WA Technology

Changing Oil in Grand Sport & C7 Z51 (Also for Z06:)

Including; Checking Magnetic Drain Plug

Reasons to Change My Own Oil

A forum poster made a comment that helped make my decision to change my own oil and not take advantage of the GM 4 (was 5, now 3) free oil changes. He said, *"Do you think your dealer will have their Corvette Certified Mechanic change your oil or a newbie?"* It reminded me of an incident with my 1st new car! My 1967 Corvair was purchased with all the performance options available, quick steering, HD suspension, and others. About that time, GM extended their warrantee but you had to have the dealer change oil and filter. My uncle was the service manager at the large dealership where I bought the car. (This was the same uncle who helped when I put the '51 Olds engine, bored an 1/8 inch to fit '55 pistons, in my '41 Ford Opera Coupe.) For the first oil change I brought the car in for service. I had several Corvairs prior to the '67 and was very concerned about folks who did not understand that the aluminum heads and other parts could not be treated like cast iron! I was watching the young mechanics helper who was working on my car as it was on the lift and was obviously looking for something. I went over and inquired and he said, as I expected he might, *"looking for the oil filter!"* In a Corvair the filter is in the engine compartment, not accessible from under the car! I had to tell him where it was! I recall going into my uncle's office and saying I was going to do my own oil changes in the future and for sure change my own plugs (a frequent requirement for a Corvair!) He said be sure to keep all receipts and that may help if you have an engine warrantee issue. GM soon thereafter backed down on their requirement to have a dealer do all maintenance, as long as you kept receipts!

There are a number of reported issues where C7's with Dry Sumps had problems caused by a dealers oil change. The system is sensitive to overfilling, which will cause oil to be expelled with the "burped air" from the tank. To evacuate all the oil from the pan you need to pump a good deal of air as well. That burped air from the Dry Sump Tank enters the air intake duct though a hose exiting downstream of the air filter. If oil enters as well as air, it soaks the air filter and contaminates the air intake duct!

It also takes time to change the oil. Will that newbie mechanic bring the oil up to temperature before removing the old oil? Will they be sure to remove both drain plugs? Will they take the time to allow all ~9.6 quarts to fully drain? Will they use Mobil 1 or whatever one of over 100 brands that meet the GM dexos certified, perhaps an oil blend, they have in that 55 gallon drum? Would they underfill and check the level? That requires starting the car, having the oil reach 175 F, then when it is shut off, waiting 5 minutes (but not more than 10 per the Owner's Manual) before checking the level. If they wait too long some oil will drain back to the pan through the scavenge pump resulting in a low oil level reading. Will they follow your request and leave the level ½ quart low to help avoid oil "burping" into the air intake along with the air that is entrained with the oil as the pan is pumped dry? *Too many unanswered questions!*

Photo How to Sequence

These are the tools I use. The 15 quart oil drain pan has closures for all openings to transport used oil to a recycling center.

Two Harbor Freight, low provide profile jacks Four Reverse Logic Jacking Pucks. Jack stands are also needed. Wheel chock and ratchet wrench with extensions. Torque wrench and metal pan are optional.

The wood stanchions are homemade, see Appendix for details. Several forum posters questioned their safety so I made Safety Factor Calculations that are also included in the Appendix!

