

Back Country Times

Volume 10 Issue 1

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This Issue....

~ Meeting of the Minds

~ On the Run

Schedule of Events

* **January 11th** ~ General Meeting @

7:00pm, Arby's on Mt. Rushmore

* **January 15th** ~ SDOHVC Public

Meeting @ 2pm to 6pm, Spearfish
Holiday Inn

* **January 25th** ~ Board Meeting @

7:00pm, Arby's on Mt. Rushmore

Meeting of the Minds

Elections were successfully held last general meeting. Congratulations to our new President, Todd, Vice President Darla, Secretary - Ryan, Treasurer Roberta and the new board Members - Jason and Marty.

On a serious note I've appreciated these words of wisdom for the New Years.



Trail Runs

New Year Trail Run Report:

After our original trail leader bailed out, I guess his jeep is still in a perpetual state of repair, I drafted our always popular former president Brad Rikken to be my navigator. We decided to meet at the Sugar Shack so we could get a good hot breakfast before spending all day in my buggy. The heater and windows don't work too good in it, but Carhartt makes good clothes....



There was a very SMALL turnout by the club this year. (editor: really surprised and somewhat disappointed by this after all the talk about the club never does Sunday runs or they are all too "hardcore") I am expecting a list of feeble excuses. (Terry Fuller, Brad Rikken and yours truly were the only club members present. We were joined by Justin Bailey and Jeremy Ludwig, both guests on this run. I believe it was Jeremy with a super sweet 85 4runner which I quickly tried to buy from him, and Justin in a pretty fancy red TJ.



After we waited till 930, and decided that all of the rest of you were too scared of a little snow so we headed down to Custer Crossing store and unloaded my trailer queen. Another short jump took us to the trail head.

We proceeded to zig zag down forest service roads in search of deep snow. There was a lot off logging going on and the large slash piles made really deep drifts that I circled around and all of the little guys followed.

I think we only had to pull a tow strap once for Terry, the little Samurai does very good in the snow. The 4runner was not locked at all so it had a little trouble, and the TJ had a little more horse power so it could power a little more than the 4 cylinders. From past experience in the area I found a drifted in road with 20 inches on the whole road and I let the little guys bust fresh snow. Terry's Samurai may not be the fastest but it sure does just chug right along, only getting stuck when a hidden log slowed him down.



We found a sunny spot and ate lunch, and zig zagged some more. Terry is very good with his GPS and made sure we stayed on roads approved by our new map. Around 230 we had made it through all of the roads in that area, and decided to call it a day. We found some good snow, 8 inches all the way to 20 inches plus in spots.



The guests said they had fun and plan to attend some meetings here in the future. I had to do a little horse power wheeling to get my truck and trailer out of a very slick spot, and loaded up. Brad Rigger's new Ford needed a visit from the "Ether Bunny" to start and we all headed our way home.



Land Use:

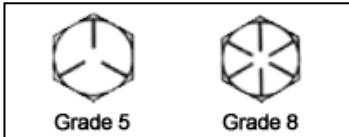
Be aware that the winter closures are in effect. I don't understand why with the limited trails we now have, the FS still insist on having winter closure areas but that's the way it is.

The trail permits are also in full effect. They can be purchased at any of the Ranger District Offices. Ranger Station on Highway 16 is open on Saturday's 9am - 4pm. Remember the sticker is required for anything designated as a "trail" and I believe it would have a TR on the brown marker. You do not need a sticker to drive on the FS roads.

Tech Ramblings:

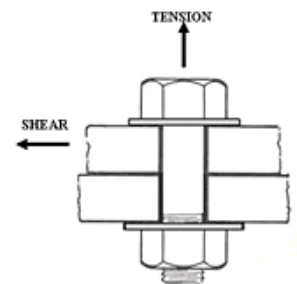
I'm hoping to bring the tech section back in some form or another so I will be writing about various subjects that I stumble onto and hopefully you find it interesting as well. I ran across this statement the other day: "It's better to run a Grade 5 bolt as it will bend where as a Grade 8 bolt is brittle and would break." I cringe when I hear someone say this, and I'll try to explain why.

Let's start with the different bolt classifications, the most common class is the Society of Automotive Engineers (SAE). This is the standard classification of bolts that you might find in a hardware store are used in many everyday applications (largely automotive applications). SAE has three grades of bolts that we should be aware of; Grade 2, 5, and 8. A bolt's grade is simply a reference to a set of specific standards that determine the material composition, heat treatment, hardness and overall strength of a bolt. The grades can be easily determined by the marks stamped on the head of the bolt. Grade 2 bolts have no markings, Grade 5 have three radial dash marking and Grade 8 have six radial dashes (as shown in the figure on the left).



