

GM MEDIUM DUTY FRAMES SPECIFICATIONS

GENERAL INFORMATION

Section Modulus

- Section modulus is a measure of the frame strength based solely on the height, width, thickness, and configuration of the side rails. It is calculated at the point of maximum stress, which is usually directly behind the cab.
- Section modulus is not a measure of material strength and can only be used by itself to compare frames of like materials.
- Frame reinforcements will increase the section modulus because they increase the strength by adding to the thickness of the section.
- Consult the Frame Properties for all section modulus ratings.

Yield Strength

- Yield strength is a measurement of the frame material's strength. It is maximum load (PSI) that can be placed on the material and still have it return to its original position when the load is removed without being bent out of shape.
- It can be used only to compare frames of identical section. Three yield strength frames are available for the C-series. They are 50,000 psi (344,750 kPa), 80,000 psi (551,600 kPa), and 120,000 psi (827,400 kPa).

RBM-Resisting Bending Moment

- Since Section Modulus can only be used to compare frames of like materials and yield strength can only indicate relative strengths of identical frames, some measurement is necessary to compare frames of different materials and different sections. The RBM, or Resisting Bending Moment, can be used for this comparison as it utilizes section modulus and yield strength in its makeup.
- **RBM = Section Modulus x Yield Strength**
- This measurement will show that a smaller section frame of higher strength steel will be just as strong as a larger section frame of lower strength of steel.
- It is readily apparent that both section modulus and yield strength are equally important so that their product, RBM, is the correct figure to use for frame comparisons. The RBMs for all standard and optional frames are shown on the Frame Properties charts.
- Frames are designed to torsional stiffness and beaming criteria as well as fatigue strength.

GENERAL INFORMATION

FRAME RAIL-MATERIALS & WELDABILITY

- The frames on GM Trucks are built for strength, durability, and adaptability. They are available in tensile strengths of 50,000 psi (344,750 kPa), 80,000 psi (551,600 kPa) and 120,000 psi (827,400 kPa) ratings.
- The 50,000 psi (344,750 kPa) and 80,000 psi (551,600 kPa) frames are made from hot rolled steel that is pierced and formed to produce a finished side rail. Following the procedure outlined in the GM Truck Service Manual these frames can be subjected to welding without affecting frame integrity.
- The 120,000 psi (827,400 kPa) frame rails are made from steel with an initial yield strength of 35,000-40,000 psi. The chemistry of the steel is slightly different to allow for better handling characteristic. Because the heat-treating operation causes molecular movement in the steel, the only holes pierced in the side rails prior to heat-treating are near the front-end hole. Growth can be predicted in this area and adjustments in whole placement can be made accordingly. The balance of the required holes are pierced in the frame rail after heat-treating.
- The 120,000 psi (827,400 kPa) frame rails are heat treated by an electric induction heat-treating process. During this process, the formed side rails are moved through a series of three induction coils and brought to a temperature of about 1650_ F, (898.9°C). Once at this temperature, the side rail passes through a cold-water quench. After the frame goes through the cold - water quench, it is very hard but also brittle. Thus, the rails continue to roll through the final “tempering” electric coil and are brought to a temperature of about 900_ F, (482.2°C). Then the frame is allowed to cool to room temperature. This tempering operation “draws” some of the hardness out of the material, but it now becomes very tough and durable. Once through the tempering operation, the side rail passes through a “shot peen” operation. This process hurls millions of 1/8-inch, (0.3175 cm), diameter spherical-shaped balls at the side rails. Shot peening significantly increases the fatigue life of the frame rail, as well as providing a clean surface.
- Welding should not be performed on the heat-treated 120,000 psi (827,400 kPa) frame rails. Welding depends on heat for a good adherence. Applying heat or welding on hardened side rails will create a “soft zone” where the heat was applied. Since the heated area is now softer than the balance of the side rail, the general area would become more susceptible to failure of the frame rail.