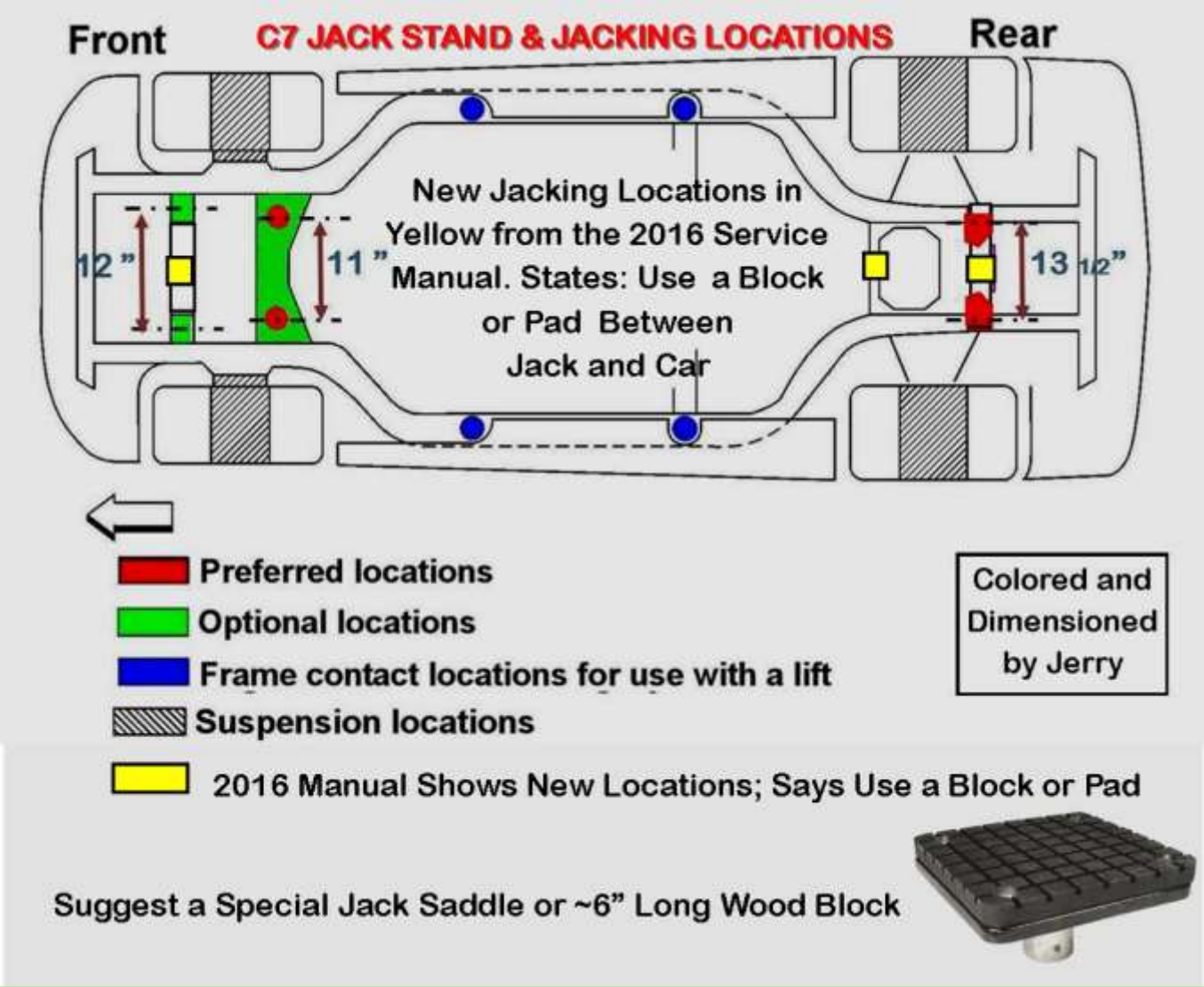
I was using aluminum jack pads from Katech. They are the recommended 2 ½ inch diameter (not 3 inch I had used on my C6.) I bought the 2 inch high pads to assure I cleared my added Z51 side skirts.

However to assure a dealer or tire shop uses them and doesn't crack my Grand Sport side skirts I bought and keep 4 Reverse Logic pads in my car. They can be installed and bolted on the Vette. Not permanently, as they stick down BUT for a trip to the dealer or tire shop where they may or may not use the pads I was putting on the passenger seat with "clear instructions to use them!" But some techs don't want to bother!

The schematic top of net page shows the GM suggested lifting points for a C7.

Note the preferred locations are on the front and rear cradle. These cradles are hollow castings and the 2014 Service Manual warned not to lift in the center. However the 2016 Service Manual provides options for lifting in the center by using a wood block or rubber pad to spread the load.

I use the side frame locations to place my jacks after inserting jack pads in the frame slots and the "Optional Locations" on the Front Cradle or the "Preferred Locations" on the Rear Cradle to place the Jack Stands.



With the two drain plugs, front and side of the pan, having the car level provides the best angle to get as much oil out as possible. Therefore jacked up the rear and put the wheels on the home built Wooden Stanchions.

Watch that the Jack moves in as you lift. **The Jack should be perpendicular to the car and the rear casters turned to help it move. Especially with a small jack that is necessary to keep the jack saddle centered on the Jack Puck! With my C7 2014 side skirts, 2 inch high Jack Pucks are needed. For the Grand Sport the 1 inch high Reverse Logic pads clear fine.**

This is a view of the two jacks lifting the front on the 2 inch high Jack Pucks (red.) The Jack Stands were placed on the "Optional Locations" as noted on the GM chart. That left room for the drain pan and access to the front drain plug. The Jacks were left in place with no tension and plenty of room to access the side drain plug and oil filter. The stanchions can be seen below the rear tires.

A flat metal pan is partially inserted under the car. These are available at auto parts stores for changing oil and also stopping drips in a garage if that is an issue with an old car. As typical, when I use it there are no drips! If not, there are a few small spills!

Place the drain pan under both oil drain plugs on the Grand Sport. I did the side first. While the pan is draining unscrewed the filter. Note, unscrew slowly to allow oil to drain. A glove helps since it is warm! There is a place in the drain pan to place the filter upside down so it fully drains. When finished draining installed the cleaned drain plug and oil filter. Instead of the 2014 Owner's Manual that says to use 22 ft-lbs to tighten the filter, which I found on the 1st oil change was excessive and would have distorted the gasket. Newer C7s recommend what I have used for ~60 years, tighten by hand until it just seats than use ¾ to one full turn more.

