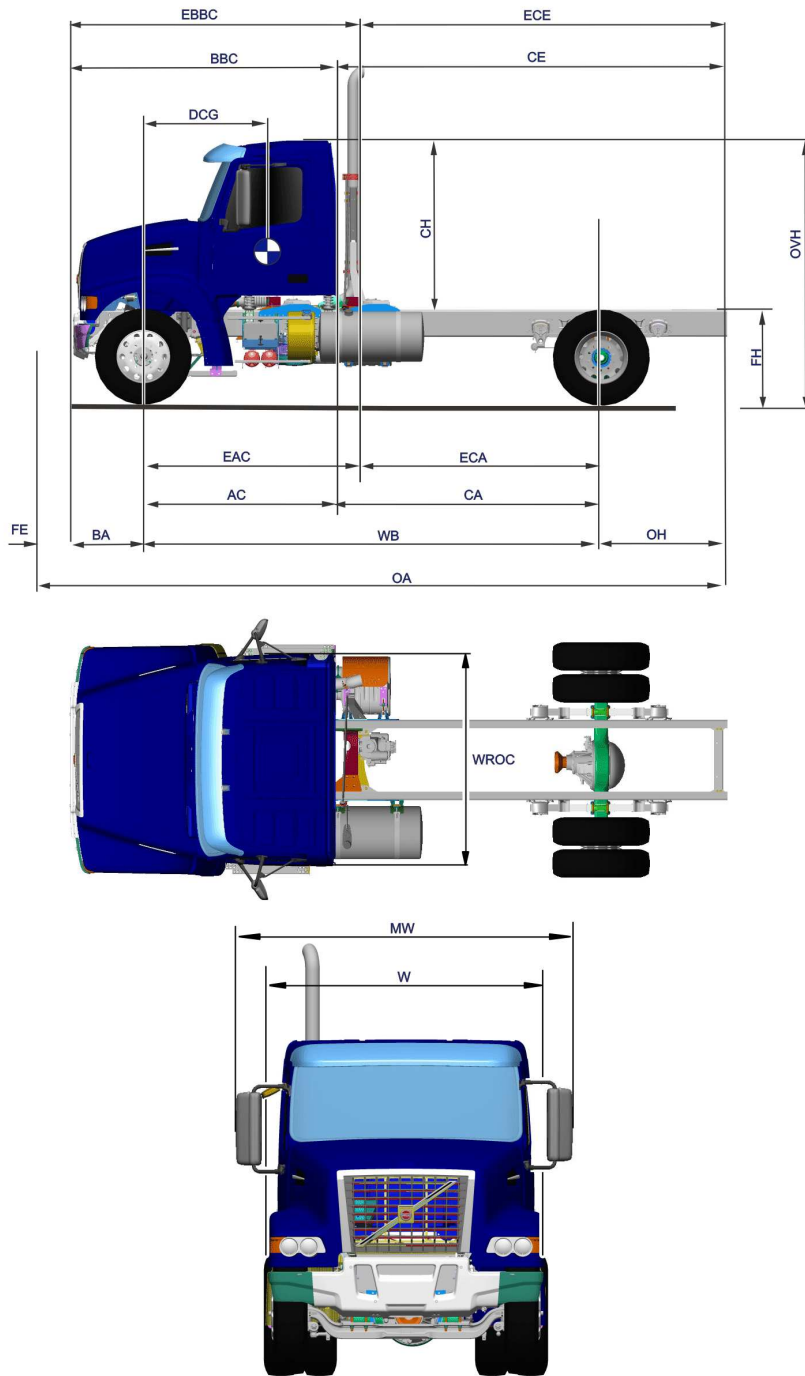
Convert From:		To:		Multiply By:
Volume				
Cubic inch	in ³	Cubic millimeter	mm ³	16387.06
Cubic inch	in ³	Cubic centimeter	cm ³	16.3871
Cubic foot	ft ³	Cubic meter	m ³	0.0283
Cubic yard	yd ³	Cubic meter	m ³	0.7646
Quart (U.S. liquid)	qt	Liter	L	0.9464
Gallon (U.S. liquid)	gal	Liter	L	3.7854
Liter	L	Quart (U.S. liquid)	qt	1.0566
Liter	L	Gallon (U.S. liquid)	gal	0.2642
Gallon (U.S. liquid)	gal	Cubic meter	m ³	0.0038
Cubic millimeter	mm ³	Cubic inch	in ³	0.00006
Cubic centimeter	cm ³	Cubic inch	in ³	0.061
Cubic meter	m ³	Cubic foot	ft ³	35.3357
Cubic meter	m ³	Cubic yard	yd ³	1.3079
Cubic meter	m ³	Gallon (U.S. liquid)	gal	263.1579

Notes

Chassis Diagrams

Chassis Diagrams, VHD

VHD 200, Truck, Axle Forward, 4 x 2



W9031950

Fig. 8 VHD 200, Truck, Axle Forward, 4 x 2

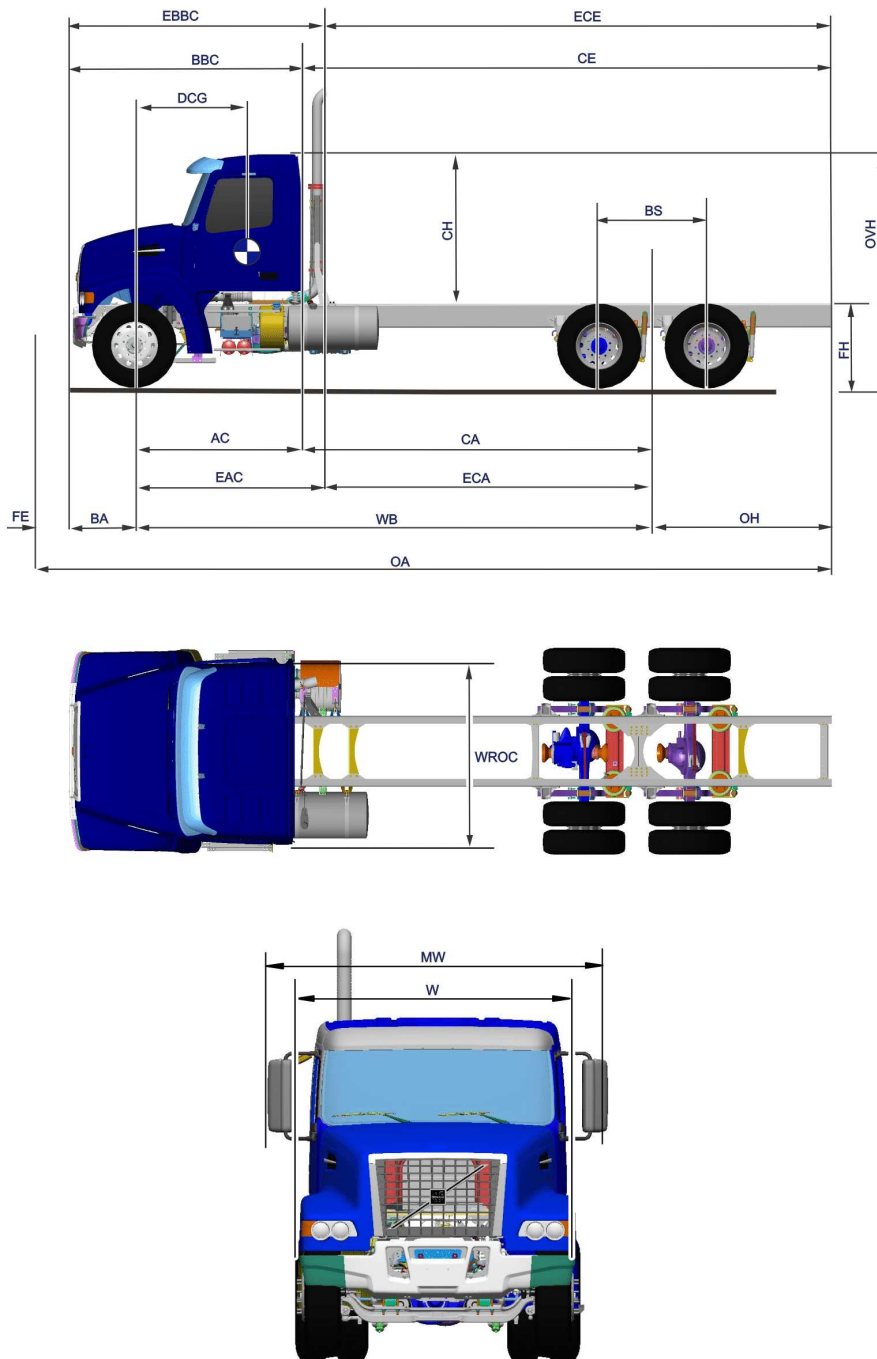
See Fig. 8

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	29.10 in (739 mm)
Wheelbase	WB	199 in (5055 mm)
Overhang	OH	84 in (2134 mm)
Overall Length	OA	312.10 in (7927 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	114.50 (2908 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	84.50 in (2146 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	198.50 in (5042 mm)
Effective Cab to End of Frame	ECE	See table below.
Unladen Frame Height	FH	43.49 in (1105 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	117.55 in (2986 mm)
Driver CG	DCG	64.50 in (1638 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	97.95 in (2488 mm)	101.05 in (2567 mm)	127.05 in (3227 mm)	185.05 in (4700 mm)
Dual Stack	101.81 in (2586 mm)	97.19 in (2469 mm)	130.91 in (3325 mm)	181.19 in (4602 mm)
Vertical SCR	106.06 in (2694 mm)	92.94 in (2361 mm)	135.16 in (3433 mm)	176.94 in (4494 mm)

VHD 200, Truck, Axle Forward, 6 x 4



W9034070

Fig. 9 VHD 200, Truck, Axle Forward, 6 x 4

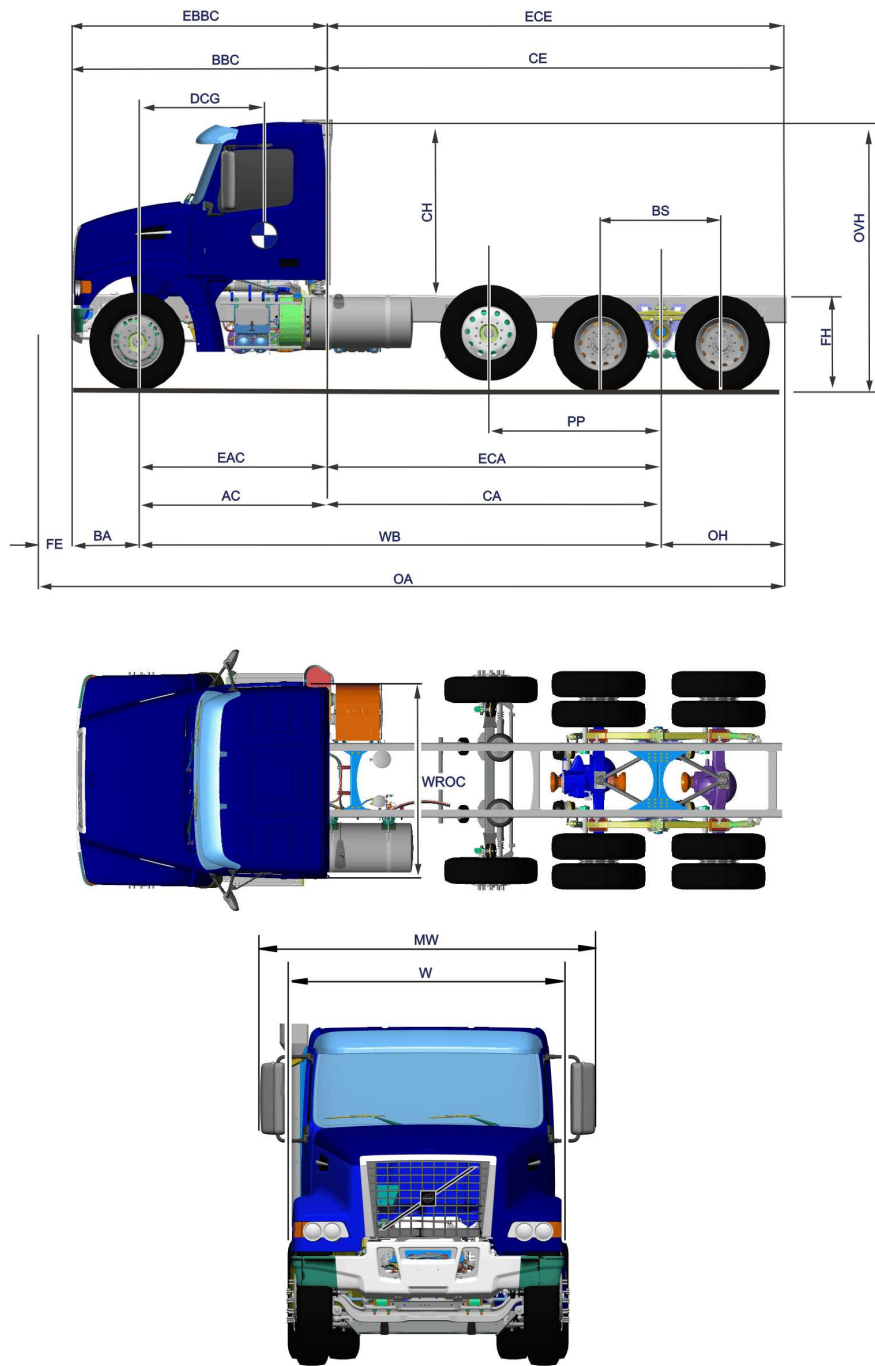
See Fig. 9

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	29.10 in (739 mm)
Wheelbase	WB	232 in (5893 mm)
Overhang	OVH	55 in (1397 mm)
Overall Length	OA	316.10 in (8029 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	147.50 in (3747 mm)
Effective Cab to Rear Axle	ECA	See table below.
Cab to Rear of Axle	AC	84.50 in (2146 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	202.50 in (5144 mm)
Effective Cab to End of Frame	ECE	See table below.
Unladen Frame Height	FH	42.31 in (1075 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	116.61 in (2962 mm)
Driver CG	DCG	64.50 in (1638 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	97.95 in (2488 mm)	134.05 in (3405 mm)	127.05 in (3227 mm)	189.05 in (4802 mm)
Dual Stack	101.81 in (2586 mm)	130.19 in (3307 mm)	130.91 in (3325 mm)	185.19 in (4704 mm)
Vertical SCR	106.06 in (2694 mm)	125.94 in (3199 mm)	135.16 in (3433 mm)	180.94 in (4596 mm)

VHD 200, Truck, Axle Forward, 8 x 4



W9031949

Fig. 10 VHD 200, Truck, Axle Forward, 8 x 4

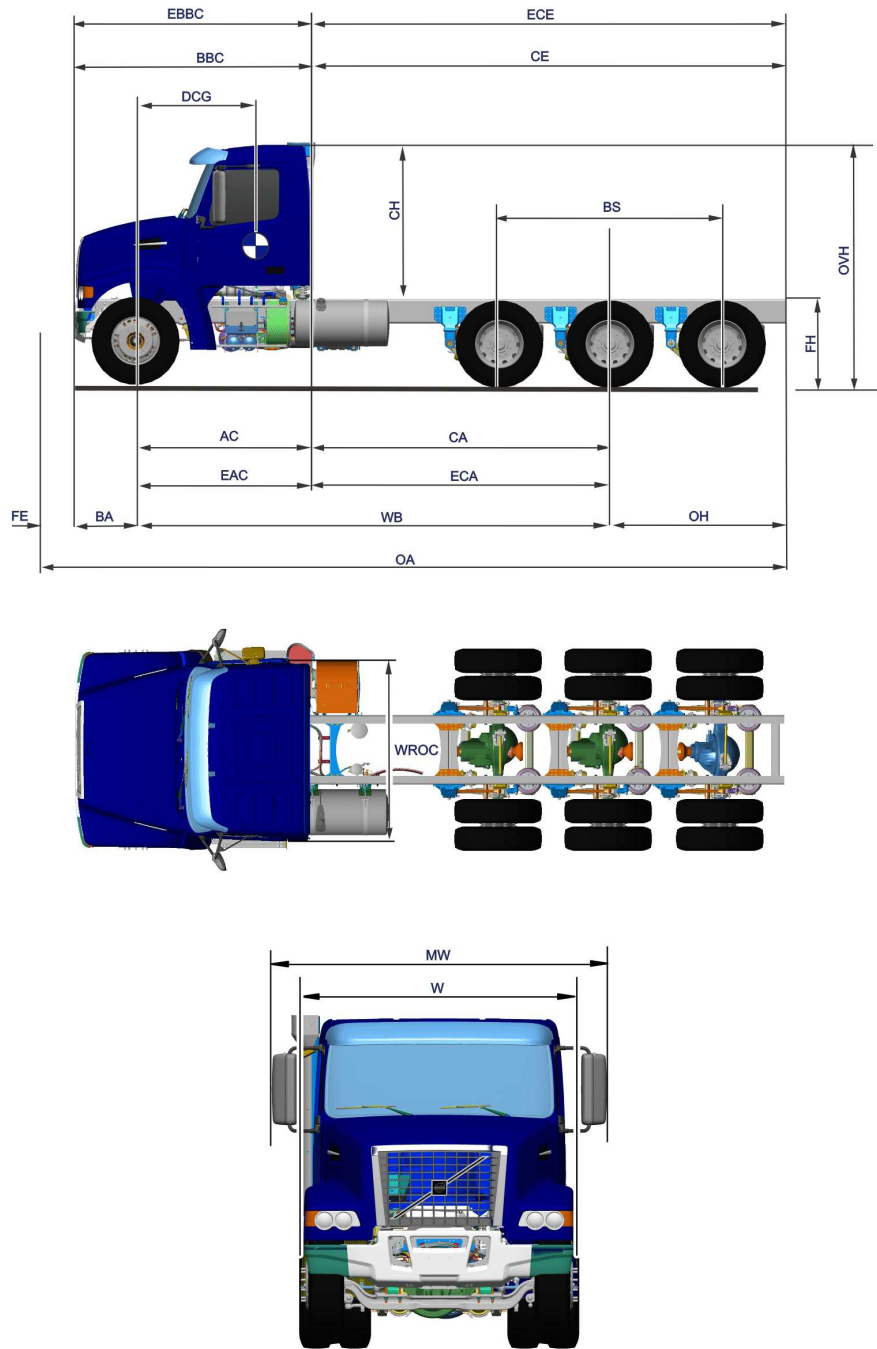
See Fig. 10

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	29.10 in (739 mm)
Wheelbase	WB	232 in (5893 mm)
Overhang	OH	55 in (1397 mm)
Overall Length	OA	316.10 in (8029 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	147.50 in (3747 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	84.50 in (2146 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	202.50 in (5144 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	54 in (1372 mm)
Unladen Frame Height	FH	42.31 in (1075 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	116.61 in (2962 mm)
Driver CG	DCG	64.50 in (1638 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)
Pusher	PP	75 in (1905 mm)