GENERAL INFORMATION

BODY MOUNTING CONCERNS

- The great variety of truck bodies and applications is difficult to appreciate. GM has tried to offer frame equipment suitable for the greatest number of configurations, but some concerns do exist. To assist sales personnel and customers, we remind everyone to review and follow data presented in:
 - TRUCK BODY BUILDER BOOK Located at gmupfitter.com
 - SERVICE MANUAL
 - OWNERS MANUAL
- Each publication contributes to an understanding of the complex issues of good vehicle / body application.
- The amount of load carried by the front axle is the most significant consideration. Front Gross Axle Weight Ratings (FGAWR) are sometimes controlled by the frame.
- The front frame limit is defined by wheelbase and frame choice for each model. The attachment method and the structural character of the body will also affect the final vehicle performance.
- Based on experience, GM has determined that **the first body mounting point should be within 12 inches or (30.5 cm) of the Back-of-Cab**. This will assure that ride, handling and load carrying ability are maintained for high customer satisfaction.

SINGLE AXLE MEDIUM DUTY CONVENTIONAL

- C6500 single-axle model frames feature straight full-channel side rails over the total length of the frame except on LoPro model. Channel type crossmembers are web mounted to leave side rail flanges clear for body mounting.
- Heavier gauge sidemember (FD5) and reinforcement is available and standard on LoPro.
- C7500 & C8500 single-axle model frames are similar to the C6500 frames with a few exceptions: heavier gauge sidemembers standard on wheelbases greater than 174", (442 cm).
- Optional heat-treated sidemembers (F02) are also available on these models. Inverted "L" reinforcements are available to increase the section modulus.
- Rear side rail taper is standard for tractor

TANDEM-AXLE MEDIUM DUTY CONVENTIONAL C8500

- C8500 conventional tandem models have full-depth channel-type rails with an inverted "L" reinforcement available, (standard on wheelbases greater than 174", (442 cm) with FD5 frame) that starts at the front spring rear hanger and continues to the end of the frame. Internal C-channel gussets are standard for the rear suspension area.
- Rear side rail taper is standard for tractors. Optional heat-treated side members/ reinforcements are also available.

GENERAL INFORMATION STRENGTH

- The frame has a straight, full-depth, C-shaped side member rail design and a ladder-type frame assembly.
- The overall frame length on sizes similar to those previously offered has increased by about 1 inch or (2.54cm) to accommodate a slight increase in front overhang (related to improved aerodynamics and visibility).
- Basic frame dimensions, including channel height, thickness and material specifications, are essentially carryover.
- The 6500-8500 Series models (unlike the 4500-5500 Series) allow customers to select the frame strength they want and tailor it to their particular requirements.
- The (RPO FD0) 6mm thick frame with a 50,000 psi (344,750 kPa) material strength is available on the four short wheelbase models.
- The (RPO FD5) 8mm thick frame with 80,000 psi (551,600kPa), strength is available on all single-axle trucks. Because of its widespread availability and strength, it has, by far, been the most popular choice, accounting for nearly 80 percent of total frame selection.
- The (RPO F02) 10mm thick frame with 120,000 psi (827,400 kPa) strength is available on all but the shortest wheelbase single-axle models. It is now also the standard frame for the tandem axle models. This provides more value (extra strength) for customers and simplifies manufacturing for GM.
- The frame crossmembers all have a 50,000 psi (344,750 kPa) material strength. Their thickness varies, depending on their application.
- Customers can also choose frame reinforcements for extra strength to meet their GVW/gross axle weight rating (GAWR) needs.
- The reinforcements can make a considerable difference in front axle loading capability. For example, if a customer selects a 224-inch, (569 cm) wheelbase and (RPO FD5) frame, the maximum load rating allowed on the front is 10,000 pounds, (4536 kg). Adding the inverted L-shaped frame reinforcement option increases front axle load rating 12,000 pounds, (5443 kg).
- Basically, the inverted L-shaped reinforcement gives the 8mm-thick/80,000-psi frame a front axle load rating equal to a (F02) 10mm thick/120,000 psi (827,400 kPa) strength frame. (The longest wheelbase, using the heaviest strength frame material, still limited to a 12,000-pound, (5443 kg) front frame rating due to its length. Shorter wheelbase models offer front GAWRs ranging all the way up to 18,000 pounds, (8165 kg).)
- The 6500-8500 Series offer two frame reinforcements. Both have the inverted L-shape (with the flange at the bottom) to fit this Series' particular design requirements. Both are also 6mm thick.
- (RPO F08) an 50,000 psi (344,750 kPa), strength "L" reinforcement on 4500 & 5500 models.
- (RPO F08) an 80,000 psi (551,600 kPa), strength Inverted "L" reinforcement on 6500 & 7500 models
- (RPO F20) which is made of heated treated material to match the heat-treated frame option. (The heat-treated reinforcement is dimensionally similar in its Inverted L-shaped configuration, but taller than the RPO F08.)
- RPO F08 and F20 start under the cab and run to approximately the front of the rear spring hanger on the (C042) Conventional Cab single axle.

