Portland Bolt
& MANUFACTURING COMPANY
Established 1912

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Calculating Yield & Tensile Strength

Q How do I determine the yield and tensile strength of a specific diameter of bolt?

A In most cases, the strength of a given material used to make a fastener has strength requirements or parameters described as pounds per square inch (psi) or thousands of pounds per square inch (ksi). This is helpful when analyzing what grade of material should be used for a given application, but this doesn't tell us the actual strength of that diameter of material. In order to calculate the actual strength values of a given diameter, you would use the following formulas:

Note: the formulas below do not depend on the finish of the fastener.

Ultimate Yield Strength

$$y_{min} \times a = s_{yield}$$

Take the minimum yield in psi of the ASTM grade (see our Strength Requirements by Grade Chart for this value), multiplied by the stress area of the specific diameter (see our Thread Pitch Chart). This formula will give you the ultimate yield strength of that size and grade of bolt.

Example: What is the ultimate yield strength of a 3/4″ diameter F1554 Grade 36 rod?

$$36{,}000\,psi \times 0.334\,in^2 = 12{,}024\,lbs$$

This is the minimum requirement for F1554 grade 36. In other words, a 3/4″ diameter F1554 grade 36 anchor rod will be able to withstand 12,024 pounds force (lbf) without yielding.

Ultimate Tensile Strength

$$t_{min} \times a = s_{tensile}$$

Take the minimum tensile strength in psi of the ASTM grade, multiplied by the stress area of the diameter. This formula will give you the ultimate tensile strength of that size and grade of bolt.

Example: What is the ultimate tensile strength of a 3/4″ diameter F1554 Grade 36 rod?

$$58{,}000\,psi \times 0.334\,in^2 = 19{,}372\,lbs$$

This is the minimum requirement for F1554 grade 36. In other words, a 3/4″ diameter F1554 grade 36 anchor rod will be able to withstand 19,372 pounds force (lbf) without breaking.

Shear Strength

First, find the ultimate tensile strength using the formula above. Take that value and multiply it by 60% (0.60). It is important to understand that this value is only an estimate. Unlike tensile and yield strengths, there are no published shear strength values or requirements for ASTM specifications. The Industrial Fastener Institute (Inch Fastener Standards, 7th ed. 2003. B-8) states that shear strength is approximately 60% of the minimum tensile strength. For more information, please see our FAQ on bolt shear strength considerations.

Share

Written October 10, 2011 by

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105 comments

Andy
December 13, 2016 at 10:24 am
Is it possible to estimate the effects of torsion (torque) on a bolt in relation to its yield and tensile strength? Thank you.

Dane McKinnon
December 13, 2016 at 11:19 am
@Andy- We are not certain what exactly you are asking. We can calculate the torque needed to achieve a specific load, but the effects of torsion on yield? We are not sure.

KAMLESH
September 7, 2016 at 8:15 am
For SA193 B7 bolt of 3/4inch diameter, the allowable Stress at 500F are 25000psi and what torque value should be considered for a Flexotelic Gasket

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Dane McKinnon
September 7, 2016 at 8:18 am
@Kamlesh- I am sorry, but are not able to make recommendations for specific applications like this. Apologies.

Jeff Deutsch
August 25, 2016 at 10:21 pm
As I understand it, in simplist terms, tensile strength is the force required to pull a bolt apart and yeild is the force required to deform it to the point where it does not fully recover. On metric bolts it is listed as a percentage of tensile strength 8.8 is 800 megapascals with 80% yield strength or 640 megapascals. I was wondering how the tensilestrength of the bolt related to the thread strength. I never realized that the bolt would fail before the thread, with sufficient engagement and a female thread of equal strength. How badly does a full thread bolt affect shear strength when it is used in place of a partial thread bolt where the unthreaded part was in the stress or shear area? Thanks, Jeff

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Dane McKinnon

September 1, 2016 at 1:58 pm

@Jeff- Yes, the bolt will always fail in tensile as opposed to thread stripping, unless there is a problem like loose threads or weak female material. As for shear, the strength in the threads is approximately 25-30% less than the shear strength in the shank. That is simply due to the minor (root) diameter of the threads vs the full diameter of the shank.

