FRAME STRUCTURES

CONTENTS

GENERAL INFORMATION

The main function of the truck frame is to provide support for all chassis components, body mounting and to carry the payload while keeping deflections at a tolerable level.

The frame is a complex structural mechanism which reacts to applied loads and road inputs by bending and twisting. The main bending members are the siderails. Resistance to frame twist is provided by crossmembers which are rigidly attached to the siderails with either rivets or bolts to form the so-called "ladder type" frame (Figs. 1 thru 4).

Frame Siderail Material

Carbon steel with a minimum yield strength of 32000 psi is used to fabricate the light and the medium duty truck frame siderails.

Since the yield strength for the same steel can vary considerably it has been Dodge's practice to specify the minimum yield strength. Thus the 32000 psi minimum frame has in reality a range of 32000 to 44000 psi with a typical average value of 38000 psi.

For severe applications, high strength steel frame siderail reinforcements of the same steel is used.

Frame Load-Carrying Capacity

Since by far the most important factor of frame action is its flexing, it is customary to compare the frames by their "Resisting Bending Moment" (R.B.M.), term denoting the maximum bending the siderails can safely withstand.

The resisting bending moment can be used for quick comparison of frames having different rail configuration and materials.

The Resisting Bending Moment consists of two terms: Section Modulus and Material Yield Strength.

(Section Modulus x Yield Strength = R.B.M.)

The greater the section modulus and the higher the yield strength, the stronger the siderails.

The term Section Modulus pertains to the cross-section of the siderail and is determined by rail depth, flange width and material thickness.

Yield strength is a measurement in psi of stress at which a material exhibits a specified permanent deformation.

Frame Type

Light Duty Truck and Sport Utility frames are of a ladder type with drop center section channel siderail and crossmembers. Crossmembers are riveted or bolted to the frame. Body support and suspension mounting brackets are riveted to siderails. (See Figs. 6, 7 and 8 for inch dimensions.)

D1-4 frames are designed to accommodate independent front suspension with the suspension crossmember as a part of the frame assembly as are engine front mounting brackets which are welded to the suspension crossmember and riveted to the siderail.

AW1-PW1 and W15-4 (four-wheel drive vehicles) frames are basically the same, except front suspension crossmember is replaced with a smaller engine support crossmember.

INSPECTION PROCEDURES

INDEX

GENERAL INFORMATION

Improper frame alignment is usually a result of an accident or vehicle being operated with excessive loads or with loads not positioned in a reasonably distributed manner.

A distorted frame will affect front wheel or rear axle alignment and cause excessive tire wear, mechan-