	EAC	ECA	EBBC	ECE
Single Stack	97.95 in (2488 mm)	134.05 in (3405 mm)	127.05 in (3227 mm)	189.05 in (4802 mm)
Dual Stack	101.81 in (2586 mm)	130.19 in (3307 mm)	130.91 in (3325 mm)	185.19 in (4704 mm)
Vertical SCR	106.06 in (2694 mm)	125.94 in (3199 mm)	135.16 in (3433 mm)	180.94 in (4596 mm)

VHD 200, Truck, Axle Forward, 8 x 6



W9034068

Fig. 11 VHD 200, Truck, Axle Forward, 8 x 6

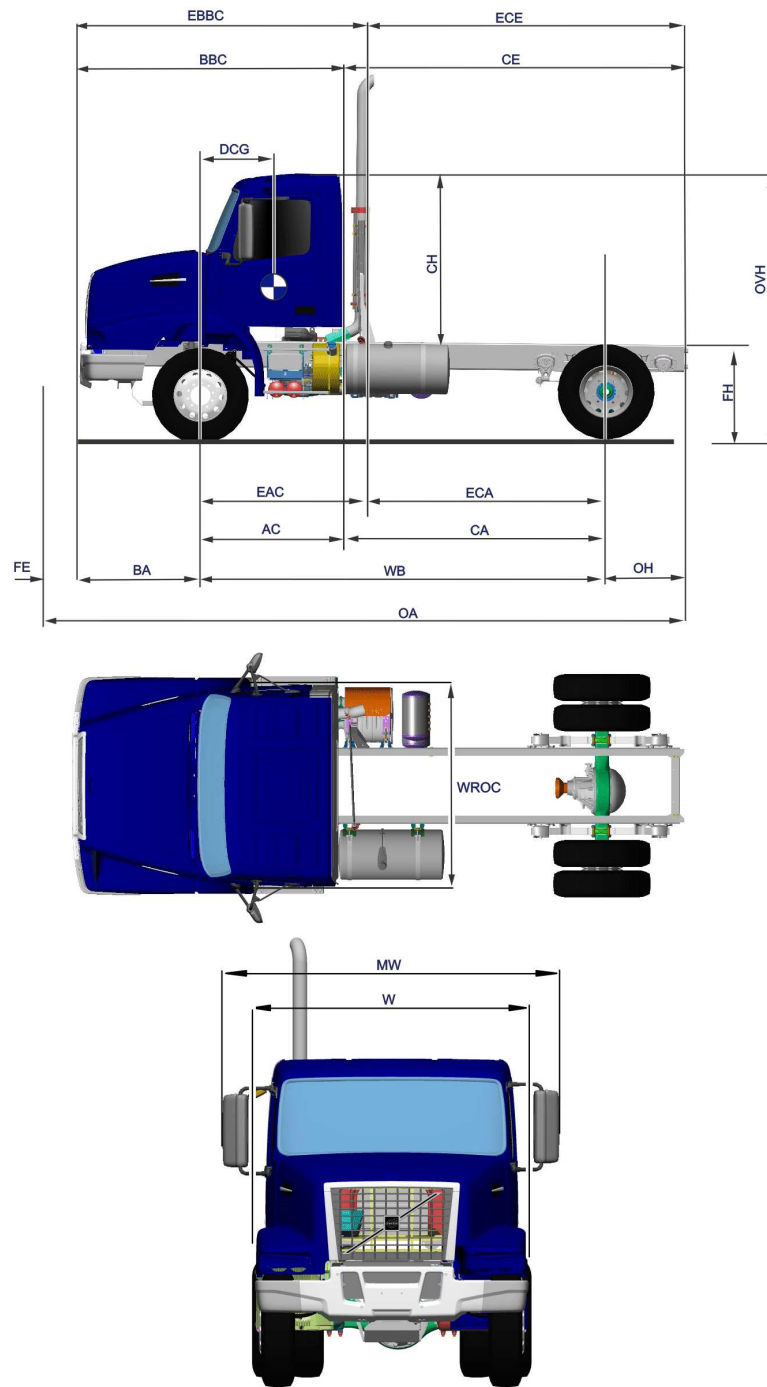
See Fig. 11

Dimensions

Description	Drawing Reference	Dimension (mm/in)
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	29.10 in (739 mm)
Wheelbase	WB	230 in (5842 mm)
Overhang	OH	84 in (2134 mm)
Overall Length	OA	343.10 in (8715 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	137.50 in (3493 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	84.50 in (2146 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	229.50 in (5829 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	108 in (2743 mm)
Unladen Frame Height	FH	42.31 in (1075 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	115.31 in (2929 mm)
Driver CG	DCG	64.50 in (1638 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	97.95 in (2488 mm)	132.05 in (3354 mm)	127.05 in (3227 mm)	216.05 in (5488 mm)
Dual Stack	101.81 in (2586 mm)	128.19 in (3256 mm)	130.91 in (3325 mm)	212.19 in (5390 mm)
Vertical SCR	106.06 in (2694 mm)	123.94 in (3148 mm)	135.16 in (3433 mm)	207.94 in (5282 mm)

VHD 200, Truck, Axle Back, 4 x 2



W9031954

Fig. 12 VHD 200, Truck, Axle Back, 4 x 2

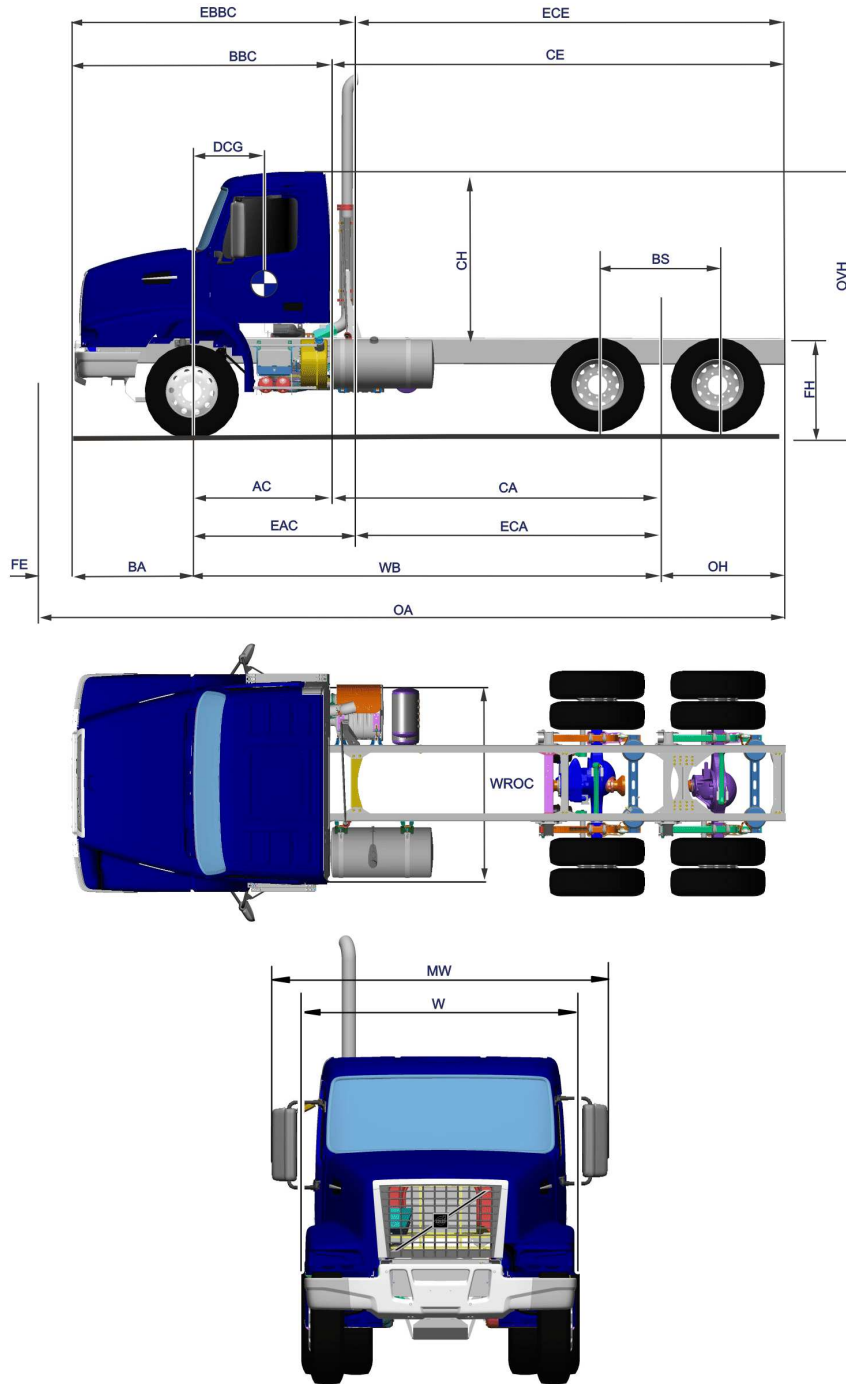
See Fig. 12

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.2 in (1300 mm)
Wheelbase	WB	177 in (4496 mm)
Overhang	OH	84 in (2134 mm)
Overall Length	OA	261 in (6629 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	114.60 in (2911 mm)
Effective Cab to Rear Axle	ECA	See table below.
Axle to Back of Cab	AC	62.40 in (1585 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	198.60 in (5044 mm)
Effective Cab to End of Frame	ECE	See table below.
Unladen Frame Height	FH	43.25 in (1099 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	117.55 in (2985 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	116 in (2946 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.90 in (1928 mm)	101.10 in (2568 mm)	127.10 in (3228 mm)	185.10 in (4702 mm)
Dual Stack	79.76 in (2026 mm)	97.24 in (2470 mm)	130.96 in (3326 mm)	183.24 in (4654 mm)
Vertical SCR	84.01 in (2134 mm)	92.99 in (2362 mm)	135.21 in (3434 mm)	176.99 in (4496 mm)

VHD 200, Truck, Axle Back, 6 x 4



W9033935

Fig. 13 VHD 200, Truck, Axle Back, 6 x 4

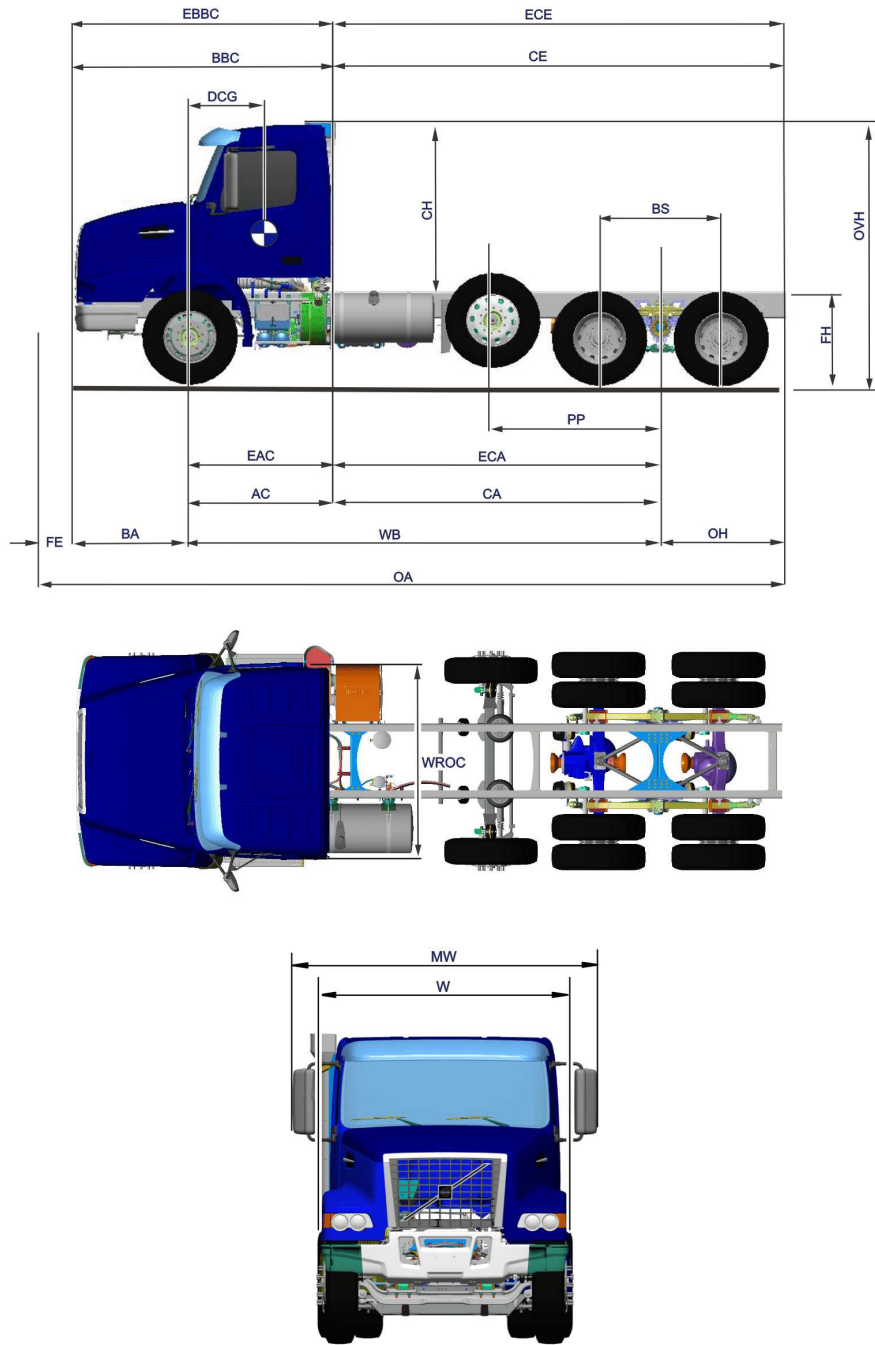
See Fig. 13

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.2 in (1300 mm)
Wheelbase	WB	208 in (5283 mm)
Overhang	OH	55 in (1397 mm)
Overall Length	OA	314.20 in (7981 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	145.60 in (3698 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	62.40 in (1585 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	200.60 in (5095 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	54 in (1372 mm)
Unladen Frame Height	FH	42.31 in (1075 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	116.61 in (2962 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.90 in (1928 mm)	132.10 in (3355 mm)	127.10 in (3228 mm)	187.10 in (4752 mm)
Dual Stack	79.76 in (2026 mm)	128.24 in (3257 mm)	130.96 in (3326 mm)	183.24 in (4654 mm)
Vertical SCR	84.01 in (2134 mm)	123.99 in (3149 mm)	135.21 in (3434 mm)	178.99 in (4546 mm)