For my 2014 the oil cooler allowed room to use a 6 point 15mm socket on the drain plug and extension that fit under the oil cooler.

For the Grand Sport the oil cooler (finned plates) is larger and does not allow enough room for an extension. Especially when I had planned that I might need my ½ inch pry bar as I did on the 1st oil change in the 2014! GM uses Loctite.

Sure enough they also used a strong Loctite material on the 15 mm Grand Sport side drain plug! What to do??

Tried 12 point box and open end wrenches but even with a "pipe section persuader" it didn't budge. Concerned that the head was rounding, tried my 6 point open end flare wrench. Still looked like it was only rounding the plug head!

The solution- inserted a 6 point socket and used an old pipe wrench! It turned!

Placed an order for 13mm 6 point box wrench since the magnetic drain plugs installed are that size. They are also made of quality steel versus the OEM which appeared to be very low strength!

Suggest getting a 15mm 6 point box wrench for the OEM drain plug.

This is a pic of the front plug draining.

Of interest, that front plug on the Grand Sport, *where I would have no problem using my 6 point socket and an extension with a ½ inch pry bar had they used strong Loctite*, it wasn't needed. Not only did it loosen easily with an open end wrench-*it was too easy!*

Why did GM use strong Loctite on the side plug and none also not fully tighten (IMO) the front plug??

Purchased magnetic drain plugs from: http://www.powerslutracing.com/oil-drain-plugs.html with very powerful magnets.

Good info on their website about why they should be used and magnet quality.

A forum poster, *sahlbom*, had measured the pulling force on these plugs at 36 oz, which was 2.25 times that of one bought at an auto parts store. He also found the magnet had a far stronger attachment. Good analytical information.

Note for the Grand Sport they now have the same gaskets as the OEM plugs. Also only purchased two smaller magnets for the GS.

This is a pic of the drain plug removed from the front of the pan, on my 2nd oil change in the 2014 z51. That is the Drain Plug the one that drains the dry sump. Very few and very fine particles, cleaned with a paper towel. The longer magnet side plug was the same.

This is a pic of the oil draining from the front of the Grand Sport pan.

Was able to position the oil drain pan to collect oil with both plugs removed. However the forward plug was removed slowly and allowed to drain some oil before fully removing as the jack stands prevented it from being moved further.

APPENDIX: Jacking Up A C7 Corvette

This section *IS NOT* for those happy with their present method of lifting their C7, so skip it! . It is for those who aren't either happy with their current method or want to try the method shown here for this oil change.

Background: Worked on many cars with my Dad years ago. After we jacked up a car we would use cement block(s) under the frame (our jack stands!) Even with that, would have to hit the car with my shoulder to be sure it was stable and could not fall! Dad had a friend crushed and killed when working under a car that fell; he was justifiably very careful!

To have the C7 level, assuring all old oil is drained, wood "stanchions" were fabricated.

I was somewhat surprised when a few forum posters said they would not trust these to get under a car! I commented that I could calculate the loads they could hold but just stated they were no doubt stronger than the commercial ones you could buy for >$100 each or some ramps I have seen!

For fun, decided to perform those calculations and they are presented at the end of the Appendix! You'll see they have a conservative Safety Factor of >~15! For a bridge 3 to 5 would be used and sufficient!

Can't 4 Jack Stands be Used?

No- Not Safely. Using 4 jack stands does not provide a very stable support, IMO. Would be concerned to try my Dad's required shoulder test!

Note the warning on this pair of jack stands that I use, very good and rugged ones. It states

"USE ONLY TO SUPPORT ONE END OF A VEHICLE AT A TIME."

If getting under the car this is especially important.

Building the Stanchions

First, I cut a twelve foot long 2x6 into 4 pieces 21 inches long and 4 pieces 9½ inch long. This makes two stanchions 12½ inches wide, sufficient to fit the rear tires. With the ¾ inch plywood top it makes a 6 ¼ inch high "stand." Not bad for an $8 investment (had some left over plywood!) Be sure to make the cuts square.

Assemble the cut pieces as shown in this picture. Note the corner clamp which makes it easy to assure a 90 degree fit when drilling for the first screw but it's not essential.

Don't follow these suggestions unless you have the skills required to properly cut and screw the pieces together

Suggest using four 3 inch #8 screws to join each corner joint. That provides 1 ½ inches of gripping length. Pic shows the 4 screws on one joint.

It can be seen in the calculations of Safety Factor, that each screw in pine will have a "Pull Out" force of 790 lbs.

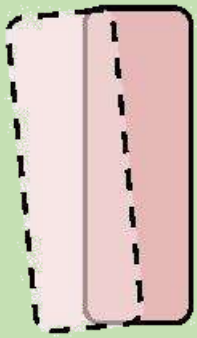
Use a pilot drill somewhat smaller than the root or minor screw diameter before inserting and screwing the parts together.