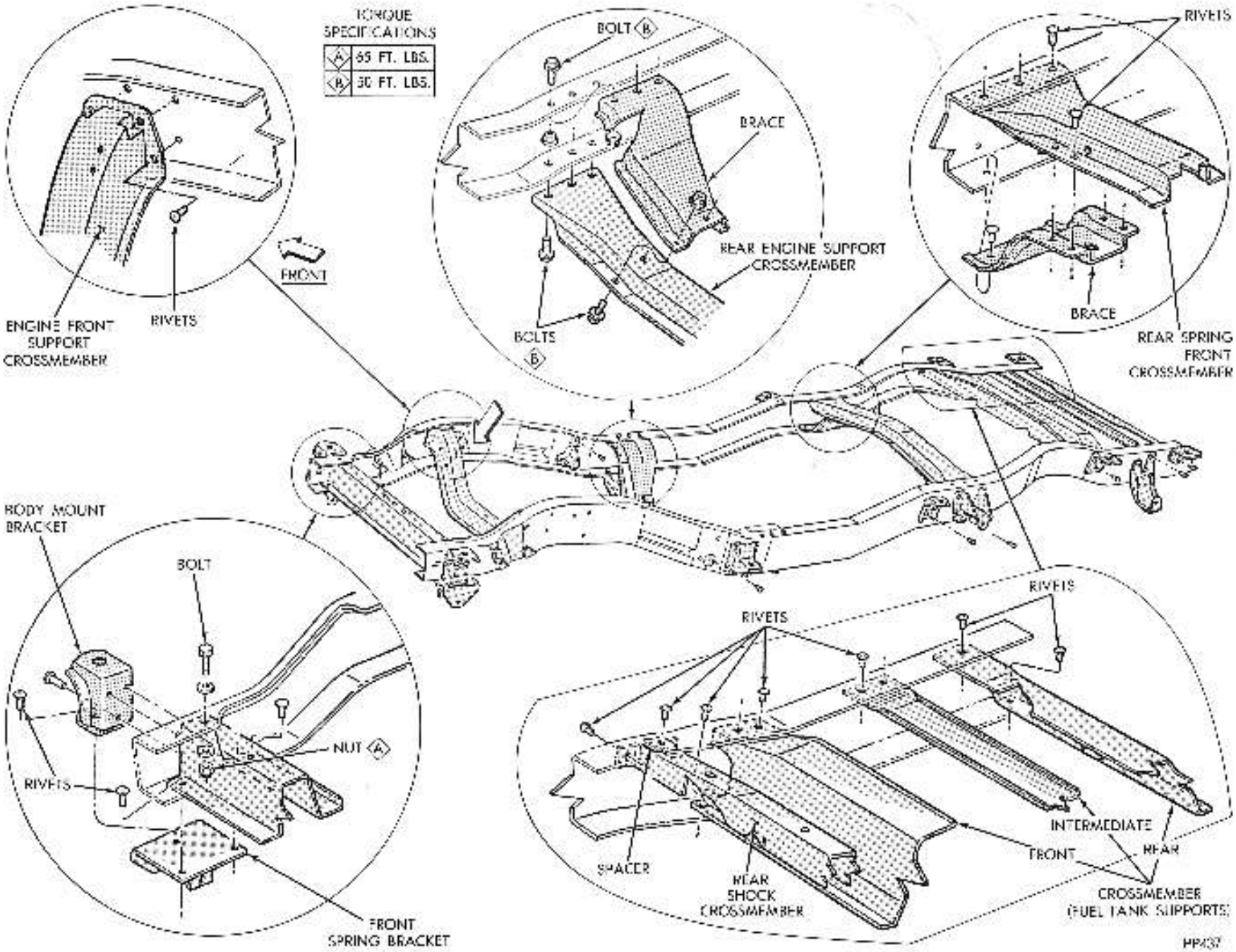


Fig. 1—Frame Structure with Body Mount and Spring Hanger Brackets (AW1, PW1—Models)

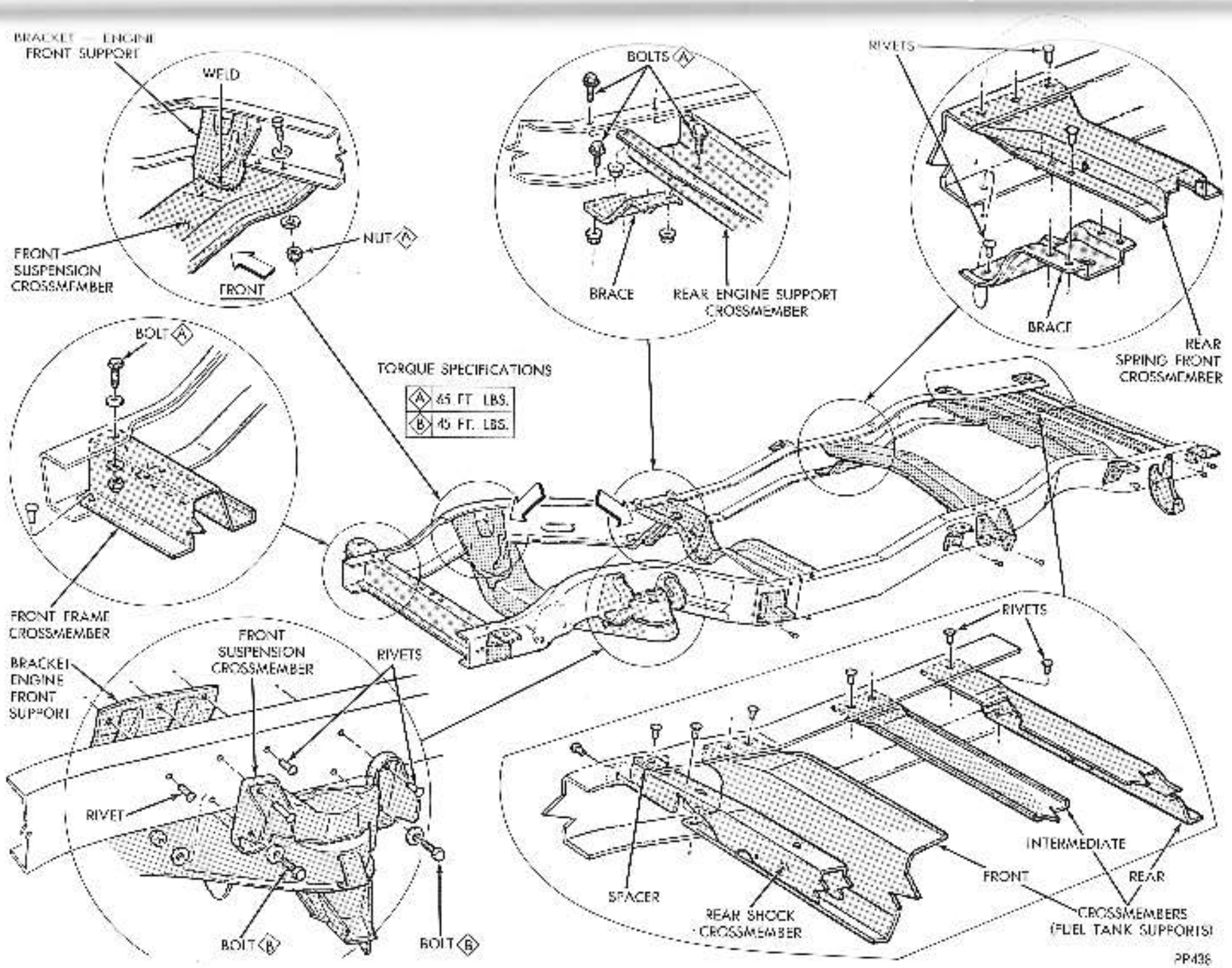


Fig. 2—Frame Structure with Body Mount and Suspension Brackets (AD1, PD1—Models)