VHD 200, Truck, Axle Back, 8 x 4



W9054803

Fig. 14 VHD 200, Truck, Axle Back, 8 x 4

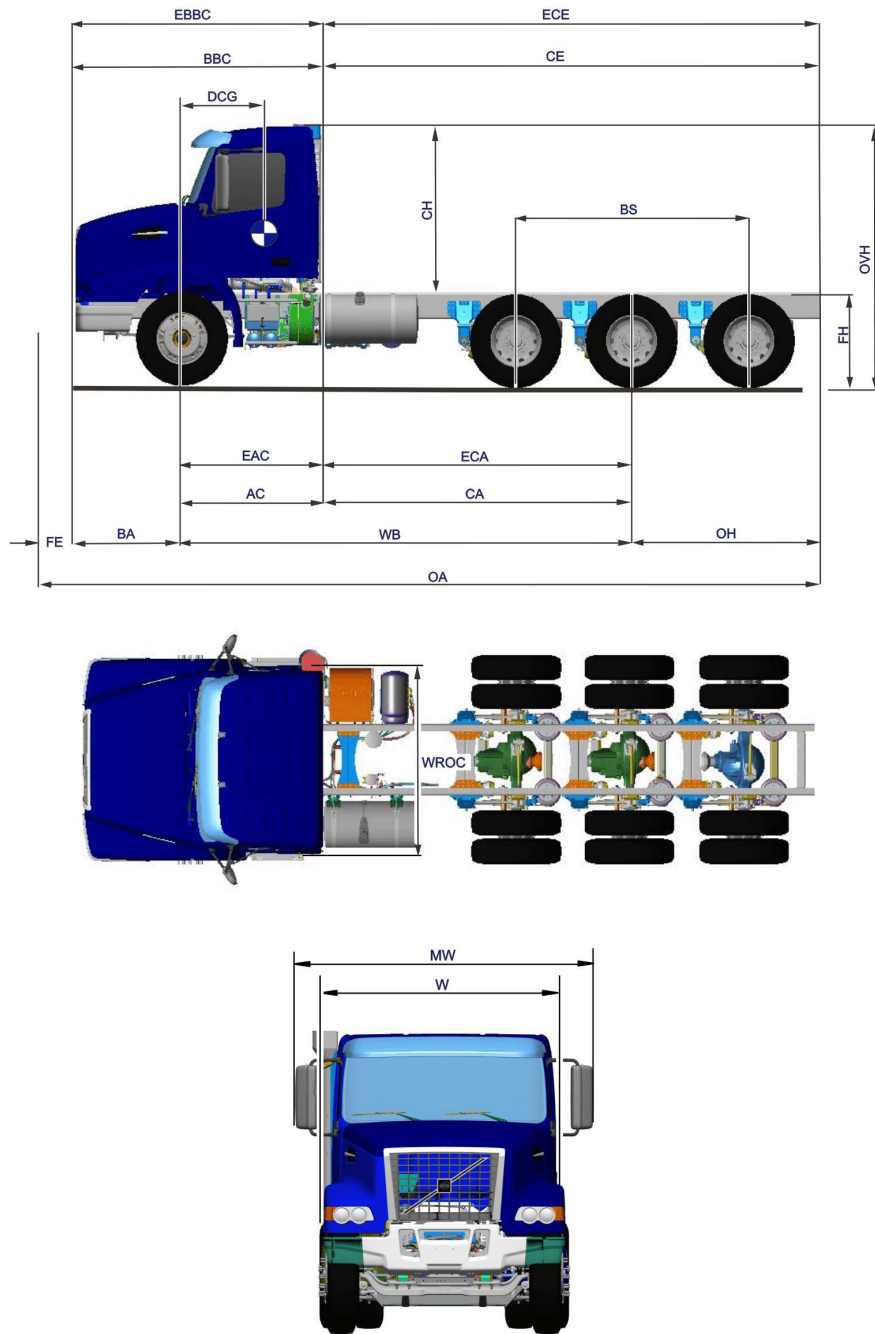
See Fig. 14

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.2 in (1300 mm)
Wheelbase	WB	208 in (5283 mm)
Overhang	OH	55 in (1397 mm)
Overall Length	OA	277.20 in (7041 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	145.60 in (3698 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	62.40 (1585)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	200.60 in (5095 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	54 in (1372 mm)
Unladen Frame Height	FH	42.31 in (1075 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	116.61 in (2962 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)
Pusher	PP	75 in (1905 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.90 in (1928 mm)	132.10 in (3355 mm)	127.10 in (3228 mm)	150.10 in (3813 mm)
Dual Stack	79.76 in (2026 mm)	128.24 in (3257)	130.96 in (3326 mm)	146.24 in (3715 mm)
Vertical SCR	84.01 in (2134 mm)	123.99 in (3149 mm)	135.21 in (3434 mm)	141.99 in (3607 mm)

VHD 200, Truck, Axle Back, 8 x 6



W9054805

Fig. 15 VHD 200, Truck, Axle Back, 8 x 6

See Fig. 15

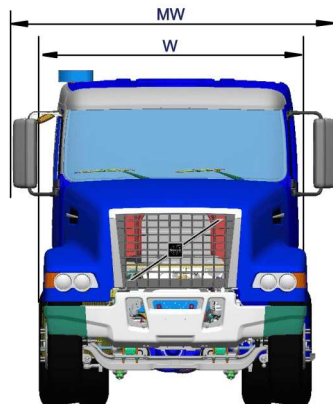
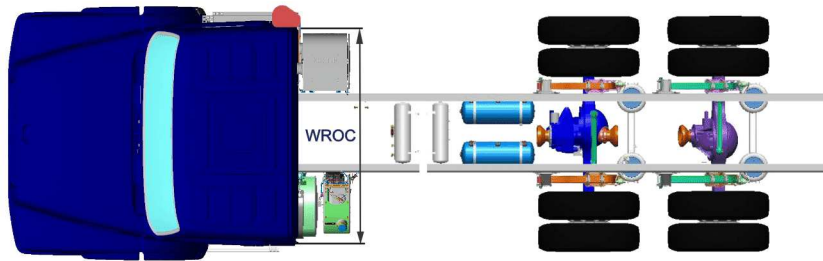
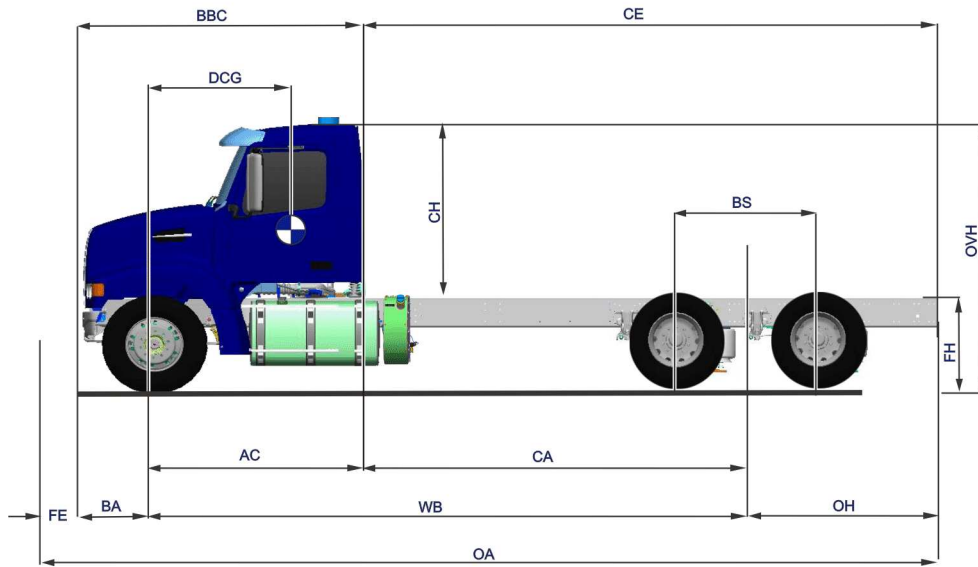
Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.2 in (1300 mm)
Wheelbase	WB	208 in (5283 mm)
Overhang	OH	84 in (2134 mm)
Overall Length	OA	343.20 in (8717 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	145.60 (3698)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	62.40 in (1585 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	229.60 in (5832 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	108 in (2743 mm)
Unladen Fifth Wheel Height	FWH	50.50 in (1283 mm)
Unladen Frame Height	FH	41.01 in (1042 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	115.31 in (2929 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.90 in (1928 mm)	132.10 in (3355 mm)	127.10 in (3228 mm)	216.10 in (5489 mm)
Dual Stack	79.76 in (2026 mm)	128.24 in (3257 mm)	130.96 in (3326 mm)	212.24 in (5391 mm)
Vertical SCR	84.01 in (2134 mm)	123.99 in (3149 mm)	135.21 in (3434 mm)	207.99 in (5283 mm)

Chassis Diagrams, VAH

VAH 200, Truck, Axle Forward, 6 x 4



W9057063

Fig. 16 VAH 200, Truck, Axle Forward, 6 x 4

See Fig. 16

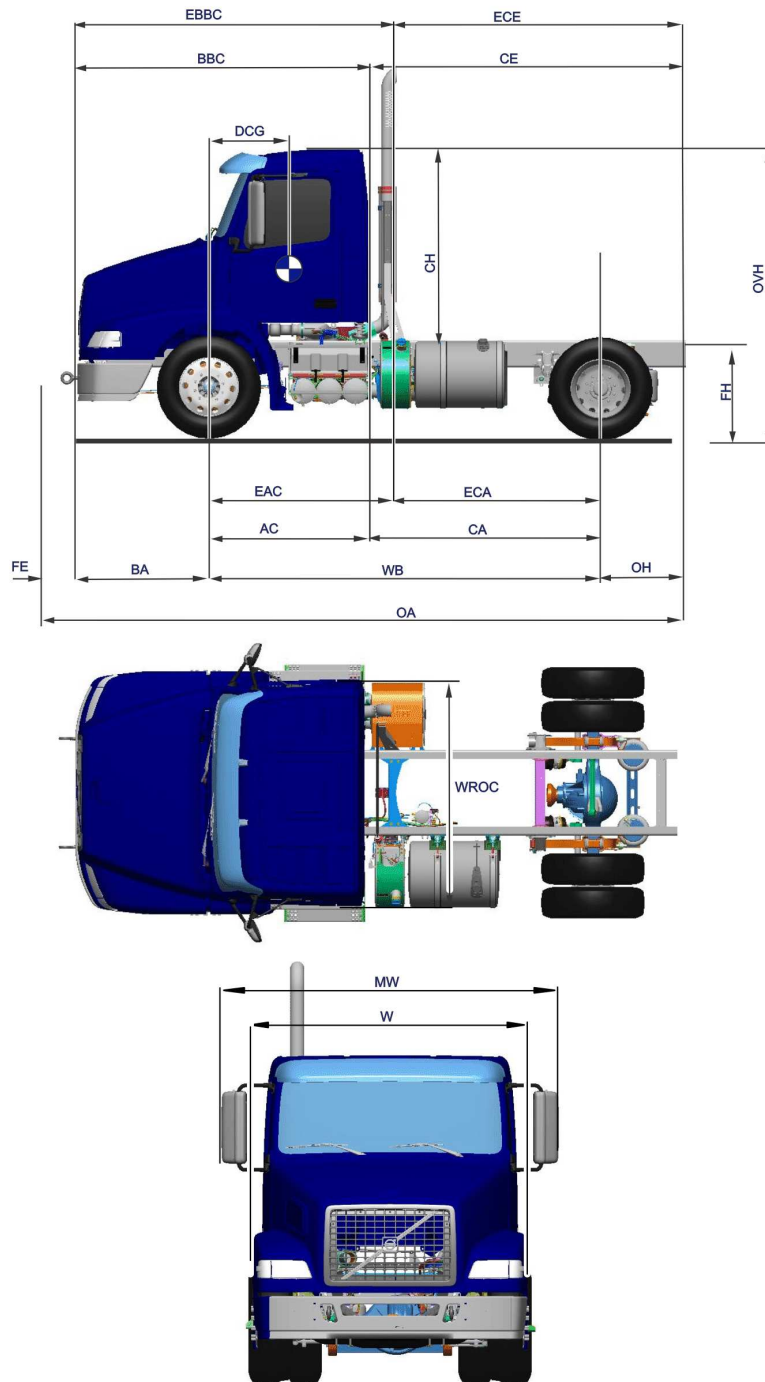
Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	29.10 in (739 mm)
Wheelbase	WB	237 in (6020 mm)
Overhang	OH	62 in (1575 mm)
Overall Length	OA	328.10 in (8334 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Cab to Rear Axle	CA	152.50 in (3874 mm)
Front Axle to Back of Cab	AC	84.50 in (2146 mm)
Cab to End of Frame	CE	214.50 in (5448 mm)
Bogie Spread	BS	52 in (1321 mm)
Unladen Frame Height	FH	35.70 in (907 mm)
Cab Height	CH	74.30 in (1887 mm)
Overall Height	OVH	110 in (2794 mm)
Driver CG	DCG	64.50 in (1638 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

Notes

Chassis Diagrams, VNM / VNR

VNM 200 / VNR 200, Truck, Axle Back, 4 x 2



W9056682

Fig. 17 VNM 200 / VNR 200, Truck, Axle Back, 4 x 2

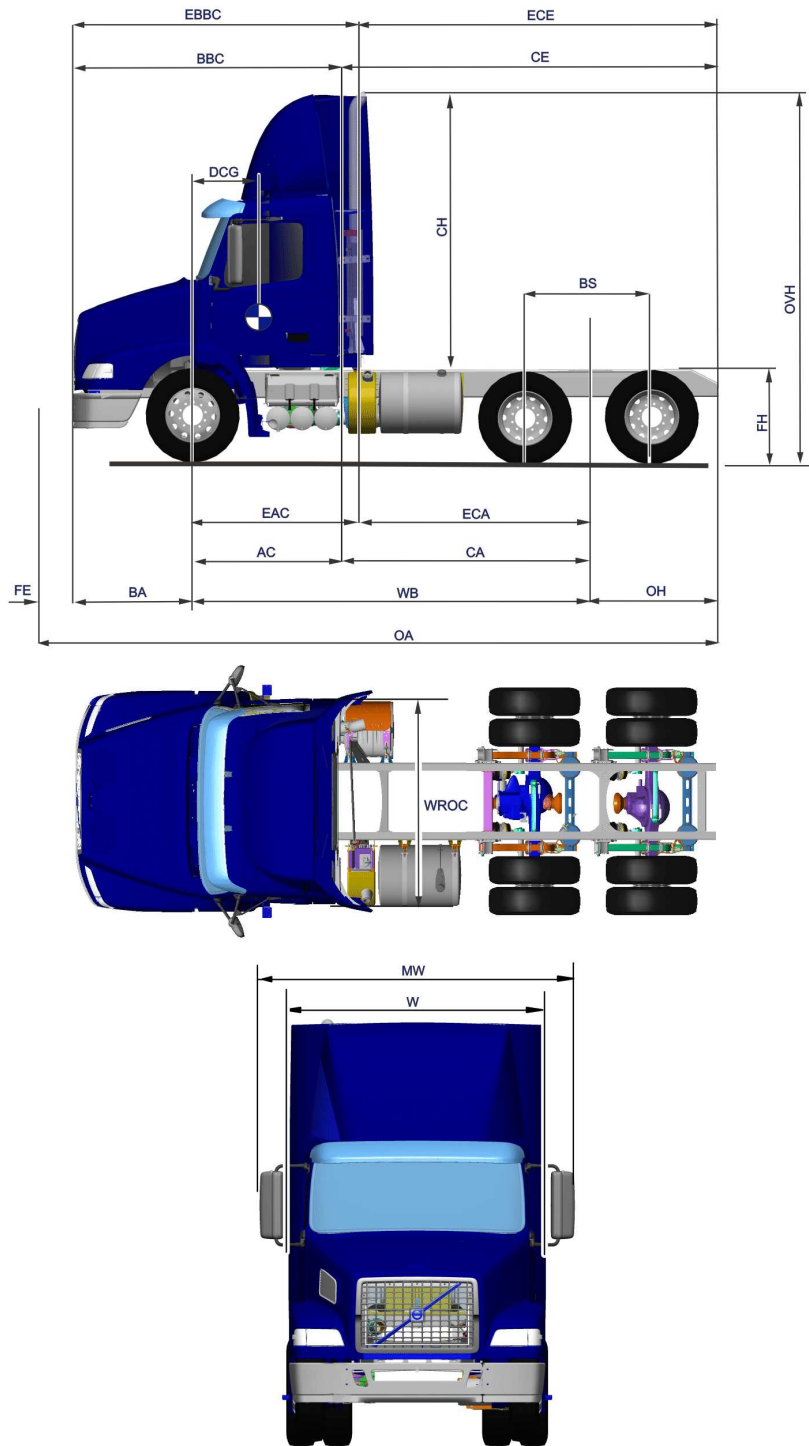
See Fig. 17

Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.10 in (1298 mm)
Wheelbase	WB	152 in (3861 mm)
Overhang	OH	33 in (838 mm)
Overall Length	OA	236.10 in (5997 mm)
Bumper to Back of Cab	BBC	113.50 in (2883 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	89.60 in (2276 mm)
Effective Cab to Rear Axle	ECA	See table below.
Axle to Back of Cab	AC	62.40 in (1585 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	122.60 in (3114 mm)
Effective Cab to End of Frame	ECE	See table below.
Unladen Fifth Wheel Height	FWH	47.50 in (1207 mm)
Unladen Frame Height	FH	38.60 in (980 mm)
Cab Height	CH	75 in (1905 mm)
Overall Height	OVH	113.60 in (2885 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	116 in (2946 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.91 in (1928 mm)	76.09 in (1933 mm)	127.01 in (3226 mm)	109.09 in (2771 mm)
Dual Stack	N/A	N/A	N/A	N/A
Vertical SCR	84.01 in (2134 mm)	67.99 in (1727 mm)	135.11 in (3432 mm)	100.99 in (2565 mm)