The top was made with ¾ inch plywood. It not only is supporting the tires it has a major function of keeping what we'll call the 2X6 "columns" from tilting. Considering the tensile strength of plywood and the loading, it has a Safety Factor of 35 based on its strength! However their role in keeping the side 2X6 "columns" from tilting is more important as we'll see in the next item.

Failure Mode

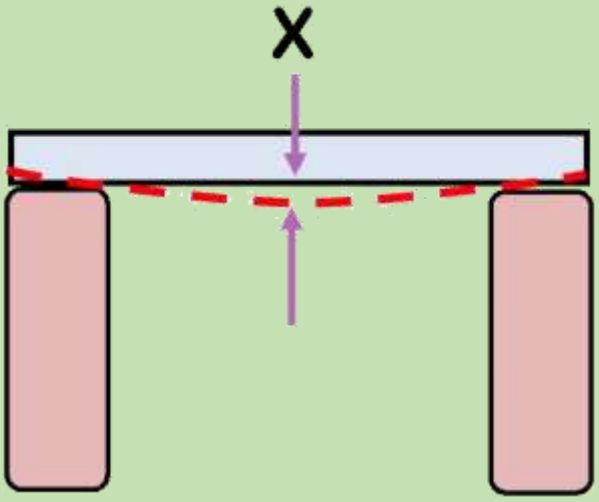
Vertical Column

Tilting



Straight compression of the column members provides a Safety Factor of several hundred! That is not a plausible failure mode. The largest risk occurs if the "columns" are subjected to a side load and the screws holding the sides together and those securing the plywood top to the side columns cannot support the side load.

I was reminded of another possible approach employed by Brunelleschi in the 1400'rds when building a huge dome for cathedral in Florence Italy. If interested, google or get an old best seller "Brunelleschi's Dome" by Ross King. And he did it without the Internet that was a big help (in addition to an old Strength of Materials text book) in assisting with my Safety Factor calculations! LOL



How does the tire load cause a side load on the 2X6 "columns?" If the deflection of the plywood is sufficient then there will be a load pushing the 2X6 columns outward. Calculating that deflection, "X", for a 1000 lb load concentrated in the center would cause a deflection of only, 0.02 inches. That creates a side force of only 4 pounds! Even if 10,000 lbs was centered on the top the deflection "X" would only be 0.2 inches.

Calculated with a side load of 200 lbs (which would need very poor construction or some other defect.) As noted in the attached, the Safety Factor would still be 15!

Check Out the Safety Factor Assumptions and Calculations at the End of this Appendix.

Why Not Use Ramps?

Many folks do and are pleased with that approach; I tried and was not happy!

A friend used ramps to change oil on his C6. When I asked if he had difficulty with the ramps slipping, he said at times! When the C6 was new, built the cross brace for my large hydraulic jack but still needed to lift up the front and back to make room for the jack and cross brace. Decided to make my own low profile ramps! As noted, made four.

Used a 3 support rib design with ½ inch particle board on top and bottom. They were sufficiently strong, even used on the wife's CTS she had at the time. In fact with her automatic trans they seemed easier to use.

However one or both ramps would still slip when driving the Vette up on them.

Note the "rubber runner starting" tabs placed on the front of these finished home fabricated ramps. Thought that would help avoid them sliding forward. Unfortunately they were no help!

Having gone through the effort of building the ramps thought of a possible way to improve them. Perhaps a higher friction material placed on the bottom might help eliminate the ramps moving when I tried to get the Vette up onto them. In fact one would move and not the other so I had to back off and start all over! This was particularly an issue when on my garage tiled floor but even occurred when on my concrete driveway.

A fish scale and some weights provided repeatable data for static and sliding friction measurements! The result of these tests? None of the materials tried, including rubber runner material was much different than the rough wood the ramps were made from!

Fun to do even though the results were not as hoped!

Bottom Line:

Since I like to work on my own and not ask my wife to see if was up properly on the ramps, or if one was moving, I gave them away!

I wanted something I could safely and quickly do on my own, ramps did not would work for me! I gave them to a person who needs to raise their vehicle on grass, something I would not do and can't do with jacks! They were pleased to get the ramps and worked fine for them!

Decided to use jacking pucks and a two jack approach. Two small jacks for the sides on the jack pucks, placing the rear tires on "home made" wood stanchions. Then after jacking the front using the two jacks and jack pads put two jack stands on the front cross member.

There are many ways to jack-up a car. If you're using one and are pleased-fine. However if you are looking for a way to do it for a reasonable cost, I hope this information was helpful in making your decision.

MAKING WOOD STANCHIONS

Another Appendix shows the calculations made to assure the home made "Wood Stanchions" were safe. I don't blame those who questioned their use, engineers can be wrong! *They said the Titanic Couldn't Sink!* However they are light compared to what one forum poster who questioned their safety said he was going to do. He planned to stack five 2X12's to make "stanchions!" That would work but would weight about 50 lbs each versus the 12 lbs for these fabricated wood "stanchions"!