Chris Laude

September 28, 2016 at 2:27 pm

Slow down there, Dane, you should qualify that “the bolt will always fail in tensile as opposed to thread stripping” statement. The thread will *absolutely* fail if improperly designed or installed. The good news is that it is difficult to imagine a thread failure on a bolt and nut connection, but you should still check that it is installed properly for the anticipated loads, and make sure the assembly doesn’t pull out of the connection material. What i mean is (and this is an unrealistic and exaggerated example), imagine 1/2 inch bolts/nuts bolting into aluminum siding panels – unless you have large washers, the bolts can be pulled right out of the siding. Of course, the siding would likely pull away from the house first, but…

If they think carefully, a competent person can figure out what will work. When in doubt, call an engineer. You may be surprised how willing they would be to work with you, especially if it is an interesting project. If you’re building a structure that could collapse on someone, *always* get a structural engineer to design it.

Dane McKinnon

September 28, 2016 at 2:42 pm

@Chris- You are correct, I should have qualified that if the bolt is improperly designed or installed, it could strip. I will edit. Thanks for the catch.

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z

August 5, 2016 at 5:13 am

I’m attempting to find the maximum weight an 1144 steel rod can hold at both ends, though I’m not sure which type of equation to use.

Essentially, I am making a barbell, and will have weight plates on both ends of the bar. I, of course, will be gripping the bar with both hands, but would like to know what the possible breaking point may be if I only had one lever/one hand on the bar.

Thanks

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z

August 5, 2016 at 5:15 am

Sorry, forgot to clarify the dimensions:

Diameter: 1 in

Length: 96 in

Dane McKinnon

August 10, 2016 at 2:35 pm

@Z- We can calculate the tensile, yield, or shear strength, but to me it sounds like you'd be more concerned with the bar bending. If that is the case, we do not have that equation. We also would need to know the condition of the bar – that is if it was cold drawn, and if so, whether it was a normal draft or heavy draft as that can effect the strength of the bar. For an example, let's use normal draft. The tensile of the bar would be 60,600lbs. The yield would be 54,500lbs, and the shear would be 36,360lbs. Again, for a bending moment or other calculation, you'll need to find someone with that equation.

Chris Laude

September 28, 2016 at 2:35 pm

or, you could just go to a sporting goods store and see what their bars are made of and the dimensions.

you're looking for allowable plastic deformation values, which will depend on bar diameter, length and material strength. You want the bar to be able to bend (so you can still pick it up), but not bend permanently. Difficult to imagine that you'd be able to break or bend a bar made of appropriate material, but you may be the Hulk! This stuff is covered in a subject called "statics" or "static design": http://www.engineeringtoolbox.com/statics-t_63.html

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Samuel

July 26, 2016 at 7:56 am

How can I calculate the thread strength depending of the length of engagement of a bolt in a metal plate? More precisely, I want to ensure that a 3/4-10 bolt won't shear out the threads of the 1in thick plate in wich it is screwed. The plate material tensile strengths are :
Ultimate : 78ksi
Yield : 44ksi
Also the shear modulus is 11600ksi.

Dane McKinnon

July 26, 2016 at 11:50 am

@Samuel- I am not sure how to calculate that, but what I can tell you is that, beyond a certain point, additional thread engagement does not add any more strength, only cost. The first three or four threads shoulder the lion's share of the burden, then it diminishes beyond that. Rule of thumb is that one diameter's worth of thread engagement is sufficient, so a 1″ engagement on a 3/4-10 bolt should be more than enough.

Chris Laude

September 28, 2016 at 2:39 pm

These are such interesting questions! Yes that is a good analysis and rule of thumb on thread engagement. That configuration should be able to carry a hefty static tension load. If it is a large swinging or bouncing load, get an engineer to look at it.