VNM 200 / VNR 200, Truck, 6 x 4



W9056680

Fig. 18 VNM 200 / VNR 200, Truck, 6 x 4

See Fig. 18

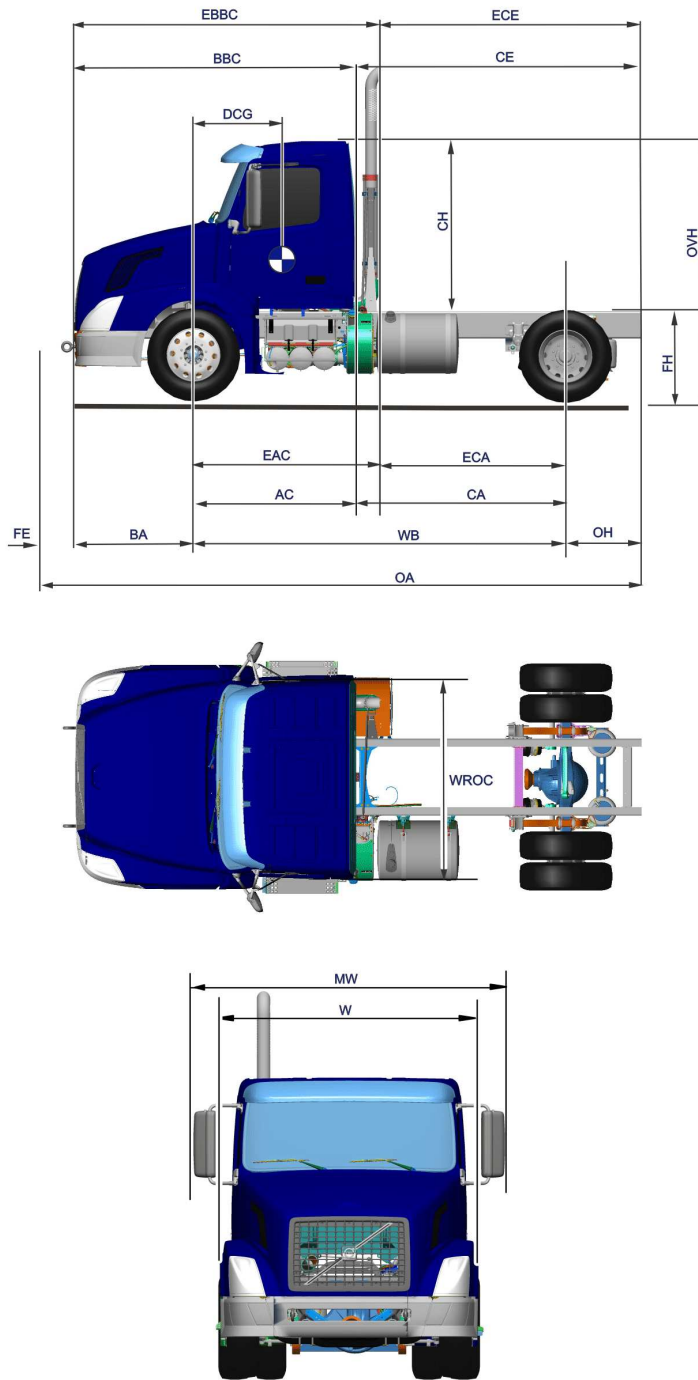
Dimensions

Description	Drawing Reference	Dimension
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	51.10 in (1298 mm)
Wheelbase	WB	170 in (4318 mm)
Overhang	OH	55 in (1397 mm)
Overall Length	OA	276.10 in (7013 mm)
Bumper to Back of Cab	BBC	113.60 in (2885 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	107.60 in (2733 mm)
Effective Cab to Rear Axle	ECA	See table below.
Axle to Back of Cab	AC	62.40 in (1585 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	162.50 in (4128 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	52 in (1321 mm)
Unladen Frame Height	FH	38.60 in (980 mm)
Cab Height	CH	75 in (1905 mm)
Overall Height	OVH	113.60 in (2885 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	117.45 in (2983 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	75.91 in (1928 mm)	94.09 in (2390 mm)	127.01 in (3226 mm)	149.09 in (3787 mm)
Dual Stack	N/A	N/A	N/A	N/A
Vertical SCR	84.02 in (2134 mm)	85.98 in (2184 mm)	135.12 in (3432 mm)	140.98 in (3581 mm)

Chassis Diagrams, VNL

VNL 300, Truck, Axle Back, 4 x 2



W9034901

Fig. 19 VNL 300, Truck, Axle Back, 4 x 2

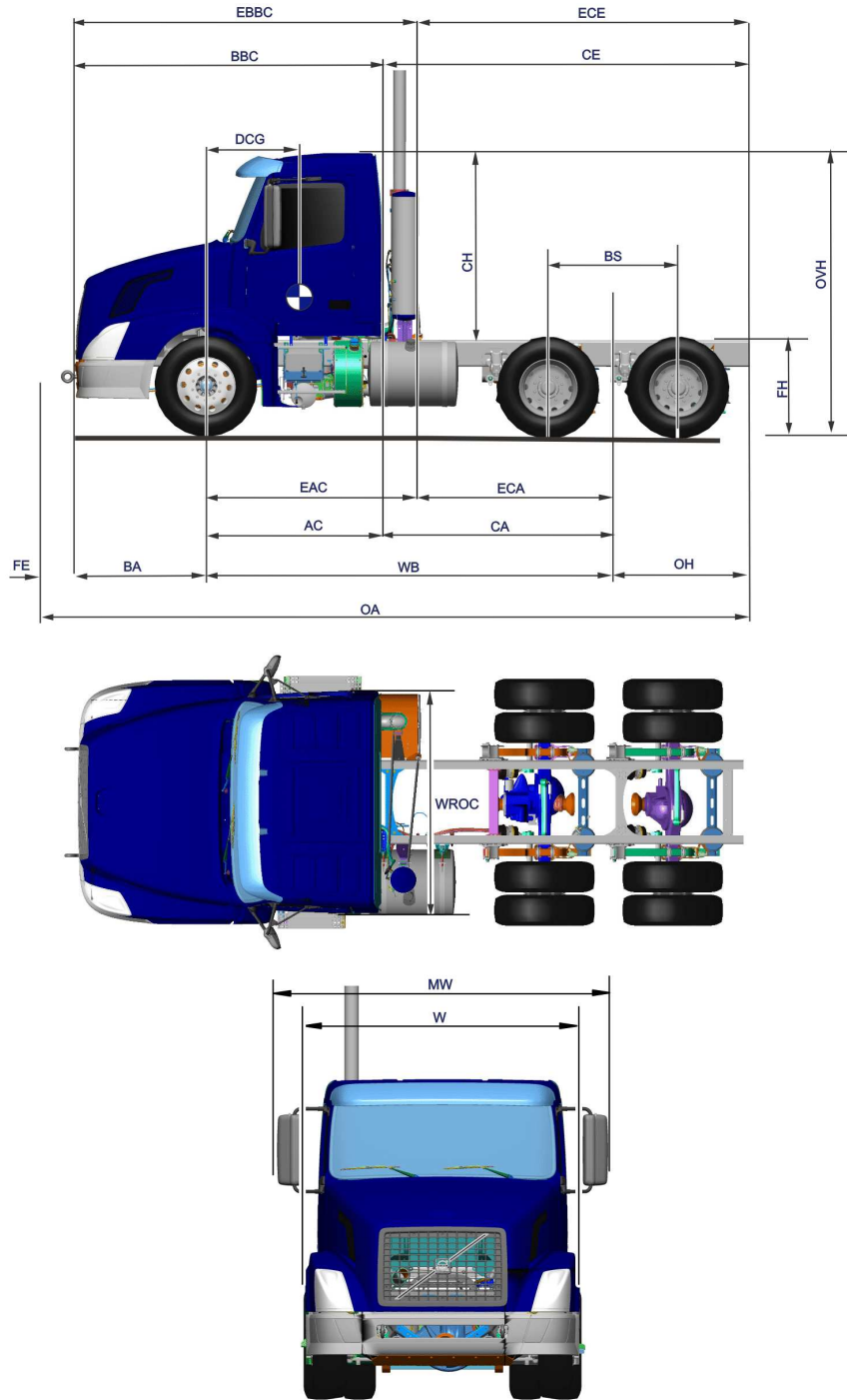
See Fig. 19

Dimensions

Description	Drawing Reference	Dimension (in/mm)
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	52.20 in (1326 mm)
Wheelbase	WB	152 in (3861 mm)
Overhang	OH	33 in (838 mm)
Overall Length	OA	237.20 in (6025 mm)
Bumper to Back of Cab	BBC	122.40 in (3109 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	81.80 in (2078 mm)
Effective Cab to Rear Axle	ECA	See table below.
Axle to Back of Cab	AC	70.20 in (1783 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	114.80 in (2916 mm)
Effective Cab to End of Frame	ECE	See table below.
Unladen Frame Height	FH	38.60 in (980 mm)
Cab Height	CH	75 in (1905 mm)
Overall Height	OVH	113.60 in (2885 mm)
Driver CG	DCG	42 in (1067 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	116 in (2946 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	80.75 in (2051 mm)	71.25 in (1810 mm)	132.95 in (3377 mm)	104.25 in (2648 mm)
Dual Stack	N/A	N/A	N/A	N/A
Vertical SCR	91.89 in (2334 mm)	60.11 in (1527 mm)	144.09 in (3660 mm)	93.11 in (2365 mm)

VNL 300, Truck, 6 x 4



W9034915

Fig. 20 VNL 300, Truck, 6 x 4

See Fig. 20

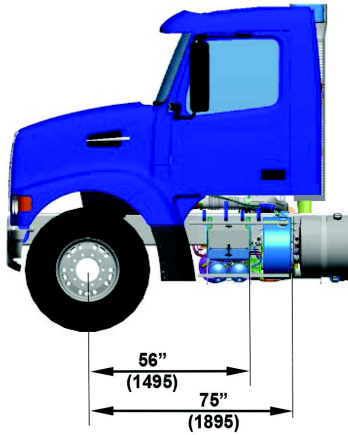
Dimensions

Description	Drawing Reference	Dimension (in/mm)
Front Frame Extension	FE	0 in (0 mm)
Bumper to Front Axle	BA	52.20 in (1326 mm)
Wheelbase	WB	170 in (4318 mm)
Overhang	OH	55 in (1397 mm)
Overall Length	OA	277.20 in (7041 mm)
Bumper to Back of Cab	BBC	122.40 in (3109 mm)
Effective Bumper to Back of Cab	EBBC	See table below.
Cab to Rear Axle	CA	99.80 in (2535 mm)
Effective Cab to Rear Axle	ECA	See table below.
Front Axle to Back of Cab	AC	70.20 in (1783 mm)
Effective Front Axle to Back of Cab	EAC	See table below.
Cab to End of Frame	CE	154.80 in (3932 mm)
Effective Cab to End of Frame	ECE	See table below.
Bogie Spread	BS	52 in (1321 mm)
Unladen Frame Height	FH	38.60 in (980 mm)
Cab Height	CH	75 in (1905 mm)
Overall Height	OVH	113.60 in (2885 mm)
Driver CG	DCG	50 in (1270 mm)
Width of Rear of Cab	WROC	89 in (2261 mm)
Mirror Width	MW	116 in (2946 mm)
Cab Width	W	95 in (2413 mm)

	EAC	ECA	EBBC	ECE
Single Stack	80.75 in (2051 mm)	89.25 in (2267 mm)	132.95 in (3377 mm)	144.25 in (3664 mm)
Dual Stack	N/A	N/A	N/A	N/A
Vertical SCR	91.89 in (2334 mm)	78.11 in (1984 mm)	144.09 in (3660 mm)	133.11 in (3381 mm)

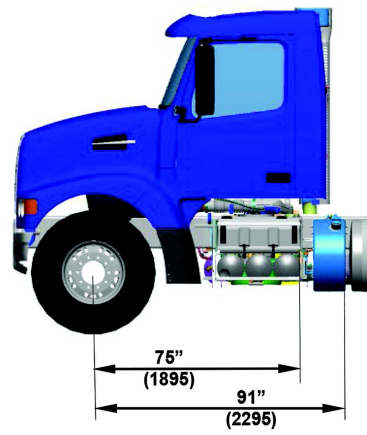
Chassis Configurations, VHD

VHD Axle Forward, Left-Hand Chassis Configuration



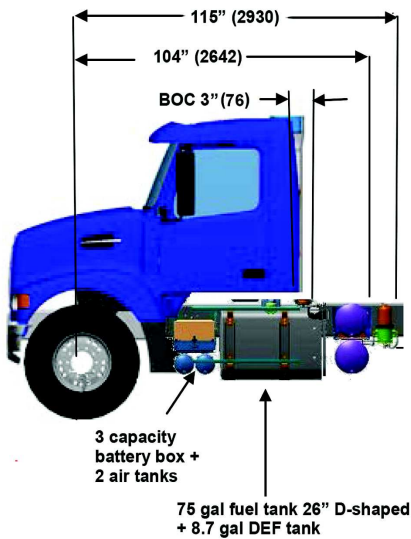
W0118134

Three battery capacity battery box



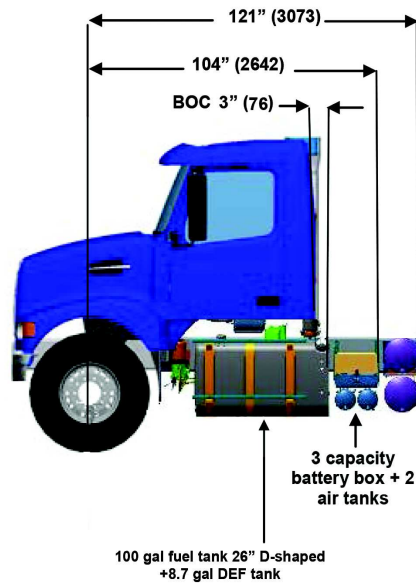
W0118135

Four battery capacity battery box



W0118136

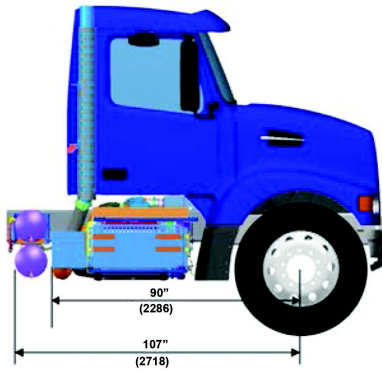
Clean Back of Cab w/75 gal fuel tank (920012)



W0118137

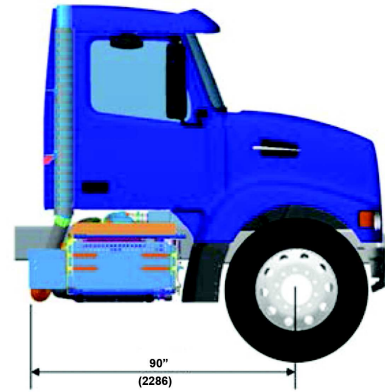
Clean Back of Cab w/100 gal fuel tank (920013)

VHD Axle Forward, Right-Hand Chassis Configuration, GHG 2017



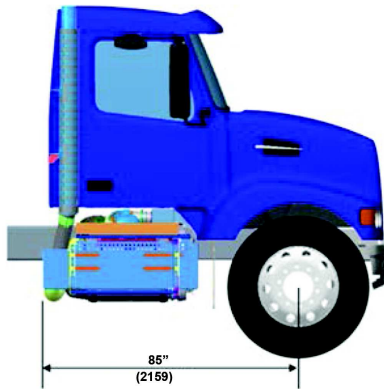
W0118138

Integrated DPF/SCR with three battery box driver side and frame mounted air tanks (also used on VAH)



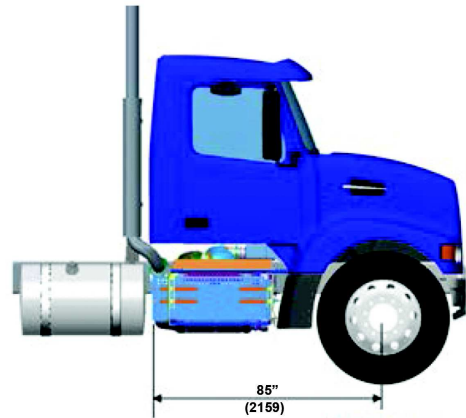
W0118139

Integrated DPF/SCR with four battery box driver side



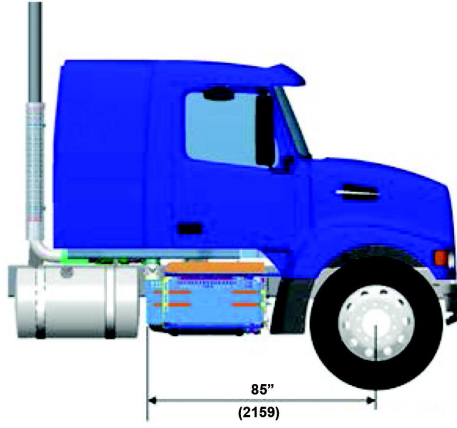
W0118140

Clean Back of Cab Package, 75 or 100 Gallon D-Shaped fuel tank with Integrated DEF tank