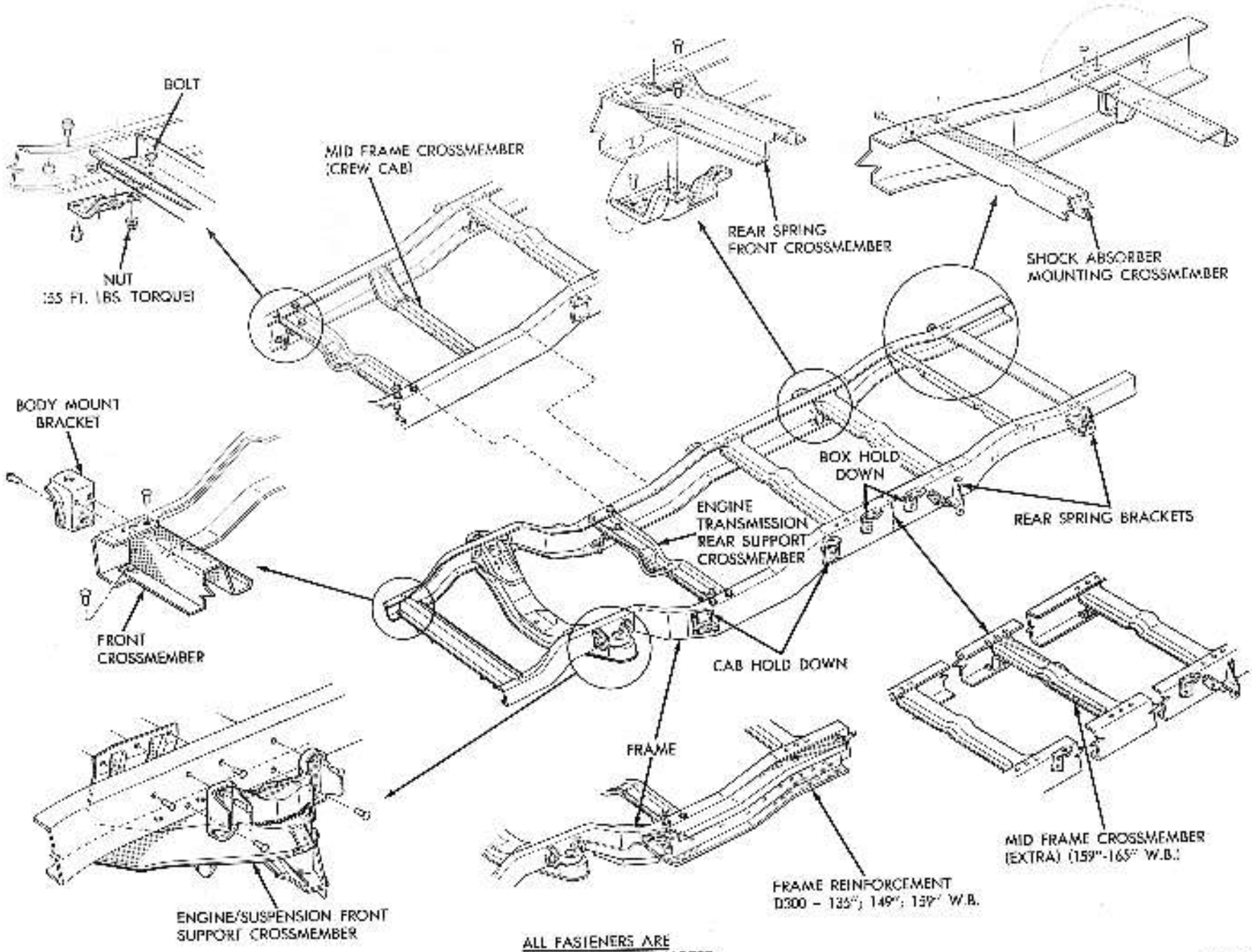


Fig. 3—D100 Through 400 Frame Structure

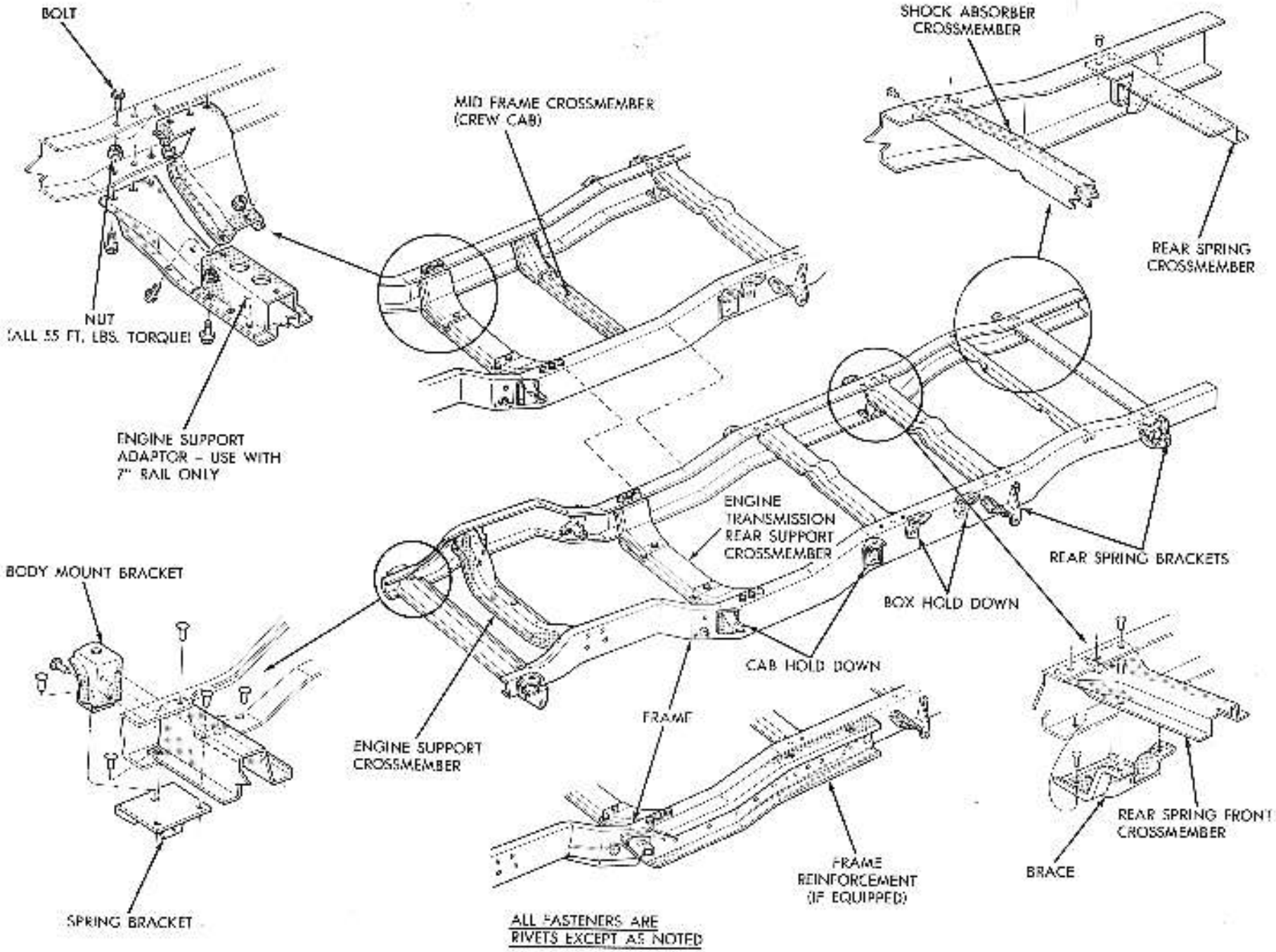
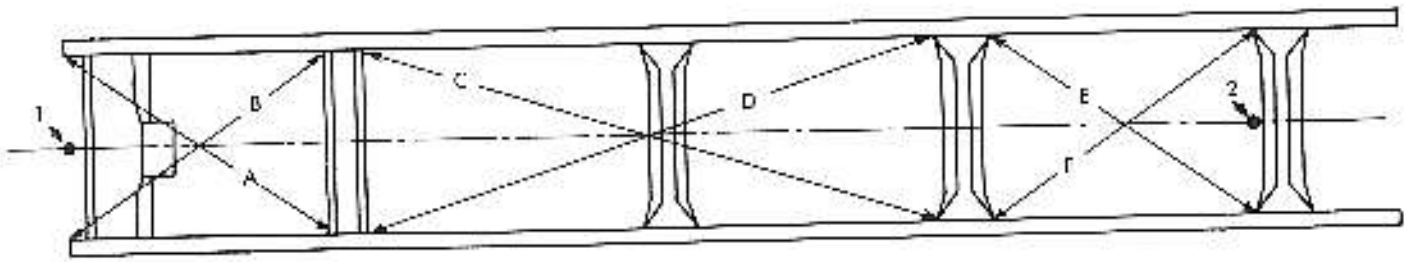


Fig. 4—W150 Through 400 Frame Structure



PD22

Fig. 5—Alignment Markings

ical failures in power train, window glass cracks and door opening problems. Vehicle performance, handling and ride quality can be impaired.

INSPECTION

Before proceeding with frame alignment checks, inspect all frame parts for visible damage such as cracks, twist, bend or other excessive deformations. Also, riveted, bolted or welded connections, looseness or missing parts.

All damaged areas must be repaired or parts replaced as necessary.

Horizontal or Diagonal

Determine frame deviation from being square by the following procedure:

(1) Select several points along one siderail, preferably at crossmember locations.

(2) Transfer these with a plumb bob to floor, paper sheets can be fastened to floor at these points for better accuracy.