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reza

February 19, 2017 at 6:28 am

please refer to the following link:
http://www.engineersedge.com/thread_strength/thread_minimum_length_engagement_fed-std-h28.htm

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Chano
May 9, 2016 at 6:32 pm
How can I calculate the breaking point (The max weight load when it breaks) of an all thread with the length of 6″.

Dane McKinnon
May 10, 2016 at 7:22 am
@Chano- In a straight line pull, the length of the bolt is irrelevant. The breaking point is the tensile stress area multiplied by the minimum tensile in psi. If your joint is more complicated, and if there are forces that are not in a straight line, then you will need to consult an engineer.

Frederick
May 3, 2016 at 5:35 am
How do I determine the yield and tensile strength for a specific diameter of a 1100 aluminum stud?

Dane McKinnon
May 3, 2016 at 12:33 pm
@Frederick- You would multiply the tensile stress area of the stud by the yield and tensile in psi of the aluminum. We, however, do not have any strength information about 1100 aluminum.

Kelly zimmerman
April 27, 2016 at 9:50 pm
Hello I am seeking the tensile strength of a 1 inch thick a36 steel bar with a 1 inch hole threaded for national coarse thread. I want to know the tensile strength of the threads in the steel. Also I would like to know the same exact thing but for a 2 inch bar of the same steel. Please help I can not find anywhere.

Dane McKinnon
May 3, 2016 at 1:36 pm
@Kelly- This FAQ shows you how to calculate the strength of both bars, however we do not know how the addition of that hole will effect the mechanicals. It will likely be determined by the location of the hole relative to the placement of the nut.

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aman
April 23, 2016 at 1:15 pm
Hey, i want to know if 12 mm MS nut & Bolt can bear a load of 300 Kg

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Dane McKinnon

April 25, 2016 at 11:59 am

@Aman- In order to help you with this question, we would need to know the grade of bolt and nut, as well as how the fastener is being used. For example do you need it's tensile value, or shear value, or perhaps some other value?

Roger Marin

March 7, 2016 at 2:09 am

If a 1/4-20 x 5′ threaded rod falls a distance of 3′ to an uncarpeted shop floor, and there is no one in the building, will it make a sound? Thanks in advance.

Dane McKinnon

March 9, 2016 at 2:11 pm

@Roger – yes

Paul Oliver

March 1, 2016 at 5:41 am

Hi, I have been trying to find a comparison chart to determine at what torque in NM a bolt would go into yield in this case a M20x2.5 A4-80 stainless bolt. any ideas?

Dane McKinnon

March 4, 2016 at 8:34 am

@Paul- Apologies, but we do not have any information on stainless steel torque values.

success

December 30, 2015 at 1:50 am

please how do i calculate the lifting capacity of an m30 shoulder eyebolt and the tensile stress

Dane McKinnon

January 5, 2016 at 7:17 am

@Success- Each individual manufacturer of eye bolts has a chart that lists what their bolts are rated at. You will need to contact the manufacturer of your specific eye bolt to obtain that information.

Gary Teate

December 12, 2015 at 4:41 pm

Hi, I'm building a barbed wire fence roller and would like to use 3/4″ 1018 cold roll round stock for the shaft that the wire spool will attach to. The shaft will extend beyond a pillow block bearing approximately 13″ and will not be supported on the end. The wire spool is approximately 12″ in length and has a 1″ O.D. Steel tube between the spool ends. This 1″ tube has an I..D. a little larger than 3/4″ which will allow the wire spool to slip over the 3/4″ inch shaft. I need to know how much pull weight can be placed on the shaft before it will bend. Thanks in advance.

Dane McKinnon

December 14, 2015 at 10:08 am

@Gary – I am sorry, but we are unable to calculate that information for you. Apologies.

raymond roy

December 1, 2015 at 7:41 pm

hi. could you please help settle an argument between me and my fellow fencing contractor, i think a 76 x 76 x 2mm steel post is stronger than a 150 x 150 pine post, can you please help.