W0118141

Integrated DPF/SCR four battery box driver side

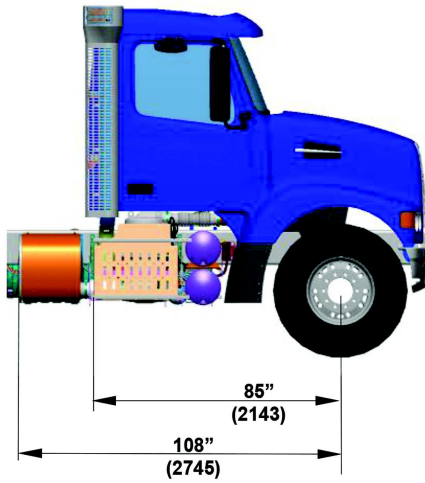


W0118142

Integrated DPF/SCR four battery box driver side

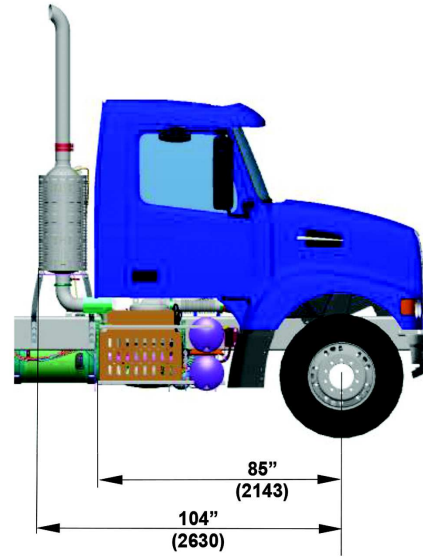
Notes

VHD Axle Forward, Right-Hand Chassis Configuration, US 2010



W0118143

Frame mounted SCR

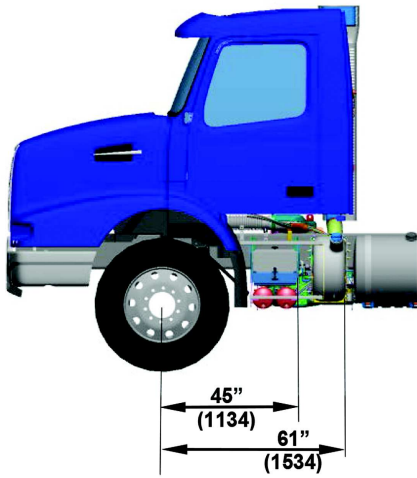


W0118144

Vertical mounted SCR

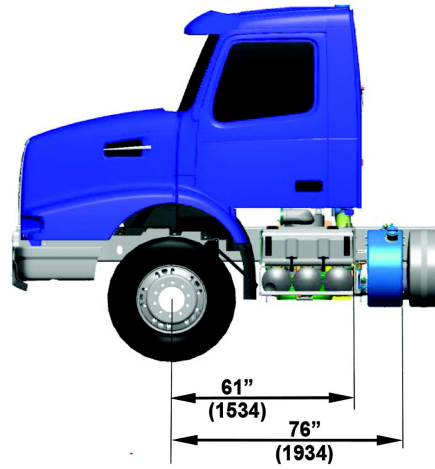
Notes

VHD Day Cab Axle Back, Left-Hand Chassis Configuration



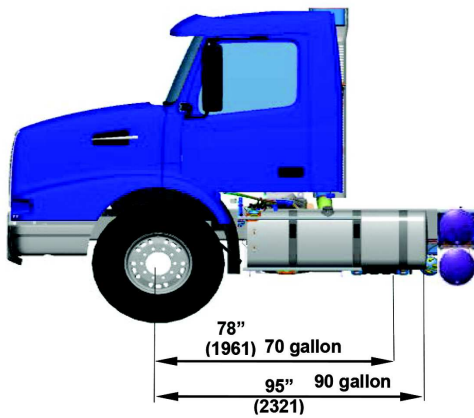
W0118119

Three battery capacity battery box



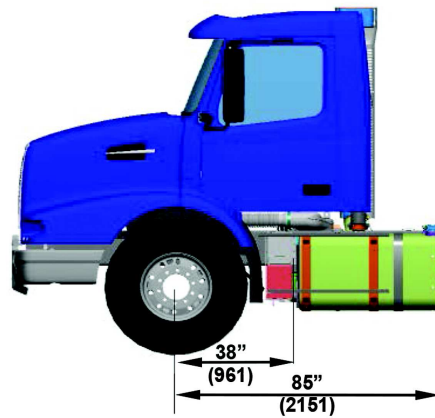
W0118120

Four battery capacity battery box



W0118121

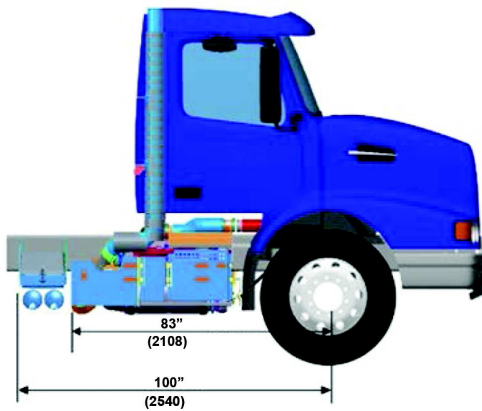
Battery box mounted on right side



W0118122

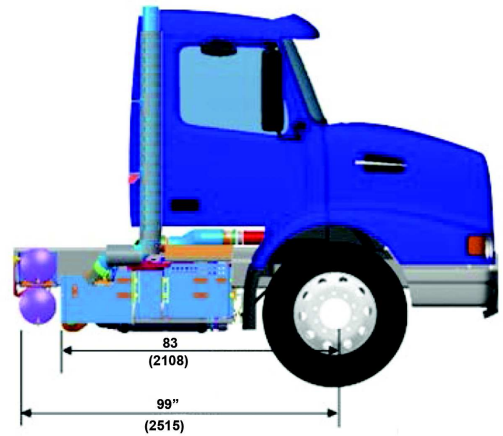
Narrow stacked three capacity battery box

VHD Axle Back, Right-Hand Chassis Configuration, GHG 2017



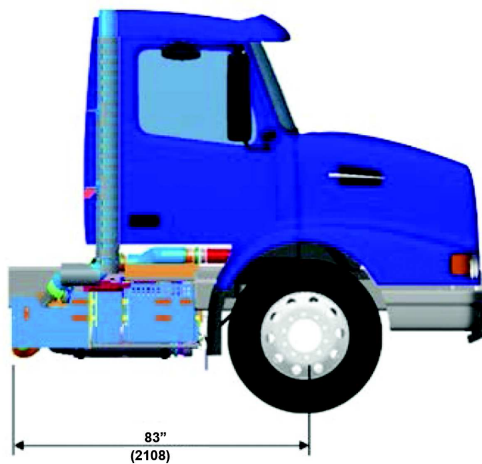
W0118123

Integrated DPF/SCR with three battery box passenger side



W0118124

Integrated DPF/SCR with three battery box driver side and frame mounted air tanks



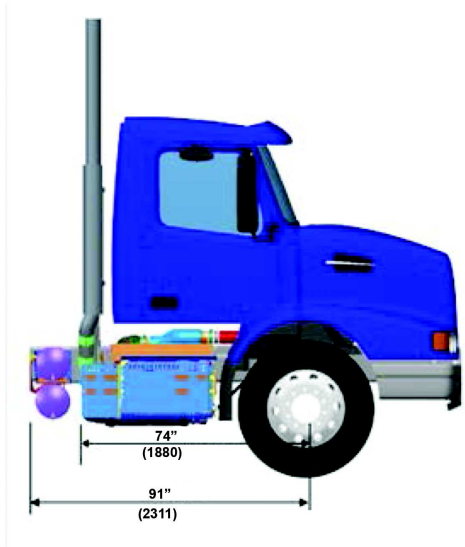
W0118125

Integrated DPF/SCR with four battery box driver side



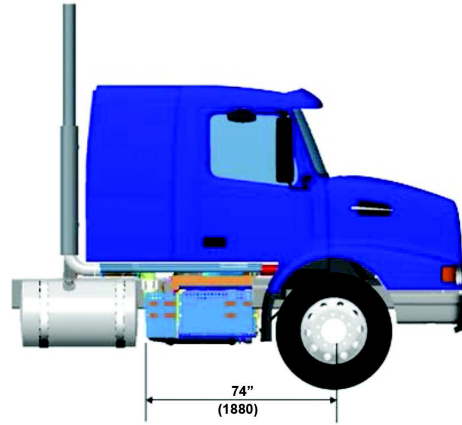
W0118126

Integrated DPF/SCR with three battery box driver side



W0118127

Integrated DPF/SCR with four battery box driver side

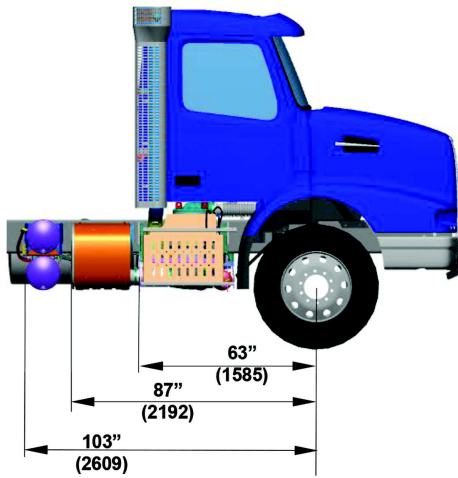


W0118128

Integrated DPF/SCR with four battery box driver side

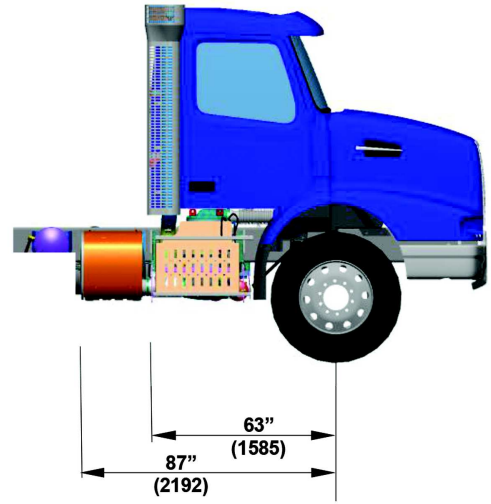
Notes

VHD Axle Back, Right-Hand Chassis Configuration, US 2010



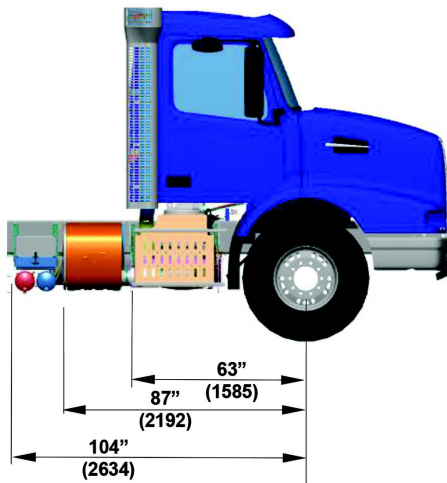
W0118129

Frame mounted SCR with Air Tank Arrangement, Basic



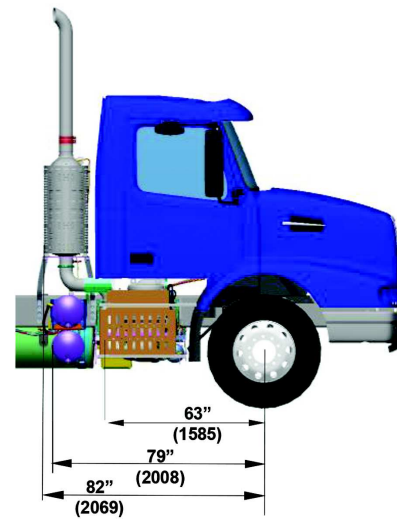
W0118130

Frame mounted SCR with In Frame Air Tanks



W0118131

Frame mounted SCR

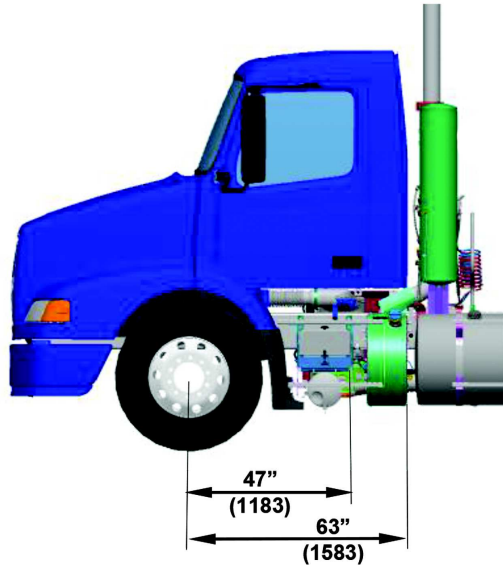


W0118132

Vertical mounted SCR

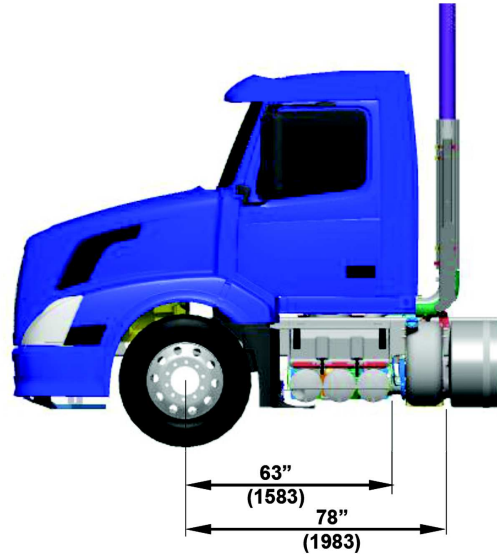
Chassis Configurations, VN

VN Day Cabs, Left-Hand Chassis Configuration



W0118215

VNM / VNR – Three battery capacity battery box



W0118216

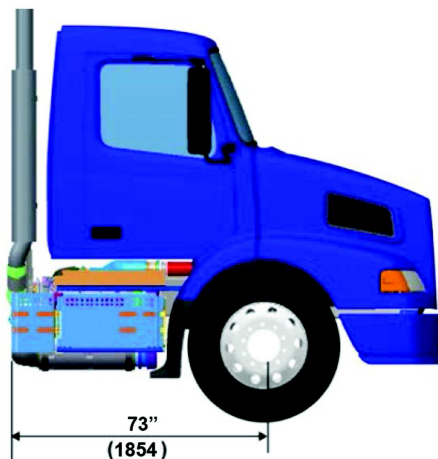
VNL – Four battery capacity battery box

Notes

VN Day Cabs, Right-Hand Chassis Configuration, GHG 2017

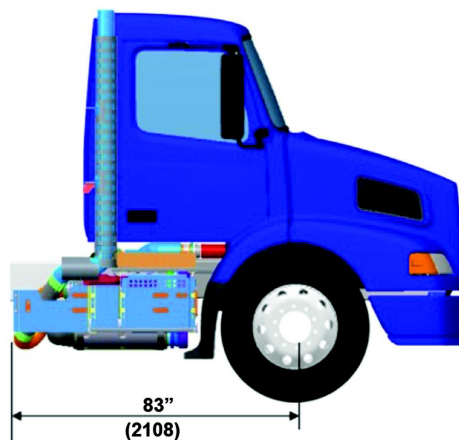
VNM / VNR Day Cabs

The VNM / VNR day cabs with Volvo D11 or D13 engines.



W0118217

Volvo D11 or D13 engine, Integrated DPF/SCR



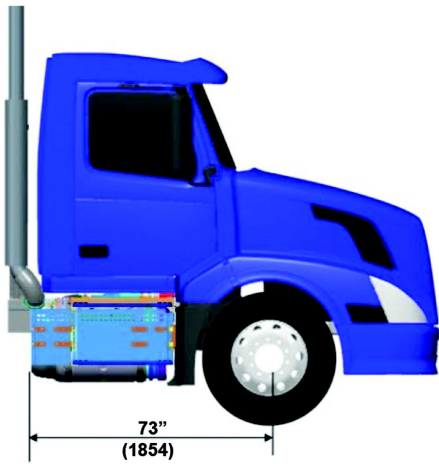
W0118218

Volvo D11 or D13 engine, Integrated DPF/SCR with B-pillar exhaust

Notes

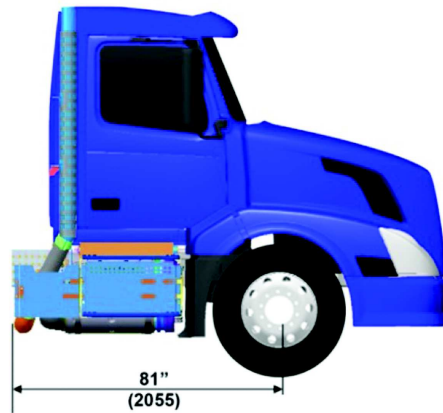
VNL Day Cabs

VNL day cabs with Volvo D11 or D13 engines.