Conventional Cab Frame Material Properties

Frame Material and Physical Properties	C4500 or C5500 Wheel Bases Greater than 152" (386.1 cm) For Regular Cab, Crew Cab and 4X4 Models on All Wheelbases
Material Steel No. or Type	SAE J1392 (-080 XLF)
Material Thickness- in. (mm)	0.32 (8)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	95,000 (655,000)
Minimum Yield Strength psi (kPa)	80,000 (551,600)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	
Section Modulus in³ (cm³)	10.31 (169)
Rated RBM	824,800
Frame Reinforcements Available	
Optional Reinforcement RPO	F08
Reinforcement Type	Upright 'L'
Material Thickness- in. (mm)	0.24 (6)
Combined Section in³ (cm³)	14.20 (232.7)
Rated Combined RBM	1,136,000
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Frame Material and Physical Properties	C4500 & C5500 Motorhome and C4500 & C5500 Cutaway Chassis with (B3D)
Material Steel No. or Type	SAE J1392 (-050XLK / XLF)
Material Thickness- in. (mm)	0.24 (6)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	60,000 (413,700)
Minimum Yield Strength psi (kPa)	50,000 (344,700)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	50,000 x SM
Section Modulus in³ (cm³)	7.63 (125)
Rated RBM	381,500
Frame Reinforcements Available	
Optional Reinforcement RPO	N/A
Reinforcement Type	Not Offered
Material Thickness- in. (mm)	N/A
Combined Section in³ (cm³)	N/A
Rated Combined RBM	N/A
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Conventional Cab Frame Material Properties

Frame Material and Physical Properties	C4500 & C5500 128" (325.1) & 152" (386.1) Wheelbases Models For Regular Cab Models and C4500 & C5500 Cutaway Chassis (w/o B3D)
Material Steel No. or Type	SAE J1392 (-080 XLF)
Material Thickness- in. (mm)	0.24 (6)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	95,000 (655,000)
Minimum Yield Strength psi (kPa)	80,000 (551,600)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	80,000 x SM
Section Modulus in³ (cm³)	7.63 (317.6)
Rated RBM	610,400
Frame Reinforcements Available	
Optional Reinforcement RPO	F08 (C4C/C5C only)
Reinforcement Type	Upright 'L'
Material Thickness- in. (mm)	0.24 (6)
Combined Section in³ (cm³)	14.1 (231.1)
Rated Combined RBM	1,128,000
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Frame Material and Physical Properties	C6500 Models
	Frame RPO "FD0"
Material Steel No. or Type	SAE J1392 (-050XLK / XLF)
Material Thickness- in. (mm)	0.24 (6)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	60,000 (413,700)
Minimum Yield Strength psi (kPa)	50,000 (344,700)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	50,000 x SM
Section Modulus in³ (cm³)	9.58 (157)
Rated RBM	479,000
Frame Reinforcements Available	
Optional Reinforcement RPO	F08 or FSA
Reinforcement Type	Inverted "L"
Material Thickness- in. (mm)	0.24 (6)
Combined Section in³ (cm³)	17.39 (285)
Rated Combined RBM	1,339,000
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Conventional Cab Frame Material Properties