Dane McKinnon

December 2, 2015 at 7:21 am

@Raymond – Apologies, but we don't have the strength data for those two posts.

Abdul

October 29, 2015 at 6:37 am

Hi,
I am new to metal industry, have a doubt. About the standards in Metals, bcoz there are different grades and standards. Starting from EU to ASTM, JIS, IS, GOST, DIN etc. However, for example S235 JR equivalent grade is A283C. My query is what is that makes the metal different, because I have seen Parallel flange I beams according to JIS G 3192: 2014 from Russia. So to understand what is the impact that happens on metal with the standard, whether it is the change in Chemical composition or other mechanical properties.
Kindly advice.

Dane McKinnon

November 5, 2015 at 11:19 am

@Abdul – I am sorry, but we are unfamiliar with those international standards, so cannot comment on them. In general however, it is usually chemistry, mechanical properties, and manufacturing process that can differentiate one grade from another.

vani

September 19, 2015 at 11:33 pm

IS M5 BOLT SUFFICIENT TO CARRY WEIGHT OF 6Kg MOTOR HAVING 270 Kgcm TORQUE

Dane McKinnon

September 22, 2015 at 7:30 am

@Vani- Apologies, but that is not something we are able to help with.

Tom Faris

June 5, 2015 at 8:27 am

I need to do a verification calculation to show that using 10 bolts in a 20 bolt ANSI 900 flange with a garlock gasket operating at 700 psig is safe. How do I show this calculation.

Dane McKinnon

June 8, 2015 at 12:16 pm

@Tom Faris – I am sorry, but that is above our level of expertise. Apologies.

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vinod

April 17, 2015 at 8:31 pm

Hi,

Pls tell me how to calculate clamp load for bolt. I need to use in calculation of Torque Value. In the formula of torque value calculation there is mention clamp load= 75 % of proof load

So pls tell me from where we get this proof load value for bolt. Or give me the calculation of clamp load.

Dane McKinnon

April 23, 2015 at 11:49 am

@Vinod- We chose to use clamploads based on 75% of proofload simply because in a few publications, that seemed to be a semi-common practice. Not every application will be the same. Proofload values should be published in the appropriate ASTM standard, or can be calculated from yield.

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mark knych

April 14, 2015 at 6:49 pm

Hi

I have 3 treated 4×6's that are bowing and want to pull them back into the straight vertical postion. They Are For My Polebarn that measures 24 x 32 and this is on the 32 side. I was wondering if 3/4 threaded rod is overkill since I will be drilling through the 6 inch wide section of the timber. If u can imagine the threaded rod will be anchored horizontally into 6 inches of concrete with epoxy on the face of the garage floor. Wanted to know what grade threaded rod should be used and size.

Thanks

Mark

Dane McKinnon

April 16, 2015 at 1:35 pm

@Mark- Thank you for your question, but I am sorry, we do not have any engineers on staff and can't make any grade recommendations.

Larry Boban

April 7, 2015 at 12:30 pm

We are considering manufacturing a holding rod to support a caster assembly. The material will be 1 inch 4130 steel rod cut to 33″ long with two 90 degree bends one on each end 5 inches in from the end. After manufacture the bar will be oil quench hardened to 1575-1625 degrees for 1.5hrs / heated to 950 degrees for 4 hours and air cooled. The resulting tensile will 163,000 can you tell me the load strength in pounds.

Dane McKinnon

April 10, 2015 at 11:18 am

@Larry- If there are no threads, just 1″ round bar, the ultimate tensile for the bar will be 127,955lbf. I cannot account for any loads on the bent portion, just the straight round bar. I hope that helps-

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Pragash

March 29, 2015 at 2:34 am

Dear Folks,

How do we calculate the remaining strenght of corroded bolts for flange joint integrity?