APPENDIX: Which Oil for Corvette?

GM reimburses the Dealer to use Mobil 1. Through 2018 all C7's used GM dexos certified Mobil 1 5W-30. In 2019 they switched to and recommend a special Mobil 1 0W-40 ESP dexos2 certified oil. Great if Tracking as you don't have to change to the 15W-50 previously recommended, but after Tracking had to switch back to 5W-30. BUT IT'S EXPENSIVE! Be careful there is a European formula 0W-40 NOT dexos certified as cheap as 5W-30, don't use it!

In addition to Chevy recommending Mobil 1 for use in a Vette, I was an early adopter of the product. My new Datsun 260Z was a great car; however it was the 1st year of new Federally mandated pollution controls that caused problems. The "Z" had an exhaust air pump, hot water channeled to the carburetors etc. There was a problem when accelerating rapidly and the Datsun District Rep suggested using a product Mobil "made for the military in Alaska, called Mobil 1." He said to replace the oil in the two Hitachi SU carburetor dash pots with Mobil 1. I recall it was hard to get and expensive. *However it worked!*

Reading about the product, I realized it might be good to put in my 1967 Corvair I had since new. This air cooled engine often collected a creamy foam visible around the top of the oil inlet pipe. The oil ran very hot, as evidenced by the oil temp gauge I added, even with my aluminum aftermarket pan that had many conical cooling pins protruding into the crankcase. Sure enough, Mobil 1 worked for the Corvair as well! Have used the product in my cars ever since. However, as most if not all of todays "full synthetic" oils as they are called it has changed!

Mobil Loses Advertising Complaint: **Paraphrasing a 2000 Car and Driver article: *"Late in 1997, Castrol eliminated the polyalphaolefins (PAO) synthetic base stock (constituting 70% of the product) and employed specially refined Group III mineral based oil in their SynTec brand "Full Synthetic" offering. Mobil brought a complaint to the National Advertising Division (NAD) of the Council of the Better Business Bureau, asserting that this oil was not synthetic, but simply highly refined petroleum oil, and therefore it was false advertising to call it synthetic. In 1999, the NAD with supporting arguments from the SAE and API who had standards based on oil performance did not support the Mobil complaint saying acceptable high performance oil could be made either way! It was decided that the word "synthetic" was marketing term and referred to properties, not to production methods or ingredients."* Good article still available on the Net: *http://www.caranddriver.com/columns/pat-bedard-synthetic-motor-oil-gets-all-new-semantics-column***

Shortly after Mobil's complaint was rejected, most oil companies started reformulating their synthetic oils to use Group III mineral base stocks instead of truly synthetic stocks as their primary component. Most of the "synthetic oil" you can buy today is made predominately of this highly-distilled and purified mineral based oil called Group III. Group III base oils cost about half as much as the true synthetics. By using a blend of mostly Group III oils and a smaller amount of "true" synthetics, the oil companies can produce a product that has nearly the same properties as the "true" synthetics, and nearly the same cost as the Group III oil. In fact, Mobil-1 is apparently now primarily made from Group III unconventional base oils. In fact, I cannot find any motor oil available in the US that says it is Group IV, which must be fully synthetic.

The old "synthetic motor oil" was made through chemical reactions unlike mineral oils that are produced by refining of existing crude oil stock. Synthetic lubricants are recombined into synthesized-hydrocarbon molecular chains with desirable characteristics and uniformity not found in even the highest-quality traditional motor oils. Typically, the best synthetic oils use a combination of synthetic base fluids--polyalphaolefins, synthetic esters, and alkylated aromatics. These synthetic molecules are much more consistent in size and shape; they are better able to withstand extreme engine temperatures. Since they are chemically produced, there are no contaminants compared to conventional oils that contain small amounts of sulfur, wax, and asphaltic material that can promote detonation as well as varnish and sludge buildup. Synthetics flow at much lower temperatures than conventional oils.

I'll stick with Mobil 1. Purchase in 5 quart jugs at Walmart (note more expensive quarts.) Mobil often has a rebate offer and 5 quart jugs purchased at Walmart after the rebate is only about $2.50/quart! The rebate has been offered twice/year using the Net- no coupon needed. Search the Mobil website for the rebate page. Note the new 0W-40 ESP oil is ~$10/quart!

WA Technology

Summary of Stanchion Safety Factors:

Based on Compressive Strength of 2x6 pine columns: *SF = >400*

Based on Yield Strength of top Plywood: *SF= >35*

Based on Failure Mode Being the Tilting of the Side 2X6 Columns:

- **Scenario 1) Assume only Top two screws, one on each end, are preventing tilting based on the angle caused by plywood deflection from a 1000 lb load: *SF=>350***
- **Scenario 2) Scenario 1 but side load raised to 100 lbs due misalignment of parts: *SF=>15***
- **Scenario 3) Scenario 2 with added safety factor from plywood screws also holding: *SF = >30***
- **Scenario 4) Scenario 3 but side load raised to 200 lbs due misalignment of parts: *SF=>15***

Conclusion:

Therefore with conservative assumptions and due to poor construction and other material misalignment, if 20% of the car weight per wheel is applied sideways on the vertical 2X6 columns, the minimum Safety Factor is greater than15. This is well above the typical structural design safety factor of 3.