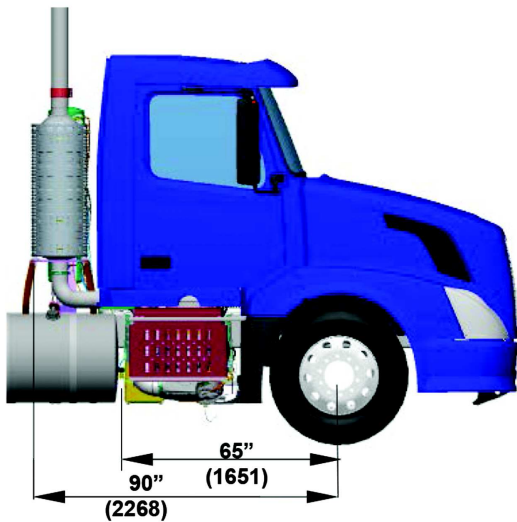
W0118220

Volvo D11 or D13 engine, Integrated DPF/SCR



W0118221

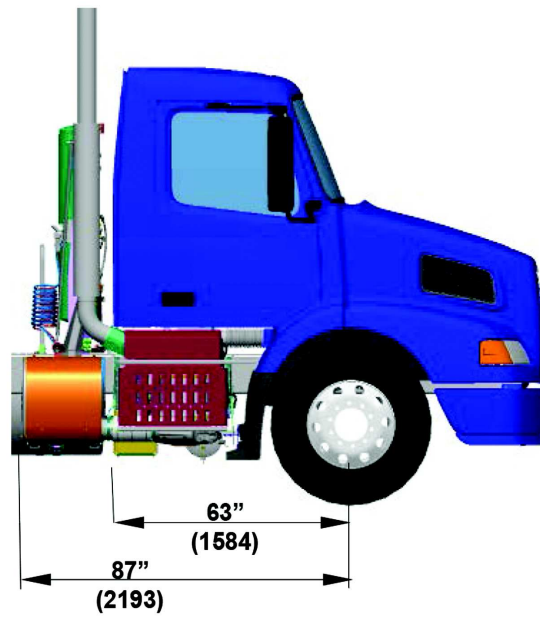
Volvo D11 or D13 engine, Integrated DPF/SCR with B-Pillar exhaust



W0118222

D11, D13, or D16 engine, Frame mounted DPF with vertical SCR

VNM / VNR Day Cabs, Right-Hand Chassis Configuration, US 2010



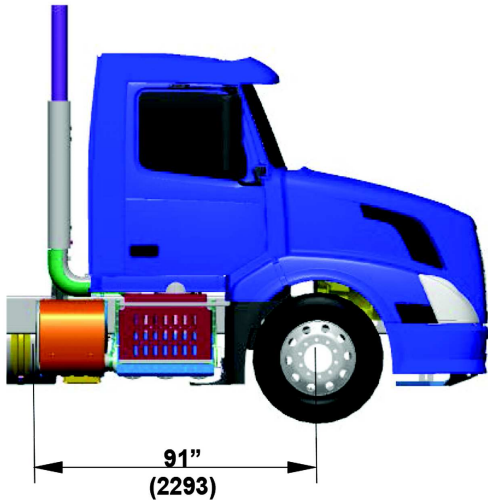
W0118219

Volvo 11 and 13-liter engine, Frame mounted SCR

Notes

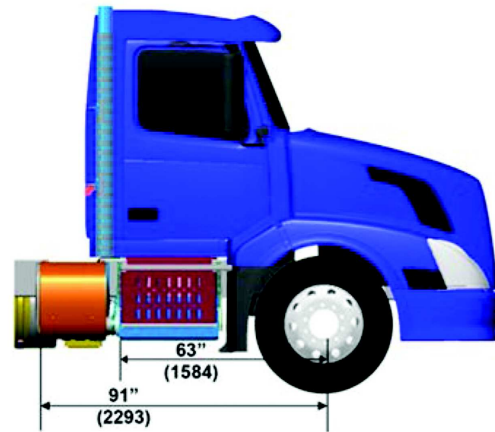
VN Day Cabs, Right-Hand Chassis Configuration, GHG 2017

VNL or VNX day cabs with Volvo D16 engines.



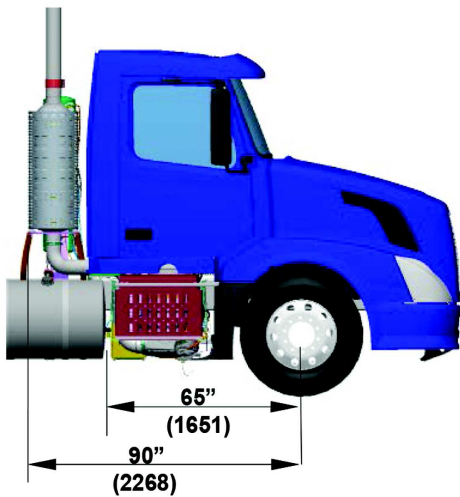
W0118223

Volvo D16 engine, Frame mounted SCR



W0118224

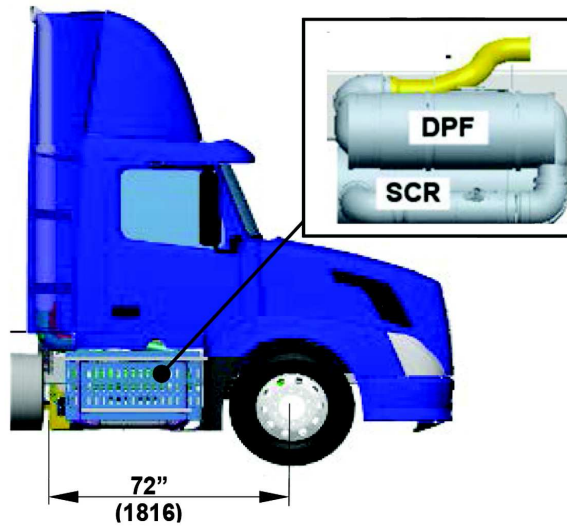
Volvo D16 engine, Frame mounted SCR



W0118225

Volvo D16 engine, Frame mounted DPF with vertical SCR

VNL or VNX day cabs with Cummins' engines.



W0118226

Cummins 15-liter engine, Frame mounted SCR

Notes

Fuel Tank Position, VHD

Fuel Tank Position (FTP) indicates the distance the fuel tanks are located from the front axle.

The VHD has multiple battery mounting options available and two SCR locations on the passenger side. This chassis configuration section will help in determining the optimum chassis configurations.

The fuel tank configurations are offered in single driver side or dual tank options. Dual fuel tanks may not always be symmetrical, depending on chassis configurations. However, different size fuel tanks on the driver side and passenger side may be chosen to make the chassis look symmetrical.

In addition, new "D-shaped" tanks are available to shorten wheelbases with the same capacity fuel tank. The D-shaped tanks provide approximately a 10% shorter fuel tank, which reduces overall fuel tank length approximately three to seven inches. The fuel tank lengths are shown in the table below.

Fuel Tank Lengths for VHD Models

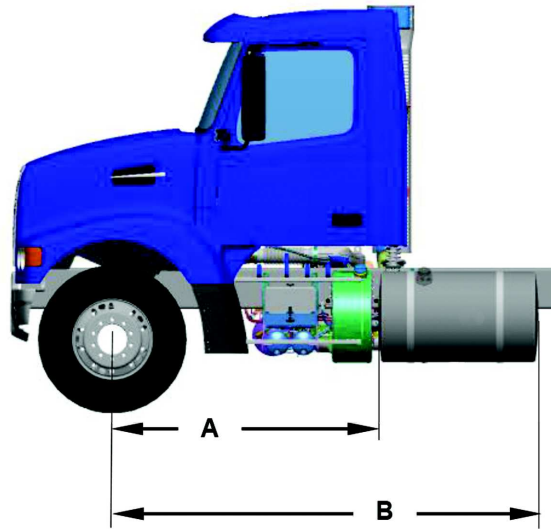
Capacity		Fuel Tank Length					
		Round		D-shaped			
		26" dia.		26" dia.		22" dia.	
Gal.	Liters	Inches	mm	Inches	mm	Inches	mm
50	190	25.2	640	22.5	572	30.9	786
70	265	N/A	N/A	N/A	N/A	40.6	1032
75	285	36.0	914	32.2	817	N/A	N/A
90	340	N/A	N/A	N/A	N/A	54.0	1372
100	380	46.0	1168	41.1	1044	N/A	N/A
125	475	58.0	1473	51.9	1317	70.5	1791
150	570	70.0	1778	62.6	1590	84.6	2148

VHD Axle Forward, Left-Hand Fuel Tank Position

The left-hand fuel tank position is dependent on the battery box configuration, three or four battery capacity battery boxes. The fuel tanks are mounted in the same location regardless of the DEF tank size, i.e., 11.9 gallons (45.0 L) or 18.5 gallons (70.0 L), because they are the same width.

Notes

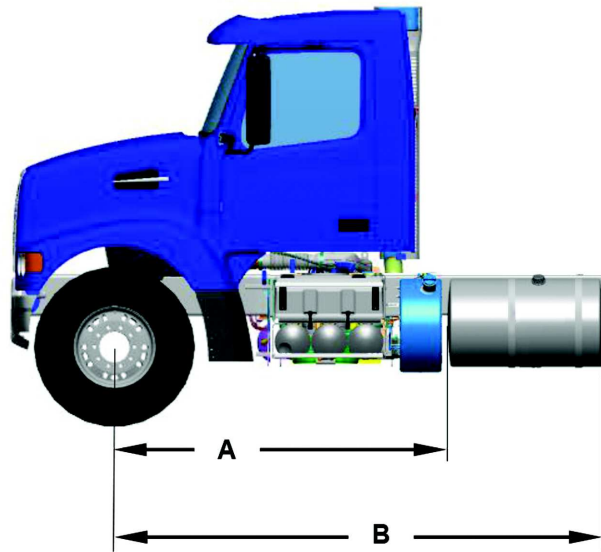
See Fig. 21			
Three (3) Battery Capacity Battery Box			
VHD Axle Forward			
Fuel Tank Dia	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		A	B
Round Fuel Tanks			
26'	75 (285)	76 (1930)	112 (2845)
	100 (380)	76 (1930)	122 (3098)
	125 (475)	76 (1930)	134 (3404)
D-shaped Fuel Tanks			
22'	50 (190)	76 (1930)	107 (2722)
	70 (265)	76 (1930)	117 (2967)
	90 (340)	76 (1930)	130 (3307)
26'	75 (285)	76 (1930)	108 (2752)
	100 (380)	76 (1930)	117 (2979)
	125 (475)	76 (1930)	128 (3252)



W0118238

Fig. 21 VHD Axle Forward, Three Battery Capacity Battery Box

See Fig. 22			
Four (4) Battery Capacity Battery Box			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		A	B
Round Fuel Tanks			
26'	75 (285)	92 (2337)	128 (3251)
	100 (380)	92 (2337)	138 (3505)
	125 (475)	92 (2337)	150 (3810)
D-shaped Fuel Tanks			
22'	50 (190)	92 (2337)	123 (3124)
	70 (265)	92 (2337)	132 (3353)
	90 (340)	92 (2337)	146 (3708)
26'	75 (285)	92 (2337)	124 (3150)
	100 (380)	92 (2337)	133 (3379)
	125 (475)	92 (2337)	144 (3658)



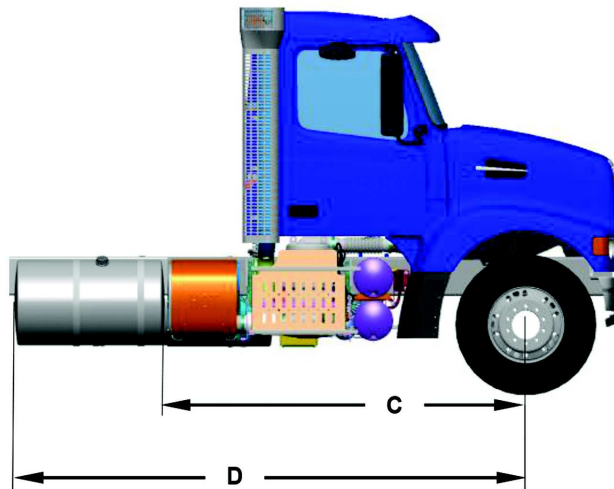
W0118239

Fig. 22 VHD Axle Forward, Four Battery Capacity Battery Box

VHD Axle Forward, Right-Hand Fuel Tank Position

On the VHD axle forward model, the right-hand fuel tank position is dependent on the SCR configuration, frame mounted or vertical SCR.

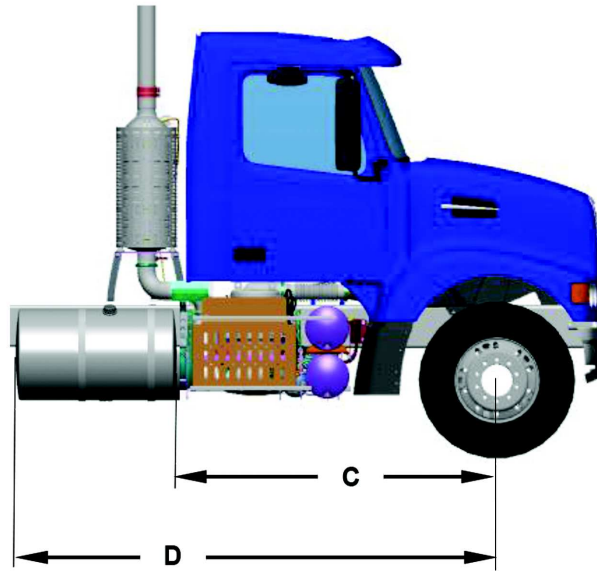
See Fig. 23			
Frame Mounted SCR US 2010			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	110 (2794)	146 (3708)
	100 (380)	110 (2794)	156 (3962)
	125 (475)	110 (2794)	168 (4267)
D-shaped Fuel Tanks			
22'	50 (190)	110 (2794)	141 (3581)
	70 (265)	110 (2794)	150 (3810)
	90 (340)	110 (2794)	164 (4166)
26'	75 (285)	110 (2794)	142 (3607)
	100 (380)	110 (2794)	151 (3836)
	125 (475)	110 (2794)	162 (4115)



W0118240

Fig. 23 VHD Axle Forward, Frame Mounted SCR US 2010

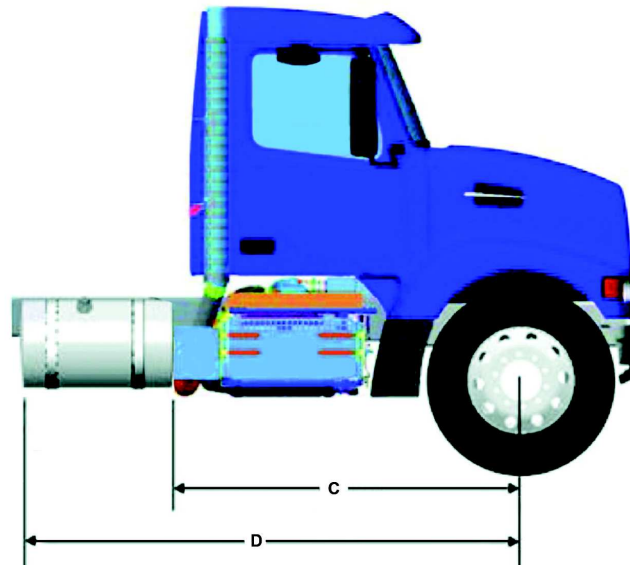
See Fig. 24			
Vertical Mounted SCR US 2010			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	86 (2185)	122 (3099)
	100 (380)	86 (2185)	132 (3353)
	125 (475)	86 (2185)	144 (3658)
D-shaped Fuel Tanks			
22'	50 (190)	86 (2185)	117 (2972)
	70 (265)	86 (2185)	127 (3226)
	90 (340)	86 (2185)	140 (3557)
26'	75 (285)	86 (2185)	118 (2997)
	100 (380)	86 (2185)	127 (3226)
	125 (475)	86 (2185)	138 (3505)



W0118241

Fig. 24 VHD Axle Forward, Vertical Mounted SCR US 2010

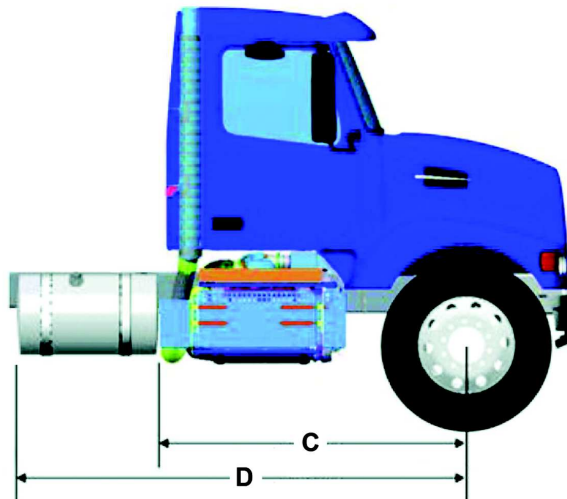
See Fig. 25			
Integrated DPF/SCR GHG 2017			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	90 (2286)	126 (3200)
	100 (380)	90 (2286)	136 (3454)
	125 (475)	90 (2286)	148 (3759)
D-shaped Fuel Tanks			
22'	50 (190)	90 (2286)	113 (2870)
	70 (265)	90 (2286)	150 (3810)
	90 (340)	90 (2286)	144 (3658)
26'	75 (285)	90 (2286)	122 (3099)
	100 (380)	90 (2286)	131 (3327)
	125 (475)	90 (2286)	142 (3607)



W0118323

Fig. 25 VHD Axle Forward, Integrated DPF/SCR GHG 2017

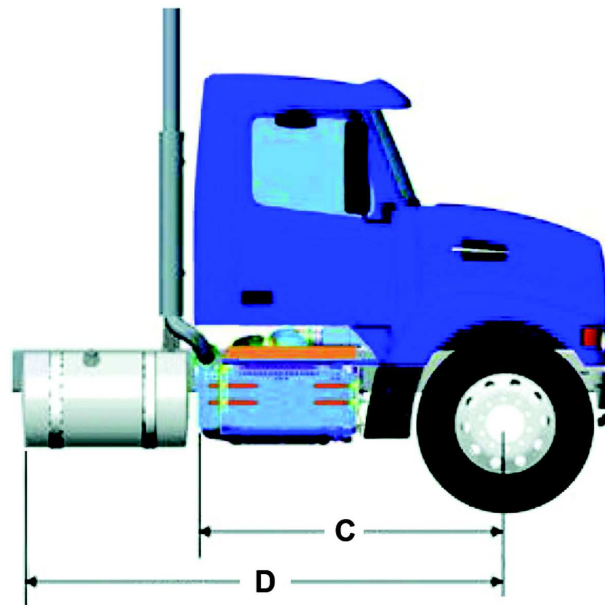
See Fig. 26			
Integrated DPF/SCR GHG 2017 Clean BOC			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	85 (2159)	121 (3073)
	100 (380)	85 (2159)	131 (3327)
	125 (475)	85 (2159)	143 (3632)
D-shaped Fuel Tanks			
22'	50 (190)	85 (2159)	116 (2946)
	70 (265)	85 (2159)	126 (3200)
	90 (340)	85 (2159)	139 (3531)
26'	75 (285)	85 (2159)	117 (2972)
	100 (380)	85 (2159)	126 (3200)
	125 (475)	85 (2159)	137 (3480)