Dane McKinnon

March 31, 2015 at 8:41 am

@Pragash- I am sorry, but we do not have that information. Apologies.

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vani

March 14, 2015 at 9:47 pm

how can we calculate safe thickness of circular plate made of 1490 LM6 aluminium plate whose diameter is 20 mm.

Dane McKinnon

March 16, 2015 at 8:08 am

@Vani- I am sorry, we do not have that information. Apologies.

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vani

March 8, 2015 at 10:33 am

how can I calculate the strength of rear cover of dc motor whose material is aluminium…give mi hint about the formula's required for calculation…if thickness of rear cover reduces will it affect the strength? plz guide me….

Dane McKinnon

March 9, 2015 at 7:45 am

@Vani- Apologies, but we do not have any information regarding this kind of material. Our expertise is limited to steel and stainless steel fasteners.

Don Quick

February 19, 2015 at 2:46 pm

Thank you for you assistance!

Don Quick

February 18, 2015 at 4:27 pm

I am trying to determine the sheer strength (which I know is an approximation) of three different diameter Grade 5 hitch pins: 3/4 inch, 1 inch, and 1 1/4 inch. Thank you for your assistance.

Dane McKinnon

February 19, 2015 at 7:44 am

@Don – Using the area (3.14 x r^2) and multiplying that by the approximate shear strength (60% of tensile), I get the following values: 3/4″=31,824lbs. 1″=56,520lbs. 1-1/4″=77,301lbs.

Gale Throne

February 11, 2015 at 10:33 am

6″ dia pipe. 1/2″ wall 15″ tall capped on both ends. in Static state, approx. wt. to withstand in compression. stated in tons

Dane McKinnon

February 12, 2015 at 7:57 am

@Gale – Apologies, but we do not have any information regarding the compression strength of pipe.

Samson

January 18, 2015 at 9:45 am

Pls how to calculate area of a tensile bar with diameter 24.25mm and gauge length of 53.100mm

Dane McKinnon

January 20, 2015 at 9:05 am

@Sampson – I am sorry, but we do not have the tensile stress area charts for metric fasteners.

Samson

January 18, 2015 at 9:41 am

I am totally lost. Pls how do you convert diameter to feet or inches?

Dane McKinnon

January 20, 2015 at 9:02 am

@Sampson – 12 inches = 1 foot. 25.4mm = 1 inch

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waseem

December 11, 2014 at 4:48 am

what is that yield strength of a 5″ round 14 gauge gi pipe.

Dane McKinnon

December 12, 2014 at 7:12 am

@Waseem – I am sorry, but we don't know how to calculate mechanical properties on pipe.

Pat

November 15, 2014 at 7:45 pm

Thank you for a very concise explanation on calculating yield and tensile strength.

Now, onto my question:

I want to hang an elephant over my bed with a single lag bolt screwed into my ceiling. I don't know how much the elephant weighs nor do I know if it will just be into drywall or a rafter. What lag bolt do I need (don't use a safety factor – I like to live dangerously)?

Yes, feel free to moderate my comment and delete my sarcasm (or whole post for that matter), but I do thank you for the information.

Dane McKinnon

November 21, 2014 at 9:24 am

@Pat – The biggest question would be Asian or African elephant? Let's go with African, as they are the larger of the two. Males can weigh up 14,000lbs, so we'll use that as a worst case scenario. A 3/4″ lag bolt, made to ASTM A307A would have an ultimate tensile strength of 14,874lbf, so it would support the weight by itself. However, the limiting factor will be the material it is screwed into, and the wood will typically yield before the lag bolt will, so you may have a problem using only one lag bolt. Not to mention that I doubt your roof/ceiling was designed to support that kind of weight. My suggestion would be to rig up a sling like they did in Smokey and the Bandit II, that supported Charlotte the elephant, and she was pregnant.