I recall one exception to the typical 3 Safety Factor was noted in a structural design course. That was for playground equipment where a Safety Factor of 5 was recommended! It was indicated you could not be sure how the structure would be stressed.

!! CAUTION !!

Use this information at your own risk! Remember *"Engineers said the Titanic Couldn't Sink!"*

WA Technology

Calculations for Safety Factors *(SF)* :

A)-Based on Compressive Strength of 2x6 pine columns: ***SF = >400***

Maximum compressive Strength of pine = 5000 lbs/in^2
Area = 1.5 in * (21*2 +9.5*2) = 92 in^2
Max Possible Load = 5000 lbs/in^2 * 92 in^2 = 450,000 lbs
Load on each wheel ~1000 lbs
SF = 450,000 lbs/1000lbs = 450

B)-Based on Yield Strength of top Plywood: ***SF= >35***

Max Stress= y F L / (4 I); where
Max Stress (psi)
y = Perpendicular distance from to neutral axis (in) = 0.75 in/2
F = load (lb) (1000 lb.)
L = length of beam (in) 9.5 in
I = moment of Inertia (in^4) see below = 0.7 in^4

Moment of inertia of a rectangular area about its centroid axis is:
$I = (1/12) * bh^3$
Where b = base of width of the rectangle
H = height of rectangle
For plywood 0.75 inched thick (h) and 20 inches wide (b)
I= 0.83*20*0.42 =0.7

Then:
Max Stress = (0.75/2*1000*9.5)/4*0.7) = 125 psi
Tensile strength of Plywood = 5000 psi
SF = 5000 psi/125 psi = 40

C)-Based on Failure Mode Being Tilting of Side 2X6 Columns:

Note 4 screws were used per side

But top screws have max stress.

Assumes top screw loaded because loaded plywood deflected.

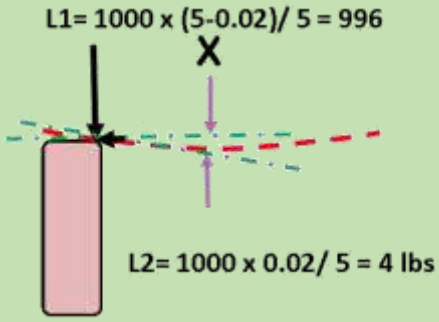
Could have indicated bottom moved outward then it has max stress

1. **Scenario 1) Assume only the Top two screws on each end are preventing tilting based on angle caused by plywood deflection from 1000 lb. load:** ***SF=>350***
   a. **Strength of 3 inch screw into pine: Two formula yields about the same result. One from the US Forestry service and a simpler one. The simpler one is:**
   Pull Force = 3.14*Screw Diameter D*Length in Wood L*Shear Strength
   For a 3 inch #8 screw D = 0.12; L- 1.5 in wood; Pine Shear Strength =1400 psi
   Then Pull Force = 3.14*0.12*1.5*1400= 790 lbs

b. **Deflection of plywood based on 1000 lb load:**
Could have calculated based on the Modulus of Elasticity and beam bending equations but found this calculator on the Internet for calculating the deflection of wood shelves:

http://www.woodbin.com/calcs/sagulator.htm

If is useful and has about 200 different woods, plywood etc. Just put in the span, shelf load, distributed of center load, thickness, and depth and out comes the deflection in inches!
As expected the deflection for 1000 lbs with a 9.5 inch board width 20 inches deep is only 0.02 inches.
Then the small angle it produces would yield a very small force sideways on the column of only 4 pounds!



Considering only the top screw of the four used and since there is one on each end the 790 ponds max pull force X 2 = ~1500 lbs holding force so 1500/4 is a SF = 375

2. **Scenario 2) Scenario 1 but side load raised to 100 lbs. due misalignment of parts: *SF=>15***
For this Scenario it was assume misalignment of the parts could cause 100 pound side force so the holding force of 1500 pounds was resisting 100 pounds of a safety factor of 1500/100: SF=15
3. **Scenario 3) Scenario 2 with added safety factor from plywood screws also holding: *SF = >30***
However the plywood top adds to the rigidity and stability of the assembly. Just using the 7 smaller screws that hold the plywood to the 2X6 increased the holding strength. Using the shear strength of the screws can estimate that added holding force. These screws are 0.1 inch diameter providing an area of 0.008 in^2. The shear strength of the screw can be estimated at 605 of the screw tensile strength conservatively estimated at 50,000 psi.
Therefore 0.008 in^2 * 50,000 psi = 235 lbs per screw * 7 screws = ~1600 lbs
Therefore total holding force with just the two top 3 inch screws adding the 7 top screws = ~3000 lbs so the SF =3000/100 = 30
4. **Scenario 4) Scenario 3 with but side load raised to 200 lbs. due misalignment of parts: *SF=>15***
Using the same logic, if the side force was increased to 20% of the car weight, which would require considerably more misalignment, the safety factor would be reduced to 300/200 = 15

Conclusion:

Therefore with very conservative assumptions and due to poor construction and other material misalignment, if 20% of the car weight per wheel is applied sideways on vertical 2X6 columns the minimum Safety Factor is 15. This is well above the typical structural design of 3.