W0118324

Fig. 26 VHD Axle Forward, Integrated DPF/SCR GHG 2017 Clean BOC

See Fig. 27			
Integrated DPF/SCR GHG 2017			
VHD Axle Forward			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	85 (2159)	121 (3073)
	100 (380)	85 (2159)	131 (3327)
	125 (475)	85 (2159)	143 (3632)
D-shaped Fuel Tanks			
22'	50 (190)	85 (2159)	116 (2946)
	70 (265)	85 (2159)	126 (3200)
	90 (340)	85 (2159)	139 (3531)
26'	75 (285)	85 (2159)	117 (2972)
	100 (380)	85 (2159)	126 (3200)
	125 (475)	85 (2159)	137 (3480)



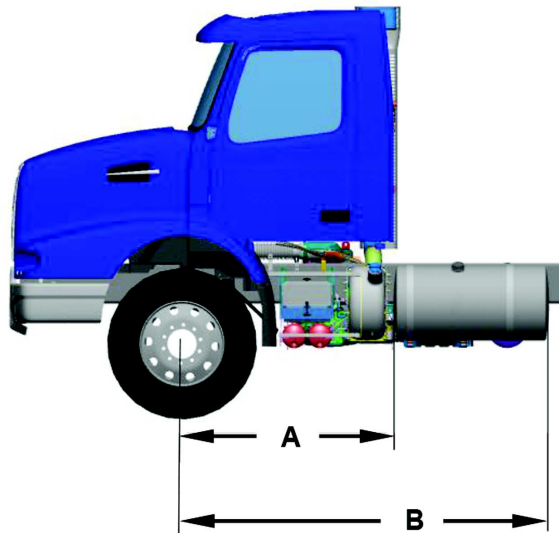
W0118325

Fig. 27 VHD Axle Forward, Integrated DPF/SCR GHG 2017

VHD Axle Back, Left-Hand Fuel Tank Position

The left-hand fuel tank position is dependent on the battery box configuration, three or four battery capacity battery boxes. The fuel tanks are mounted in the same location regardless of the DEF tank size, i.e., 11.9 gallons (45.0 L) or 18.5 gallons (70.0 L), because they are the same width.

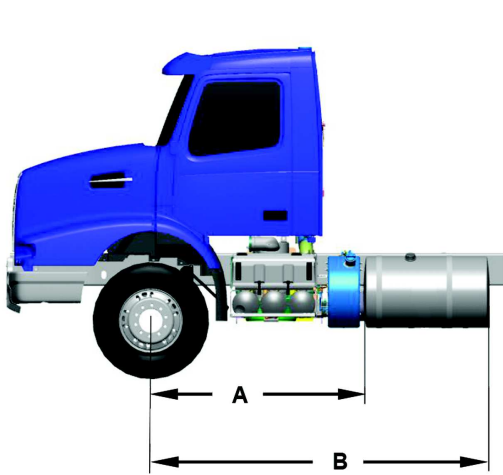
See Fig. 28			
Three (3) Battery Capacity Battery Box			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		A	B
Round Fuel Tanks			
26'	75 (285)	62 (1575)	98 (2489)
	100 (380)	62 (1575)	108 (2743)
	125 (475)	62 (1575)	120 (3048)
D-shaped Fuel Tanks			
22'	50 (190)	62 (1575)	93 (2262)
	70 (265)	62 (1575)	103 (2616)
	90 (340)	62 (1575)	116 (2946)
26'	75 (285)	62 (1575)	94 (2388)
	100 (380)	62 (1575)	103 (2616)
	125 (475)	62 (1575)	114 (2896)



W0118242

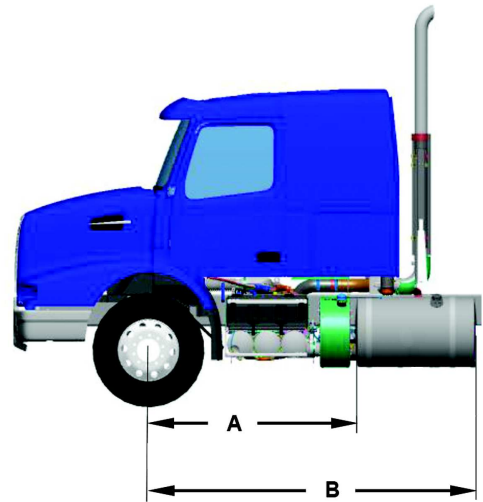
Fig. 28 VHD Axle Back, Three Battery Capacity Battery Box

See Fig. 29 and Fig. 30			
Four (4) Battery Capacity Battery Box			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		A	B
Round Fuel Tanks			
26'	75 (285)	77 (1956)	113 (2870)
	100 (380)	77 (1956)	123 (3124)
	125 (475)	77 (1956)	135 (3429)
D-shaped Fuel Tanks			
22'	50 (190)	77 (1956)	108 (2743)
	70 (265)	77 (1956)	118 (2997)
	90 (340)	77 (1956)	131 (3327)
26'	75 (285)	77 (1956)	109 (2769)
	100 (380)	77 (1956)	118 (2997)
	125 (475)	77 (1956)	129 (3277)



W0118243

Fig. 29 VHD Axle Back, Four Battery Capacity Battery Box



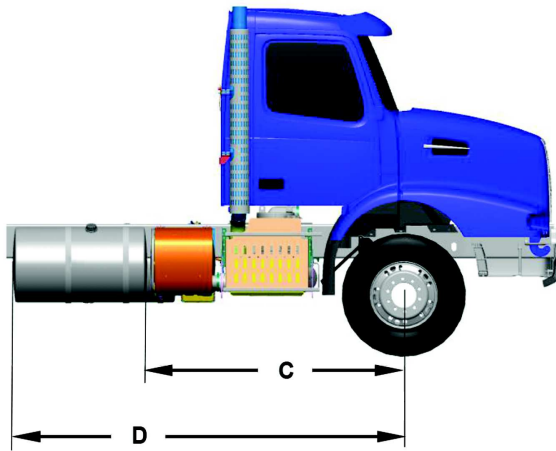
W0118244

Fig. 30 VHD Axle Back, Four Battery Capacity Battery Box

VHD Axle Back, Right-Hand Fuel Tank Position

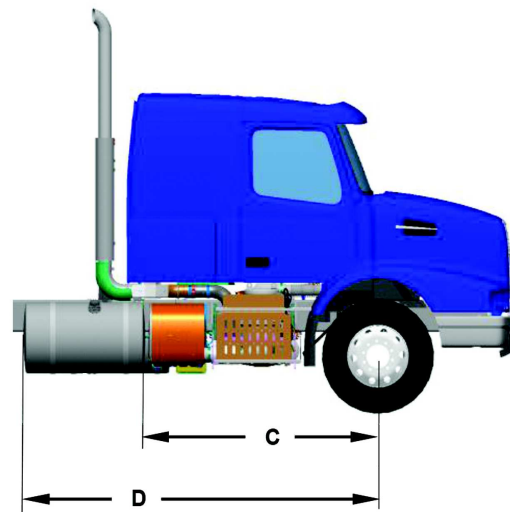
On the VHD Axle Back model, the right-hand fuel tank position is dependent on the SCR configuration, frame mounted or vertical SCR and the air tank arrangement.

See Fig. 31 and Fig. 32			
Frame Mounted SCR US 2010			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	88 (2235)	124 (3150)
	100 (380)	88 (2235)	134 (3404)
	125 (475)	88 (2235)	146 (3708)
D-shaped Fuel Tanks			
22'	50 (190)	88 (2235)	119 (3023)
	70 (265)	88 (2235)	128 (3251)
	90 (340)	88 (2235)	142 (3607)
26'	75 (285)	88 (2235)	120 (3048)
	100 (380)	88 (2235)	129 (3277)
	125 (475)	88 (2235)	140 (3556)



W0118245

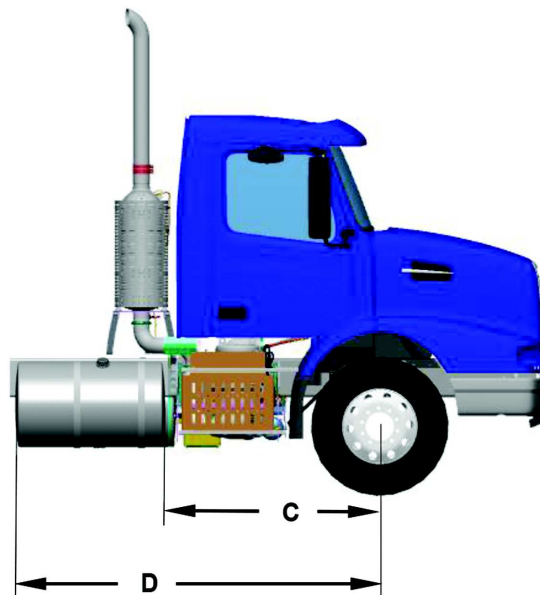
Fig. 31 VHD Axle Back, Frame Mounted SCR US 2010



W0118246

Fig. 32 VHD Axle Back, Frame Mounted SCR US 2010

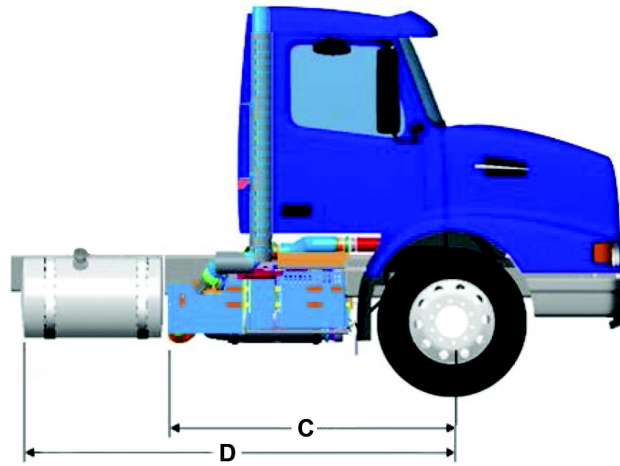
See Fig. 33			
Vertical Mounted SCR US 2010			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	64 (1625)	100 (2540)
	100 (380)	64 (1625)	110 (2794)
	125 (475)	64 (1625)	116 (2946)
D-shaped Fuel Tanks			
22'	50 (190)	64 (1625)	95 (2413)
	70 (265)	64 (1625)	105 (2667)
	90 (340)	64 (1625)	118 (2997)
26'	75 (285)	64 (1625)	96 (2438)
	100 (380)	64 (1625)	105 (2667)
	125 (475)	64 (1625)	116 (2946)



W0118247

Fig. 33 VHD Axle Back, Vertical Mounted SCR US 2010

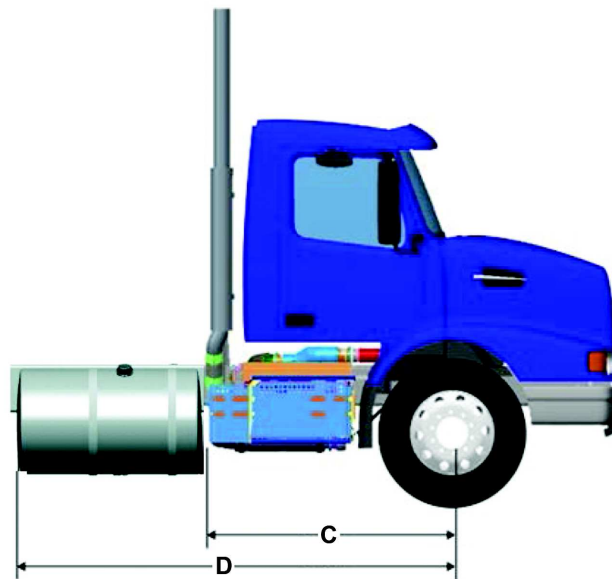
See Fig. 34			
Integrated DPF/SCR GHG 2017			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	83 (2108)	119 (3023)
	100 (380)	83 (2108)	129 (3277)
	125 (475)	83 (2108)	141 (3581)
D-shaped Fuel Tanks			
22'	50 (190)	83 (2108)	114 (2896)
	70 (265)	83 (2108)	124 (3150)
	90 (340)	83 (2108)	137 (3480)
26'	75 (285)	83 (2108)	115 (2921)
	100 (380)	83 (2108)	124 (3150)
	125 (475)	83 (2108)	135 (3429)



W0118575

Fig. 34 VHD Axle Back, Integrated DPF/SCR GHG 2017

See Fig. 35			
Integrated DPF/SCR GHG 2017			
VHD Axle Back			
Fuel Tank Dia.	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
26'	75 (285)	74 (1880)	110 (2794)
	100 (380)	74 (1880)	120 (3048)
	125 (475)	74 (1880)	132 (3353)
D-shaped Fuel Tanks			
22'	50 (190)	74 (1880)	105 (2667)
	70 (265)	74 (1880)	115 (2921)
	90 (340)	74 (1880)	128 (3251)
26'	75 (285)	74 (1880)	106 (2692)
	100 (380)	74 (1880)	115 (2921)
	125 (475)	74 (1880)	126 (3200)



W0118576

Fig. 35 VHD Axle Back, Integrated DPF/SCR GHG 2017

Fuel Tank Position, VN

Fuel Tank Position (FTP) indicates the distance the fuel tanks are located from the front axle.

There are multiple battery mounting options available on the driver's side and multiple SCR combinations provided on the passenger side. This chassis configuration section will help in determining the optimum chassis configurations.

The fuel tank configurations are offered in single driver side, single passenger side or dual tank options. Dual fuel tanks may not always be symmetrical, depending on chassis configurations. However, different size fuel tanks on the driver side and passenger side may be chosen to make the chassis look symmetrical.

In addition, "D-shaped" tanks are available to shorten wheelbases with the same capacity fuel tank. The D-shaped tanks provide approximately a 10% shorter fuel tank, which reduces overall fuel tank length approximately three to seven inches. The fuel tank lengths are shown in the table below.

Fuel Tank Lengths for VN Models

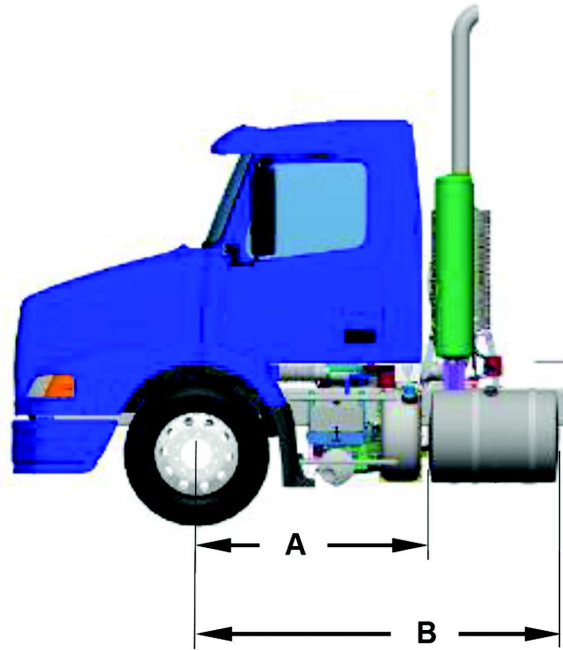
Capacity		Fuel Tank Length			
		Round		D-shaped	
		26" dia.		26" dia.	
Gal.	Liters	Inches	mm	Inches	mm
50	190	25.2	640	22.5	572
75	285	36	914	32.2	817
100	380	46	1168	41.1	1044
125	475	58	1473	51.9	1317
150	570	70	1778	62.6	1590

Notes

Left-Hand Fuel Tank Position for VN Models

The left-hand fuel tank position is dependent on the battery box configuration, three or four battery capacity battery boxes.