Dave

September 13, 2014 at 6:42 pm

Hello, I am building a 125" long by 4' dining room table out of laminated slabs 3" thick (5 slabs side by side to make 4') and I am going to drill 5, 1/2" holes divided equally all the way through them I am planing on using steel threaded rods to secure the table top together and I was wandering what would be the best steel to support this kind of load to prevent sagging in the middle. Thank you.

Dane McKinnon

September 16, 2014 at 6:32 am
@Dave – I am sorry, we we don't have the expertise to make any recommendations like that. We do have strength and grade summaries on our website, and are happy to give to any technical information we have, but we do not have any engineers on staff.

Shaira
August 26, 2014 at 6:40 am
If i have a Cabinet that weights 200 to 2000 pounds and we are using 3/8″ grade 2 bolts, will we have any problem?

thank you

Dane McKinnon
August 29, 2014 at 7:49 am
@Shaira – You should be OK, but it depends a bit on exactly how the bolts are being used and how the cabinets are attached to the framing. Your best bet would be to consult an engineer to confirm.

AL LENTES
August 6, 2014 at 6:09 am
I have a question.
What would be the tensile strength of a fastener Shoulder bolt: .500 dia shaft 3/8-16 thread?

THANKS

LENTES
08/06/14

Dane McKinnon
August 7, 2014 at 9:59 am
@Al – I think shoulder bolts are made per the same standard as regular socket head cap screws (ASTM A574). If that is true, your 3/8-16 shoulder bolt would have an ultimate minimum tensile strength of 13,900lbs. You may want to confirm that your bolts were made to the A574 standard, we don't usually handle shoulder bolts, so I am not certain.

Ryan
July 15, 2014 at 6:12 am
I'm standing a 5000lb tare on top of another 5000 lb tare. Each has a 115 ton capacity. They are supporting a 100 ton rod shaped stator field. The field can move in the axial direction some which is why I'd like to bolt the two tare's together. My question is what size bolts would I need to be able to support the stress of the field moving in the axial direction?

Dane McKinnon
July 15, 2014 at 7:38 am
@Ryan- Apologies, but this is slightly above our level of expertise, as we do not have any engineers on staff.

Matt e

July 4, 2014 at 6:16 am

I’m hanging a porch swing into a 7foot long 2×12 that is supporting my balcony. The total weight it needs to support is 700lbs and my mounting hardware has two bolt holes for each chain. Spread over four galvanized lag bolts, what’s the minimum diameter and length of a lag bolt I need?

Dane McKinnon

July 10, 2014 at 8:22 am

@Matt – from a bolt strength standpoint, anything 1/4″ diameter or larger would support the weight. However, the weakest point will be where the bolt screws into the wood and the strength will be limited by the pull out value of the wood. That is information we do not have. Apologies.

Chris Lumbricusland

March 17, 2014 at 11:51 am

Im looking for a simple steal tensile strength calculator for metal tubing/axles. Specifically 35mm diameter 3mm thick 1000 mm long. Looking for the minimum tensile strength that would be needed to be applied in the center in order to distort/bend the tube/axle.

Dane McKinnon

March 18, 2014 at 7:05 am

@Chris Lumbricusland – Sorry, but we do not have any information on calculating that. Apologies.

john

February 20, 2014 at 1:33 am

how can i compute the 8-1/2″ diameter steel to find the ultimate yield and tensile strength?

Dane McKinnon

February 20, 2014 at 8:01 am

@John – You could simply use Pi x r^2, so 56.74sq in of stress area. Then multiply that by your tensile and yield (in psi) and that will give you your ultimate strength.

Rachid

January 18, 2014 at 7:44 am

Sy = 58 Ksi ER316L rode yield strength
Pr=2.94Ks Hydrostatic test pressure
0 = 1.13in Bolt diameter
l=1.375 in Bolt’s head size
T (in) Weld fillet throat dimension
P (lbs) Load applied on the bolt by the internal pressure
SVP, comment calculer la gorge du boulons apres soudage.
Merci

Dane McKinnon

January 20, 2014 at 7:56 am

@Rachid- Apologies, but that is a little out of our realm of expertise.

adhi ganesh

January 10, 2014 at 1:00 am

how to calculate the strength of the steel for tension member without using tensile load method?
any other method to calculate strength of steel with or without using IS(indian standard) code book?