WA Technology

"48" 2017 Grand Sport & 2014 Stingray PDF's Available:

48 PDFs discuss improvements or information about a 2017 Grand Sport and 2014 Stingray function and/or esthetics. Some are minor and others, like the installing the rear diffuser & MGW shifter, include detailed install information.

Below are the PDF's available. Click on picture (may need Ctrl pressed.) Or just copy and paste the PDF info (Blue type) into your browser. Or email me at GUttrachi@aol.com **and state the title desired, shown in Yellow:**

Note: **A GS in the title indicates the info was updated from that available for the C7 Z51 PDFs.**

Rusty GS/C7 Muffler ***Why the C7 muffler is rusted and a simply way to make rust turn matte black.*** ***Bottom pic rusted, top pic treated*** **http://netwelding.com/Muffler_Rust.pdf**	
Change GS/C7 Oil ***WHY change your own oil and HOW to do it*** ***Revised, includes C7 Lifting Methods*** **http://netwelding.com/Changing_Oil.pdf**	
C7 Carbon Fiber Side Skirts ***How to install side skirts with jacking information for DIY's without lifts*** **http://netwelding.com/Side_Skirts.pdf**	
C7 Carbon Fiber Splitter w/End Plates ***How to install Splitter & Nylon bra fit*** **http://netwelding.com/CF_Splitter.pdf**	
C7 Removing GM Plastic Film ***How To Remove The Rocker Panel Film*** **http://netwelding.com/Rocker_Panel_Film.pdf**	

 GUttrachi@aol.com

GS/C7 Mirror Proximity Alarm

Limit switch alarm warns when passenger mirror is too close to door frame

http://netwelding.com/Mirror_Proximity_Alarm.pdf

Jacking Pads for GS/C7

Manual says Jacking Pads 2 1/2 inch max OD.. Have 1 inch, 2 inch pads semi-permanent pads.

http://netwelding.com/Jacking_pads.pdf

GS/C7 Radar Power

For C7 tapped rear fuse panel. For GS tapped mirror

http://netwelding.com/Radar_Detector_Power.pdf

GS/C7 Belt Rattle

Passenger seat belt rattles against the seat back. The solution, add a shoulder belt pad.

http://netwelding.com/Eliminate_Rattle.pdf

Aluminum C7 Chassis and Weld Repair

The C7 has an all aluminum chassis, made from 117 welded pieces. Includes weld repair info.

http://netwelding.com/Aluminum_Chassis.pdf

GS/C7Ceramic Brake Pads

The Z51 has very dusty brakes. These pads help!

http://netwelding.com/Ceramic_Pads.pdf

GS/C7 License Plate Frame;

Must Meet South Carolina Law

http://netwelding.com/License_Plate_Frame.pdf

Manage GS/C7 Spilled Gas & Door Lock

Protect the side of the Vette when filling up with gas. Includes info on preventing door lock failure.

http://netwelding.com/Manage_Spilled_Gas.pdf

GS/C7 License Plate & Cargo Lights

LED license plate light & cargo area bulbs are brighter and whiter

http://netwelding.com/License_Plate_Light.pdf

GS/C7 Rear Cargo Area

Rear cargo area needs storage device and rear protector

http://netwelding.com/Rear_Cargo_Area.pdf

GS Rear Diffuser (Fits Any C7)

Rear Carbon Flash Composite Diffuser

http://netwelding.com/Rear_Diffuser.pdf

GUttrachi@aol.com

GS/C7 Door Panel Protector

Black plastic protector added to prevent scuffing of door when exiting

http://netwelding.com/Door_Panel_Protector.pdf

GS/C7 Improved Cup Holder

A solution to the cup holder spilling under hard braking or shape turns.

http://netwelding.com/Improved_cup_Holder.pdf

GS/C7 Wheel Chatter/Hop

Why sharp, low speed turns with cold tires causes the front tires to chatter/hop.

http://netwelding.com/Wheel_Chatter.pdf

C7 Carbon Fiber Grille Bar

Install genuine carbon fiber grille bar overlay

http://netwelding.com/CF_Grille_Bar.pdf

Jacking a GS/C7 Vette

Safely jacking either front only or back & front

http://netwelding.com/Jacking_A_C7.pdf

Deer Whistle Installed on GS/C7

Do they work? Plus Install Info

http://netwelding.com/Deer_Whistle.pdf

Replacing C7 Battery

After using a GM type charger and showing fully charged a voltage low, replaced battery with AGM!