Grade 2 bolts are junk and should not be used for anything, period. They are low strength bolts and if they are laying around it's a good chance Murphy will put them on your rig in a place you don't want to fail. Grade 5 is a medium strength bolt and very common in automotive applications. Grade 5 are specified to have a ultimate tensile strength of 120,000 lbs per square inch (psi) or 120ksi. Ultimate tensile strength (UTS) is the maximum load that a bolt can take before failure. Grade 8 bolts are specified to have a UTS of 150ksi or 150,000 psi.

The next item we need to look at is how our bolt is going to be loaded, in tension or shear (Figure on the right). If the bolt is to be loaded in a shear application we can determine the approximate ultimate shear strength (USS) or ~60 % of the UTS. Now let's look at the load that each bolt could take for failure. We will compare a Grade 5 and Grade 8 - 1/2" bolt. The equation is [Psi = lbs * sq in] so if we rearrange so [Lbs = Psi * sq in] we can obtain the load. Cross sectional area of a 1/2 bolt is ~ 0.1963 sq in.



$$\text{Grade 8 - 1/2" bolt: } 150,000\text{psi} * (0.60) * 0.1963 \text{ sq in} = 17,667 \text{ lbs}$$

$$\text{Grade 5 - 1/2" bolt: } 120,000\text{psi} * (0.60) * 0.1963 \text{ sq in} = 14,133 \text{ lbs}$$

So we can see here that the Grade 8 bolt will take an additional 3,534lbs over the Grade 5 bolt. That's over 1.5 tons more than a Grade 5! Ok great, well obviously a Grade 8 bolt is stronger than a Grade 5 but what about the load at which a bolt will bend? And aren't Grade 8 bolts so strong they are brittle? Well we can determine the loads at which each bolt will bend as well. As for Grade 8's being brittle because they are stronger this is not true and we will discuss this a bit later on.

To determine what the load to bend a bolt is we need to look at the yield (sometimes called the proof strength) strength (YS) of the bolt. To fully understand this concept we are going to start with the fact that all steels have an elastic range. This means that when a piece of steel is loaded and the load is removed the steel will return to its original shape, like a rubber band. There is a point at which the steel will no longer return to its original shape and will become permanently deformed, or plastic deformation. Think silly putty. The point at which the steel will change from elastic to plastic is the YS. The YS is the most important number when dealing with bolts and materials in general. We don't want to design or stretch bolts beyond the YS, once past the YS the bolt is on the path to failure. If we can keep a bolt operating under its YS it will have an infinite life. So really other then determining the maximum load UTS is worthless to us. YS is much more valuable and can be approximated at 90% of the UTS. Since we don't want to load the bolt to its exact YS we will use 87% of the UTS. We will use the same example as above.

$$\text{Grade 8 - 1/2" bolt: } 150,000\text{psi} * (0.87) * (0.60) * 0.1963 \text{ sq in} = 15,370 \text{ lbs}$$

$$\text{Grade 5 - 1/2" bolt: } 120,000\text{psi} * (0.87) * (0.60) * 0.1963 \text{ sq in} = 12,296 \text{ lbs}$$

So this tells us the Grade 5 bolt will bend 3,074 lbs before a Grade 8 will. If we compare the above results to this we can see that a Grade 5 bolt will actual **FAIL** 1,237lbs before the Grade 8 bolt will start to bend! That's over a 1/2 ton more!

Now about the brittle aspect, all SAE grades are considered ductile, not brittle. There have been some bolts that claim to be Grade 9 or to exceed Grade 8 specs. These should be avoided unless you are certain of the manufacturer, these can be brittle due to excessive hardness. One place you can always get good quality bolts from is farm implement dealers. CAT, John Deere, and IH have spent lots of time and money designing bolts, fully understand the metallurgy at meet and can be completely trusted. There are also another classification of bolts that exceed SAE specs, aerospace. Aerospace classifications include Army/Navy (AN), Military Spec (MS), and National Aerospace Standard (NAS), these bolts will always be stamped on the head as to their classification per FAA requirements. FAA does not allow any SAE bolts to be used in aircraft construction, that should say enough. Typically for the average person a Grade SAE bolt will be fine for all applications.

Hopefully give some better clarification on this subject. This article will be posted to the bulletin board and discussion can be continue on there so if there are any questions please post up.