Frame Material and Physical Properties	C6500, C7500, C8500 & 8500 Tandem Models
	Frame RPO "FD5"
Material Steel No. or Type	SAE J1392 (-080 XLF)
Material Thickness- in. (mm)	0.32 (8)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	95,000 (655,000)
Minimum Yield Strength psi (kPa)	80,000 (551,600)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	110,000 x SM
Section Modulus (in ³) (cm ³)	12.53 (205.3)
Rated RBM	1,378,300
Frame Reinforcements Available	
Optional Reinforcement RPO	F08 or FSA
Reinforcement Type	Inverted "L"
Material Thickness- in. (mm)	0.24 (6)
Combined Section in ³ (cm ³)	20.36 (333.6)
Rated Combined RBM	2,239,600
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Frame Material and Physical Properties	7500, 8500 & 8500 Tandem Models
	Frame RPO "F02"
Material Steel No. or Type	H.T. SAE 1027
Material Thickness- in. (mm)	0.40 (10)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	125,000 (861,800)
Minimum Yield Strength psi (kPa)	120,000 (827,400)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	120,000 x SM
Section Modulus in ³ (cm ³)	17.93 (293.8)
Rated RBM	2,151,600
Frame Reinforcements Available	
Optional Reinforcement RPO	F20 or FSC
Reinforcement Type	Inverted "L"
Material Thickness- in. (mm)	0.24 (6)
Combined Section in ³ (cm ³)	26.91 (441)
Rated Combined RBM	3,229,200

*Grade 80 is rated equivalent to Heat Treated SAE 1027

**SECTION MODULUS BASED ON Square C-Channel.

(Actual parts contain radius)

120K Heat Treated Versus 80K HSLA

GM Truck is the only major OEM to offer 80K HSLA material on all C-Series.

This offering is based on fatigue testing which shows equivalency to heat treated steel. Frames fail in fatigue, not yield, and therefore the materials are equivalent with respect to service life.

Tilt-Cab Frame Material Properties

Frame Material and Physical Properties	T Series Single-Axle Truck Models
	Frame RPO "F05"
Material Steel No. or Type	SAE J1392 (-080 XLF)
Material Thickness- in. (mm)	0.32 (8)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	95,000 (655,000)
Minimum Yield Strength psi (kPa)	80,000 (551,600)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	80,000 x SM
Section Modulus (in ³) (cm ³)	12.69 (208)
Rated RBM	1,015,000
Frame Reinforcements Available	
Optional Reinforcement RPO	F08 or FSA
Reinforcement Type	"L" Shape
Material Thickness- in. (mm)	0.32 (8)
Combined Section in ³ (cm ³)	24.23 (397)
Rated Combined RBM	1,938,000
SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius)	

Frame Material and Physical Properties	T7500 & T8500 Models
	Frame RPO "F06"
Material Steel No. or Type	H.T. SAE 1027
Material Thickness- in. (mm)	0.32 (8)
Physical Properties: Min. Tensile or Ultimate Strength psi (kPa)	125,000 (861,800)
Minimum Yield Strength psi (kPa)	120,000 psi (827,400)
Resisting Bending Moment (RBM) (Rated Yield Strength x Section Modulus)	120,000 x SM
Section Modulus in ³ (cm ³)	12.69 (208)
Rated RBM	1,522,800
Frame Reinforcements Available	
Optional Reinforcement RPO	F20 or FSC
Reinforcement Type	"L" Shape
Material Thickness- in. (mm)	0.32 (8)
Combined Section in ³ (cm ³)	24.23 (397)
Rated Combined RBM	2,907,600
<p>*Grade 80 is rated equivalent to Heat Treated SAE 1027 **SECTION MODULUS BASED ON Square C-Channel. (Actual parts contain radius) 120K Heat Treated Versus 80K HSLA GM Truck is the only major OEM to offer 80K HSLA material on all T-Series. This offering is based on fatigue testing which shows equivalency to heat treated steel. Frames fail in fatigue, not yield, and therefore the materials are equivalent with respect to service life.</p>	