http://netwelding.com/Battery_Issues.pdf

GS/C7 Window Valet

Lower Windows with FOB

Window Valet Helps 2014/2015 Latch Hatch

http://netwelding.com/Hatch_Latch.pdf

GS/C7 Splash Guards

GM offers splash guards for the C7 Corvette. An easy DIY installation. ACS Best Front Guards for GS.

http://netwelding.com/Splash_Guard.pdf

GS/C7 Blind Spot Mirror

Smaller rear and side windows cause C7 blind spots. Small "blind spot mirrors" help

http://netwelding.com/Blind_Spot.pdf

GUttrachi@aol.com

GS/C7 Skid Pad Protector

After the air dam, the aluminum "skid pad" hits driveway ramps etc. Plastic protector helps.

http://netwelding.com/Skid_Pad_Protector.pdf

GS/C7 Wheel Locks

Wheel locks, torqued to required 100 ft-lbs, help protect your expensive wheels from theft.

http://netwelding.com/Wheel_Locks.pdf

GS/C7 OnStar Lights

Rear view mirror OnStar LED's, at a quick glance, look like a police car flashing light! This is a fix.

http://netwelding.com/OnStar_Lights.pdf

GS/C7 Skip Shift Eliminator

Skip Shift Eliminator install with suggestions on jacking a C7.

http://netwelding.com/Skip_shift_Eliminator.pdf

GS/C7 Catch Can & Clean Oil Separator

Direct inject engines are subject to "coking." What is Coking and how to reduce the potential?

http://netwelding.com/Catch_Can.pdf

GS MGW Flat Stick Shifter

The MGW shifter shortens throw and is more precise

http://netwelding.com/MGW_Shifter.pdf

GS/C7 Round Shift Knob

A round shift knob shortens throw on OEM shifter

http://netwelding.com/Shift_Knob.pdf

GS/C7 Stingray Sill Plate

Stingray sill plate replaces original.

http://netwelding.com/Sill_Plate.pdf

GS/C7 Nylon Bra

Nylon Bra Stops Bugs on Front and Grill. Fits with Stage 3 Winglets

http://netwelding.com/Nylon_Bra.pdf

GS/C7 Clutch Fluid Change

Clutch fluid after 3000 miles gets dirty

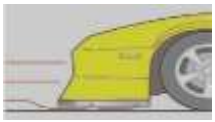
http://netwelding.com/Clutch_Fluid.pdf

C7 Carbon Fiber Hood Vent

Replaces Plastic Hood Vent

http://netwelding.com/Hood_Vent.pdf

GUttrachi@aol.com

GS/C7 Cold Air Intake ***Low Restriction Air Filter & Duct*** **http://netwelding.com/Cold_Air_Intake.pdf**	
GS/C7 Soler Modified Throttle Body ***For Improved Throttle Response*** **http://netwelding.com/Soler_Mod_TB.pdf**	
Garmin GPS for GS Cubby ***Garmin Mounts in GS Cubby & Apple CARPLAY*** **http://netwelding.com/GPS_In_Cubby.pdf**	
GS Splitter Stage 3 Winglet ***Stage 3 Winglets Integrate with Spats*** **http://netwelding.com/Stage_3_Winglets.pdf**	
GS 2LT to 2.5 LT ***Red Upper Dash Pad Like 3LT*** **http://netwelding.com/Red_Dash_Pad.pdf**	
Jake Emblem/Decals for GS ***Jake Symbols Support GS Racing Image*** **http://netwelding.com/Jake_Emblems.pdf**	
GS Splitter Protector ***Scrape Armor Protection for Splitter*** **http://netwelding.com/Splitter_Protectors.pdf**	
GS Engine Compartment Mods ***Cosmetic Additions in Engine Compartment*** **http://netwelding.com/Engine_Compartment.pdf**	
GS Vitesse Throttle Controller: Fits All C7s ***Adjustable Throttle-by-Wire Control*** **http://netwelding.com/Throttle_Control.pdf**	
Boomy Bass Solution ***Use Presets to Adjust Bass etc Tone/Balance*** **http://netwelding.com/Boomy_Bass**	
GS/C7 Air Dam, Functions ***Why Missing from Z51, Some GS & Z06*** **http://netwelding.com/Air_Dam.pdf**	
Engineering a ProStreet Rod ***How Our '34 ProStreet Rod Was Designed and Built*** **http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf**	
Motorsports Welding Article ***Wrote a 5 Page Article for AWS March 2018 Journal Covers NHRA and NASCAR Chassis Design*** **http://netwelding.com/Motorsports_Welding_2018.pdf**	

 GUttrachi@aol.com