(3) Locate corresponding points on other siderail and transfer them in the same manner to the floor.

(4) Move truck away and measure between all points diagonally and parallel to siderails, corresponding measurements should not differ by more than 1/4 inch.

(5) Take measurement across at front and rear marks and by dividing distances in half, indicate the two points on floor.

(6) Stretch a chalk-line between points 1 and 2 in Fig. 2 and snap string.

(7) Check to see how close centerline is to diagonal intersection points A, B, C, D, E and F in Fig. 2.

(8) Markings on floor will now give an indication of frame distortion in plain view.

(9) Any point on one siderail should be within 1/8 inch ahead or behind corresponding point on opposite side.

(10) Frame bow sideways should not exceed 1/8 inch per 100 inch length of frame.

(11) Overall width of frame should not vary more than 1/8 inch.

(12) Repeat steps (1) through (11) after straightening frame.

Vertical or Sideview

Determine twist of frame and degree of siderails not being parallel to one another as follows:

Vertical dimensions are measured from a level floor to corresponding points on left and right siderails. Dimensions should then be plotted to scale vertical and horizontal on a sheet of paper and points connected for each sidemember separately. Graph will show the relative position of the sidemembers.

Points on siderail or for horizontal check are selected at rear frame crossmembers and any one of these points on one sidemember should be maximum 1/8 inch above or below corresponding point on other siderail.

MEASUREMENTS

Obtain measurements for frame alignment checks with the body on vehicle. Figures 6, 7 and 8 as identified, indicate dimensions in chosen areas to determine frame alignment. The procedures are recommended as follows:

(1) Place vehicle on level floor.

(2) If vehicle is loaded, make sure payload does not exceed specified limit and the load is distributed as evenly as possible. For better accuracy of measurements, all payload should be removed.

(3) Check tires for recommended air pressure and adjust as necessary.

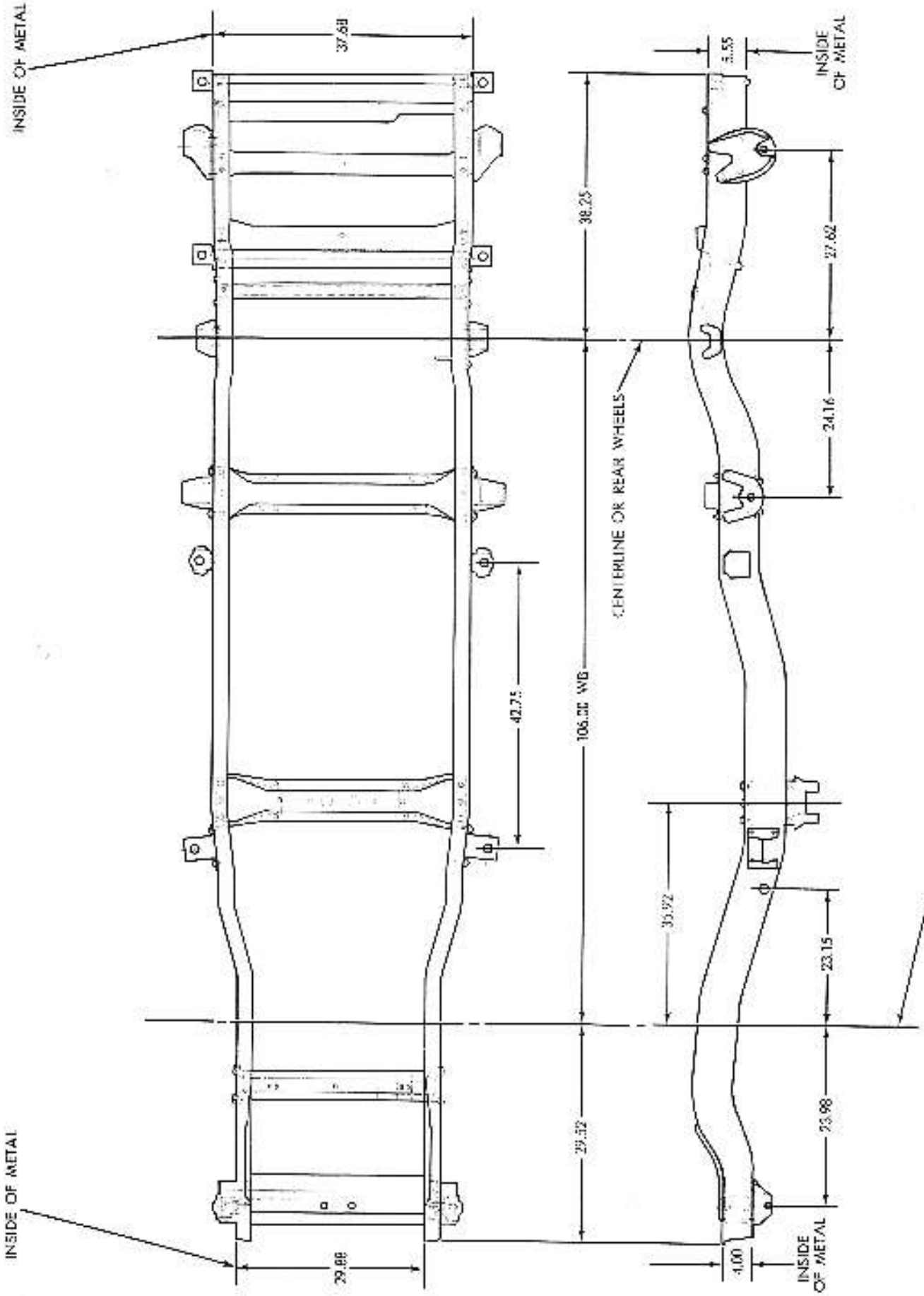


Fig. 6—Frame Dimensions (Sport Utility)