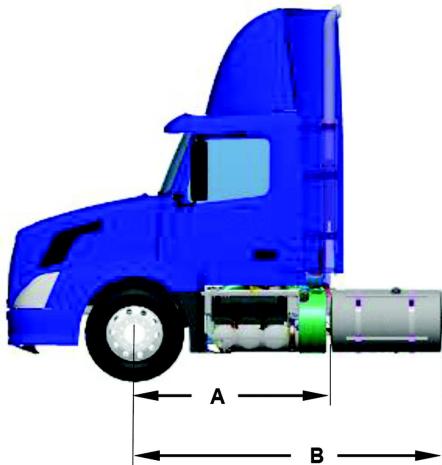
See Fig. 36			
Three (3) Battery Capacity Battery Box			
	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		A	B
VNL300 / VNM200 / VNR200	Round Fuel Tanks		
	75(285)	64 (1626)	100 (2540)
	100 (380)	64 (1626)	110 (2794)
	125 (475)	64 (1626)	122 (3099)
	150 (570)	64 (1626)	134 (3404)
	D-shaped Fuel Tanks		
	75(285)	64 (1626)	96 (2438)
	100 (380)	64 (1626)	105 (2667)
	125 (475)	64 (1626)	116 (2946)
	150 (570)	64 (1626)	127 (3226)



W0118314

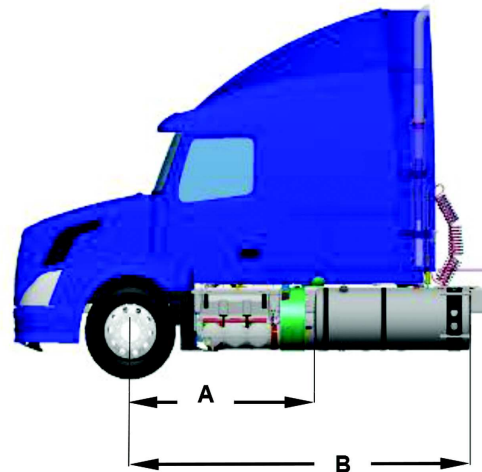
Fig. 36 Three Battery Capacity Battery Box

See Fig. 37 and Fig. 38				
Four (4) Battery Capacity Battery Box				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			A	B
Round Fuel Tanks				
VNL300 / VNM200 / VNR200		75 (285)	79 (2007)	115.3 (2929)
		100 (380)	79 (2007)	125.3 (3183)
		125 (475)	79 (2007)	137.3 (3488)
		150 (570)	79 (2007)	149.3 (3793)
D-shaped Fuel Tanks				
VNL	300	75 (285)	79 (2007)	111.9 (2842)
		100 (380)	79 (2007)	120.8 (3069)
		125 (475)	79 (2007)	131.6 (3342)
		150 (570)	79 (2007)	142.3 (3615)
VNM / VNR	200	75 (285)	79 (2007)	113.5 (2882)
		100 (380)	79 (2007)	120.4 (3059)
		125 (475)	79 (2007)	131.2 (3332)
		150 (570)	79 (2007)	141.9 (3605)



W0118315

Fig. 37 Four Battery Capacity Battery Box



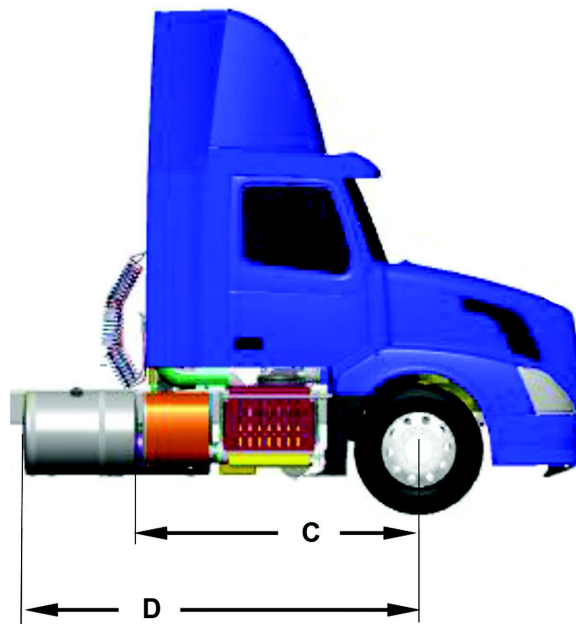
W0118316

Fig. 38 Four Battery Capacity Battery Box

Right-Hand Fuel Tank Position for VN Models

The right-hand fuel tank position is dependent on the engine selection (SCR unit size) and SCR configuration.

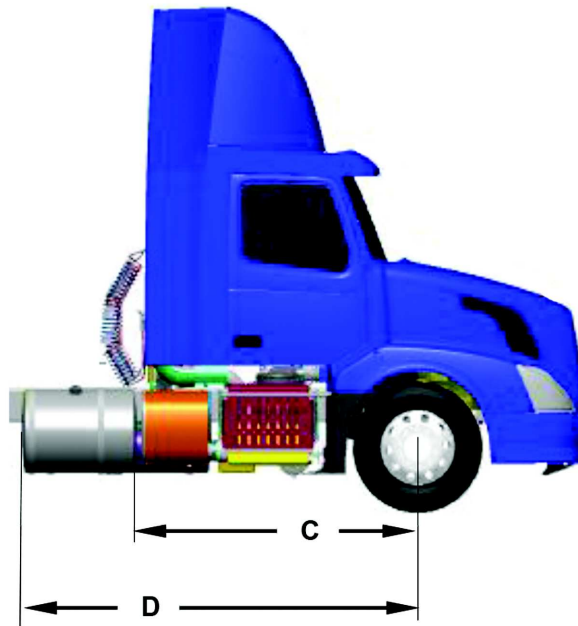
See Fig. 39				
Volvo D11 or Volvo D13 Engine				
Frame Mounted SCR US 2010				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNL / VNM / VNR	ALL	50 (190)	88 (2235)	113 (2870)
		75 (285)	88 (2235)	124 (3150)
		100 (380)	88 (2235)	134 (3404)
		125 (475)	88 (2235)	146 (3708)
		150 (570)	88 (2235)	158 (4013)
D-shaped Fuel Tanks				
VNL	300	50 (190)	88 (2235)	110 (2794)
		75 (285)	88 (2235)	120 (3048)
		100 (380)	88 (2235)	129 (3277)
		125 (475)	88 (2235)	140 (3556)
		150 (570)	88 (2235)	150 (3810)



W0118317

Fig. 39 Volvo D11 or Volvo D13 Engine, Frame Mounted SCR US 2010

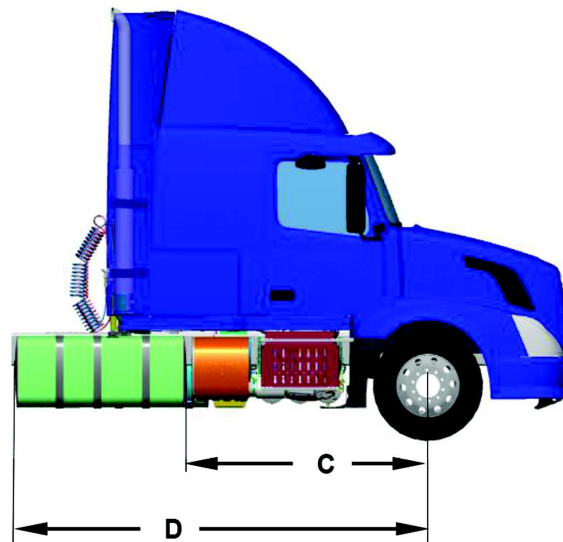
See Fig. 40				
Volvo D11 or Volvo D13 Engine				
Frame Mounted SCR US 2010				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
D-shaped Fuel Tanks				
VNM / VNR	200	50 (190)	88 (2235)	110 (2794)
		75 (285)	88 (2235)	120 (3048)
		100 (380)	88 (2235)	129 (3277)
		125 (475)	88 (2235)	140 (3556)
		150 (570)	88 (2235)	150 (3810)



W0118317

Fig. 40 Volvo D11 or Volvo D13 Engine, Frame Mounted SCR US 2010

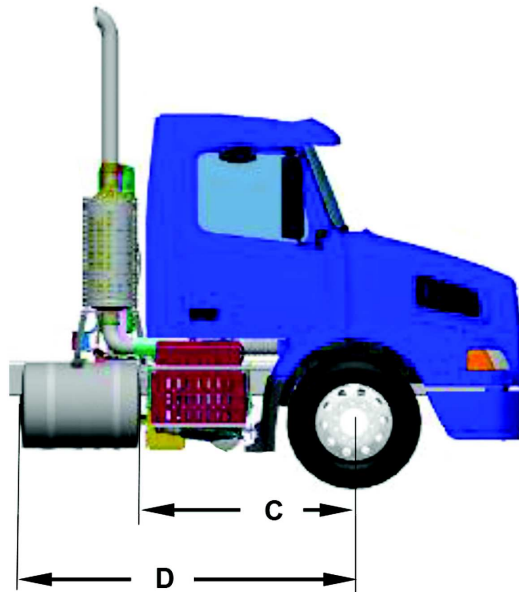
See Fig. 41				
Volvo D16 Engine				
Frame Mounted SCR US 2010				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNL	300	50 (190)	92 (2337)	117 (2972)
		75 (285)	92 (2337)	128 (3251)
		100 (380)	92 (2337)	138 (3505)
		125 (475)	92 (2337)	150 (3810)
		150 (570)	92 (2337)	162 (4115)
D-shaped Fuel Tanks				
VNL	300	50 (190)	92 (2337)	115 (2337)
		75 (285)	92 (2337)	124 (3150)
		100 (380)	92 (2337)	133 (3378)
		125 (475)	92 (2337)	144 (3658)
		150 (570)	92 (2337)	155 (3937)



W0118319

Fig. 41 Volvo D16 Engine, Frame Mounted SCR US 2010

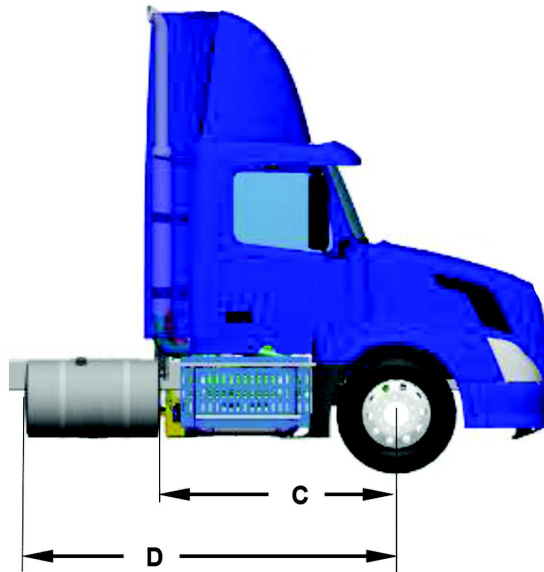
See Fig. 42				
Volvo D11 / D13 / D16 Engine				
Vertical SCR US 2010				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNM / VNR / VNL	ALL	50 (190)	64 (1626)	89 (2261)
		75 (285)	64 (1626)	100 (2540)
		100 (380)	64 (1626)	110 (2794)
		125 (475)	64 (1626)	122 (3099)
		150 (570)	64 (1626)	134 (3404)
D-shaped Fuel Tanks				
VNM / VNR / VNL	ALL	50 (190)	64 (1626)	87 (2297)
		75 (285)	64 (1626)	96 (2492)
		100 (380)	64 (1626)	105 (2669)
		125 (475)	64 (1626)	116 (2942)
		150 (570)	64 (1626)	127 (3215)



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Fig. 42 Volvo D11 / D13 / D16 Engine, Vertical SCR US 2010

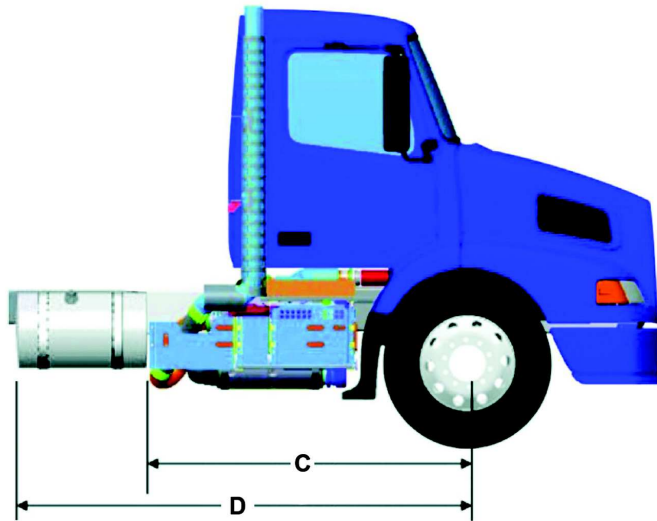
See Fig. 43				
Cummins ISX 15.0 L Engine				
Switchback Frame Mounted SCR				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNL	ALL	50 (190)	74 (1880)	99 (2515)
		75 (285)	74 (1880)	110 (2794)
		100 (380)	74 (1880)	120 (3048)
		125 (475)	74 (1880)	132 (3353)
		150 (570)	74 (1880)	144 (3658)
D-shaped Fuel Tanks				
VNL	300	50 (190)	74 (1880)	100.3 (2547)
		75 (285)	74 (1880)	106.0 (2692)
		100 (380)	74 (1880)	114.9 (2919)
		125 (475)	74 (1880)	125.7 (3192)
		150 (570)	74 (1880)	136.4 (3465)



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Fig. 43 Cummins ISX 15.0 L Engine, Switchback Frame Mounted SCR

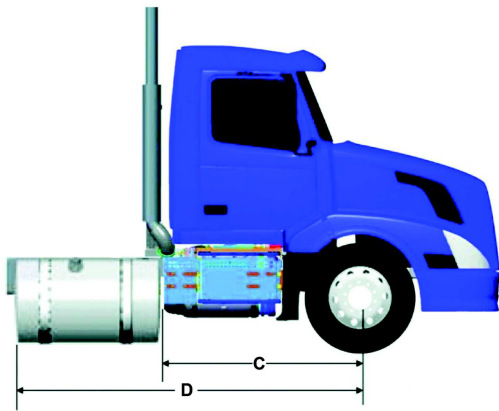
See Fig. 44				
Volvo D11 or Volvo D13 Engine				
Integrated DPF/SCR GHG 2017				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNM / VNR	200	50 (190)	83 (2108)	108 (2743)
		75 (285)	83 (2108)	119 (3023)
		100 (380)	83 (2108)	129 (3277)
		125 (475)	83 (2108)	141 (3581)
		150 (570)	83 (2108)	153 (3886)
D-shaped Fuel Tanks				
VNM / VNR	200	50 (190)	83 (2108)	106 (2692)
		75 (285)	83 (2108)	115 (2921)
		100 (380)	83 (2108)	124 (3150)
		125 (475)	83 (2108)	135 (3429)
		150 (570)	83 (2108)	146 (3708)



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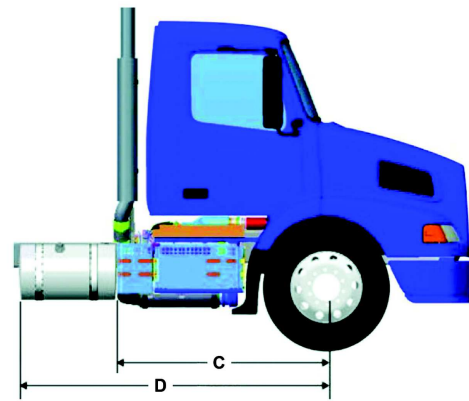
Fig. 44 Volvo D11 or Volvo D13 Engine, Integrated DPF/SCR GHG 2017

See Fig. 45 and Fig. 46				
Volvo D11 or Volvo D13 Engine				
Integrated DPF/SCR GHG 2017				
Model	Cab	Capacity gals (L)	Distance to Front Axle, in. (mm)	
			C	D
Round Fuel Tanks				
VNL300 / VNM200 / VNR200		50 (190)	73 (1854)	98 (2489)
		75 (285)	73 (1854)	109 (2769)
		100 (380)	73 (1854)	119 (3023)
		125 (475)	73 (1854)	131 (3327)
		150 (570)	73 (1854)	143 (3632)
D-shaped Fuel Tanks				
VNL300 / VNM200 / VNR200		50 (190)	73 (1854)	96 (2438)
		75 (285)	73 (1854)	105 (2667)
		100 (380)	73 (1854)	114 (2896)
		125 (475)	73 (1854)	131 (3327)
		150 (570)	73 (1854)	136 (3454)



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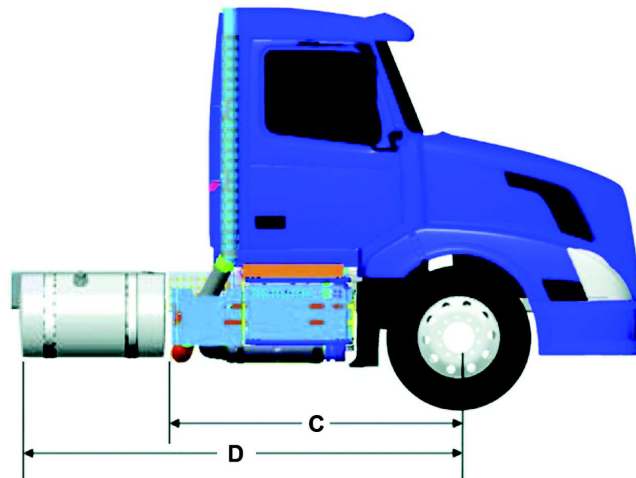
Fig. 45 Volvo D11 or Volvo D13 Engine, Integrated DPF/ SCR GHG 2017



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Fig. 46 Volvo D11 or Volvo D13 Engine, Integrated DPF/ SCR GHG 2017

See Fig. 47			
Volvo D11/ D13			
Integrated DPF/SCR GHG 2017			
Model	Capacity gals (L)	Distance to Front Axle, in. (mm)	
		C	D
Round Fuel Tanks			
VNL	50 (190)	81 (2057)	106 (2694)
	75 (285)	81 (2057)	117 (2972)
	100 (380)	81 (2057)	127 (3226)
	125 (475)	81 (2057)	139 (3531)
	150 (570)	81 (2057)	151 (3835)
D-shaped Fuel Tanks			
VNL	50 (190)	81 (2057)	104 (2642)
	75 (285)	81 (2057)	113 (2870)
	100 (380)	81 (2057)	122 (3099)
	125 (475)	81 (2057)	133 (3378)
	150 (570)	81 (2057)	144 (3658)



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Fig. 47 Volvo D11/ D13, Integrated DPF/SCR GHG 2017