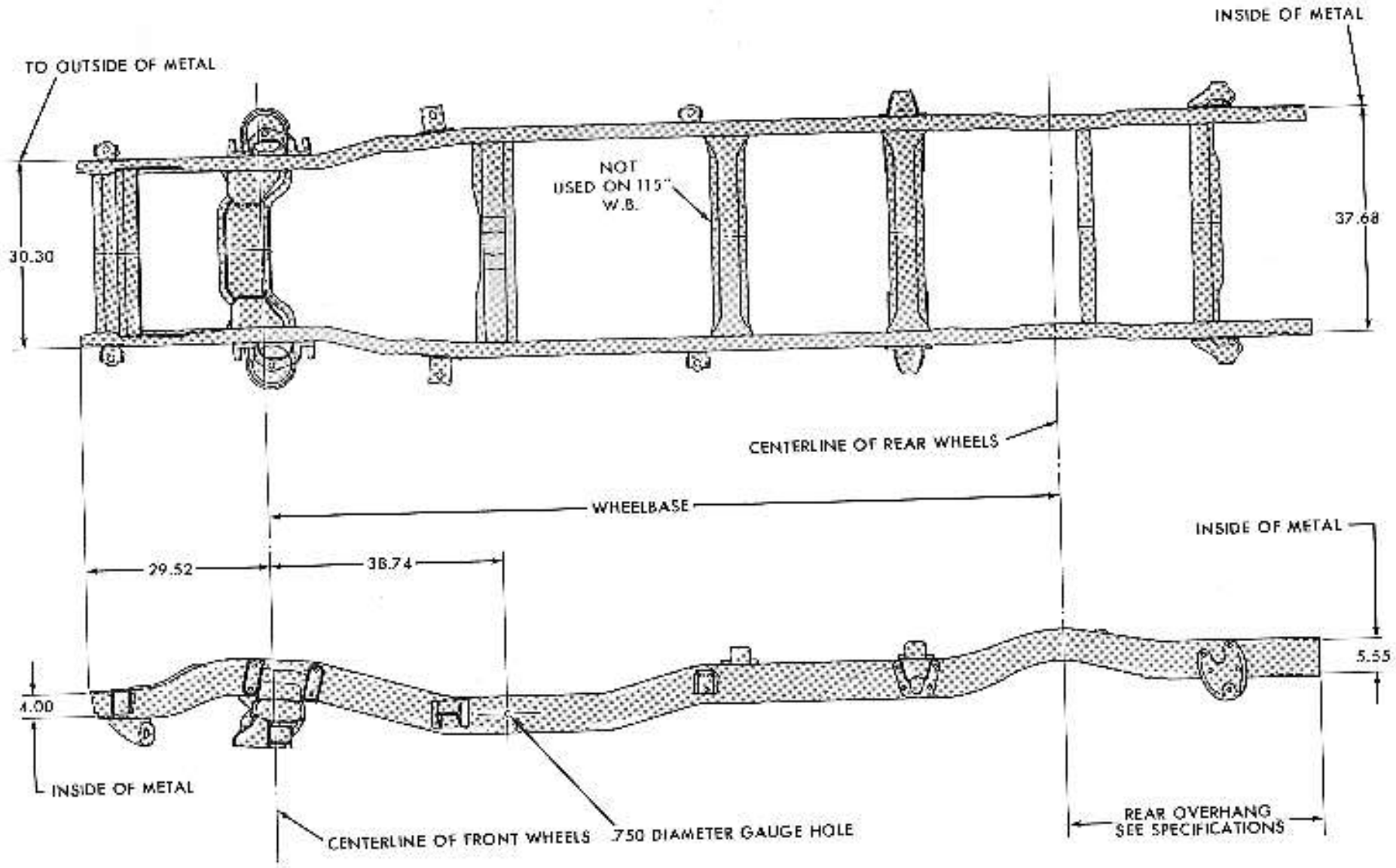


Fig. 7—Frame Dimensions (D100 thru 400)

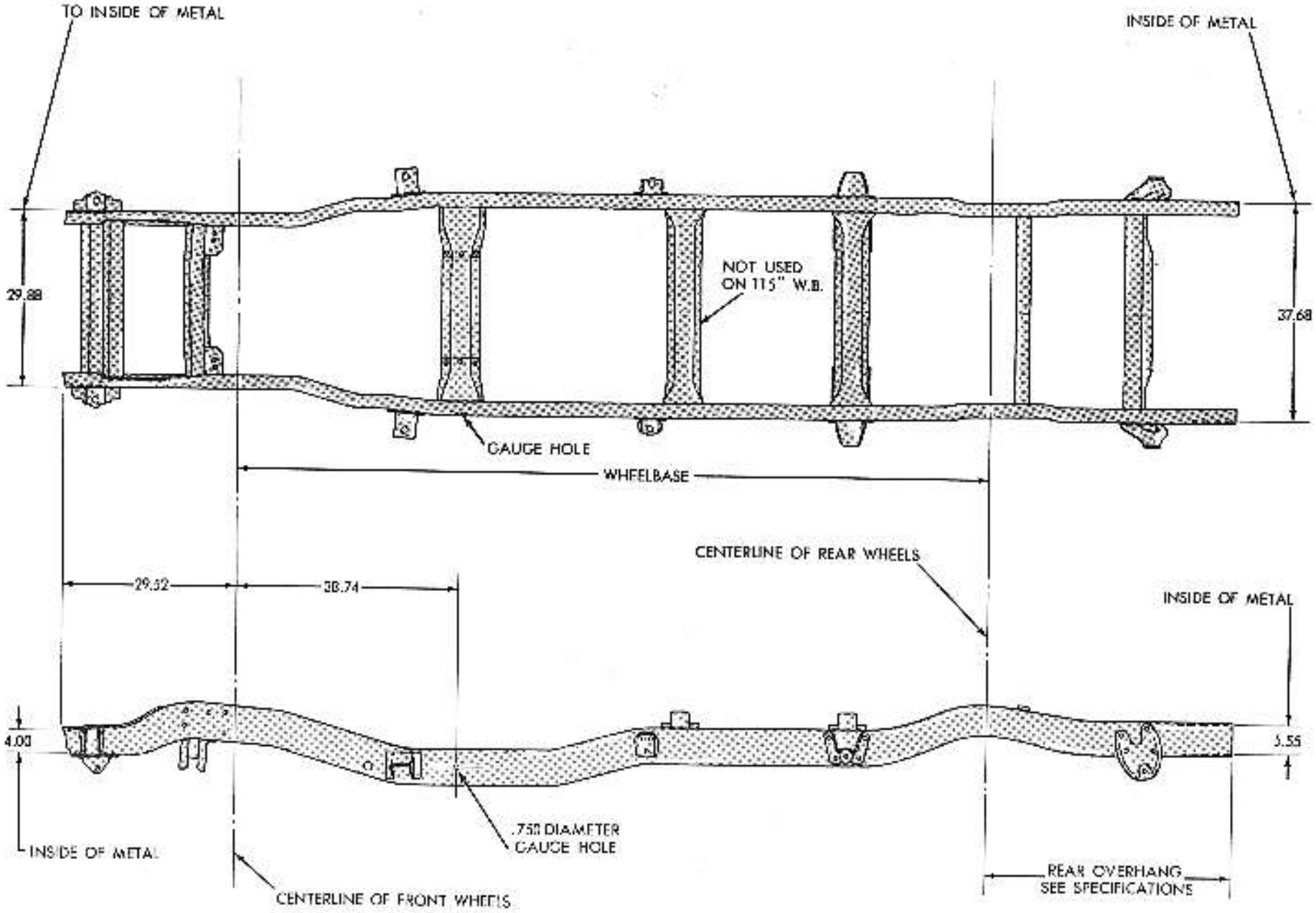


Fig. 8—Frame Dismensions (W150 thru 400)

SERVICE PROCEDURES

INDEX

GENERAL INFORMATION

Frames which are bent or twisted can be straightened, if necessary by heat application. The temperature is to be kept under 1050F. (a dull red glow) as excessive heat will impair the strength of the material, resulting in a weakened frame.

This heat method is permissible on Light and Medium duty frames only. Never use heat on Heavy Duty heat treated siderails with a yield strength of 110,000 psi. Damaged frame rails, crossmembers and brackets can be repaired by straightening or replaced.

Welded connections between rails and crossmembers are not recommended.

Straightening

Straightening should be limited to parts not severely damaged. New bolts or rivets for attaching the parts should be of same specifications as original bolts or rivets.

Replacement

Replacement is recommended as the original shape of the part may not be easily recognizable. Also, improperly straightened frame components will have harmful effects on alignment.

REPAIRING

Drilling

No holes should be drilled in siderail flanges as this will reduce frame strength. Holes drilled in siderail vertical web must be 1-1/2 inches minimum from top and bottom flanges.

New holes should be located a distance away from existing holes, as not to reduce cross section of siderails in any one vertical section by more than 30%.

Welding

Welding of siderails and crossmembers should be done preferably with electric welding equipment as it retains heat in a small area limiting the change of hardness of metal.

Never weld Heavy Duty heat treated frame siderails with a yield strength of 110,000 psi.

A damaged frame member is to be closely inspected for cracks. It is possible that cracks will appear as a result of straightening of a member. In either case, crack or cracks are to be repaired as follows:

(1) Stop-drill at the end point of the crack with 1/8 inch drill.

(2) V-groove crack to allow good weld penetration.

(3) Weld up the crack.

(4) Grind surface smooth if reinforcement is to be used.

Use of Fasteners

Bolts or rivets can be used in repairing frames or adding reinforcement. When it is more practical to substitute a bolt for a rivet, use next larger size bolt to prevent bolt from working loose. Ream holes if necessary.

Coned washers are preferred to split lock type. Generally Grade 5 bolts will suffice in the repair work. Grade 3 bolts should be avoided. Proper torque is mandatory to provide adequate locking and preclude loosing of fasteners. Refer to the following torque chart.

Reinforcing

Reinforcement can be made from channel, angle or flat stock of a common carbon steel and approximately equal in thickness to the part to be repaired. It is not possible to recommend proper reinforcement for all possible repairs. A reinforcement should provide an adequate section in cracked area and have sufficient overlap with the original part and be properly attached.

Reinforcing channel should have flanges shorter than sidemember flanges to preclude welding along edge of rail flange. Otherwise, longitudinal welds are quite acceptable. Complete transverse welds are to be avoided.

SPECIFICATIONS

Values of the section modulus, yield strength and R.B.M. are shown for each siderail in the following tables.

LIGHT DUTY MODELS

*Model	Wheel Base	Siderail Section Depth	Siderail Section Flange	Siderail Section Gage	Section Modulus	R.B.M.**	Rear Overhang
CONVENTIONAL CAB	Inch (cm)	Inch (cm)	Inch (cm)	Inch (cm)	Inch (cm)	Pounds (kg)	Inch (cm)
D1-15	115 (292)	6.06 (15)	2.27 (6)	.156 (.396)	2.86 (7.26)	91520 (41513)	38.25 (97.15)
D1-15	131 (332)	6.06 (15)	2.27 (6)	.156 (.396)	2.86 (7.26)	91520 (41513)	42.25 (107.31)
D2	131 (332)	6.17 (16)	2.32 (6)	.210 (.533)	3.88 (9.86)	124160 (57641)	42.25 (107.31)
***	131 (332)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	42.25 (107.31)
D3	135 (342)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	42.25 (107.31)
D3-4	159 (404)	7.31 (18)	2.79 (7)	.250 (.635)	6.56 (16.66)	160640 (72866)	48.25 (122.55)
W1	115 (292)	6.12 (18)	2.30 (6)	.188 (.477)	3.43 (8.71)	109760 (49787)	38.25 (97.15)
W1-2	131 (332)	6.17 (18)	2.32 (6)	.210 (.533)	3.88 (9.86)	124160 (56319)	42.25 (107.31)
W3-4	125 (318)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	48.25 (122.55)
CLUB CAB							
D1-15	133 (338)	7.16 (18)	2.72 (7)	.176 (.447)	4.57 (11.60)	146240 (66334)	38.25 (97.15)
D1-2	149 (378)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	42.25 (107.31)
D3-4	149 (378)	7.23 (18)	2.75 (7)	.210 (.533)	5.47 (13.87)	175040 (79398)	42.25 (107.31)
W15	133 (338)	7.18 (18)	2.72 (7)	.188 (.477)	4.75 (12.06)	152000 (68947)	38.25 (97.15)
W2	149 (378)	7.23 (18)	2.75 (7)	.210 (.533)	5.47 (13.87)	175040 (79398)	42.25 (107.31)
CREW CAB							
D2	149 (378)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	38.25 (97.15)
D2-3	165 (419)	7.31 (19)	2.79 (7)	.250 (.635)	6.56 (16.66)	209920 (95220)	42.25 (107.31)
W2	149 (378)	7.20 (18)	2.73 (7)	.194 (.493)	5.02 (12.75)	160640 (72866)	38.25 (97.15)
SPORT UTILITY							
AD1-PD1	106 (269)	6.06 (15)	2.27 (6)	.156 (.396)	2.86 (7.26)	91520 (41513)	38.25 (97.15)
AW1-PW1	106 (269)	6.06 (15)	2.27 (6)	.156 (.396)	2.86 (7.26)	91520 (41513)	38.25 (97.15)

*D3 and W3 Cab & Chassis Models have frame reinforcements for the purpose of FMVSS 212 Compliance Frontal Impact. Not intended to increase frame gravity load carrying capacity.
**Resisting Bending Moment based on 32000 psi minimum yield strength of siderail steel.
***D2, D3 Heavy Duty

TIGHTENING REFERENCE

Torque in **Ft.-Lbs. (N·m)**

Bolt Size	Grade 5		Grade 8	
3/8 x 16	20-40	(27-54)	30-50	(41-68)
3/8 x 24	25-45	(34-61)	30-60	(41-81)
7/16 x 14	35-65	(47-88)	50-80	(68-108)
7/16 x 20	40-70	(54-95)	60-90	(81-122)
1/2 x 13	55-95	(75-129)	80-120	(108-163)
1/2 x 20	65-105	(88-142)	85-135	(115-183)
9/16 x 12	80-130	(108-166)	110-160	(149-217)
9/16 x 18	90-140	(122-190)	125-175	(169-237)