Dane McKinnon

January 10, 2014 at 7:24 am

@Adhi – I am sorry, I do not completely understand your question. We can help in calculating tensile strength values for fasteners using the above methodology. If you have some specifics about what you are trying to calculate, please email me and perhaps I can assist.

Erinosho Mutiu

January 5, 2014 at 10:20 am

how do I calculate the ultimate tensile strenght of Ti6Al4V from hardness values.

Dane McKinnon

January 6, 2014 at 7:25 am

@Erinosho – There are conversion charts available to convert hardness to tensile for steel and steel alloy products, but I do not know if they are accurate for Titanium alloys. I can happily send you a copy if you are interested.

jd

December 6, 2013 at 10:18 am

I have a welded test coupon that is made of x70 pipe. the cross section of the coupon is .250x.250. I am using a tensile tester to measure tensile strength. what is the formula to see what tensile the material actually is?

Dane McKinnon

December 6, 2013 at 10:32 am

@JD – I am sorry, but we do not have any experience with testing pipe or special samples like that. You will need to contact a test lab for more information. Apologies.

Ted

January 29, 2013 at 6:42 am

Ted again
I did make a mistake but the question is the same.

.312 x.312 x 3.14 = .305 x 36,000psi =11,003
Thanks Ted

Dane McKinnon

January 29, 2013 at 7:08 am

@Ted – The error you are making is a common one. When calculating the strength of a fastener, the tensile stress area you use is the area of the minor(root) diameter of the threads, in this case 5/8-11 is 0.226 sq in. So 36,000 x 0.226= 8,136lbs. If instead, you are trying to calculate the strength of a full sized bar with no threads, then you did the math correctly.

Ted

January 29, 2013 at 4:49 am

I am trying to calculate the yield strength of that 5/8″ bolt and I'm not seeing how you are doing your math. If I take the area (pie x r sqd) I get 3.14 x .312 x.312 =1.962 x 36,000psi tensile = 70,650 yield. what am I doing wrong?
Thanks Ted

Ed Easter

December 3, 2012 at 4:21 pm

Frequently people are concerned about threads pulling through the nut (shearing the threads). If nut and bolt are made from the same material,and thread engagement is at least 55% the bolt will pull into (tensil) before the thread shears. (General Electric standard 12A1200),
Tensil strength of any material is available in many metalurgical sites on the internet. You only need to calculate the cross section area of the bolt X tensil strength of material bolt is made of. That will tell you how many bolts are needed to support the load + safety factor

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Pierce

November 13, 2012 at 12:21 pm

Id be interested in the same thing that Ryan is asking above. Any thoughts?

Thanks,

Pierce from PBEMusic

Dane McKinnon

November 13, 2012 at 12:31 pm

@Pierce – Ryan's question was answered by us directly above his question. I would agree with that response – it isn't anything we can easily calculate.

Ravish

September 24, 2012 at 3:34 am

how do you calculate 0.02% Proof stress. is it possible that your bolt passes in tensile strength and fails in proof stress.

Dane McKinnon

September 24, 2012 at 6:59 am

@Ravish – Yes it is possible, but not common, that a bolt can pass the tensile test but fail the proof load test. Typically speaking, the 0.2% offset is only used when testing for yield strength, not for testing proof stress. Proof stress is a simple pass or fail test where the full size bolt is tensioned to a predetermined proofload value, held for 10 seconds, then measured to see if it elongated. Yield strength differs in that the bolt or test coupon is pulled to failure, and the yield is calculated (using the 0.2% offset method) along with the tensile, elongation and reduction of area. In order to calculate using the 0.2% offset method, you must first secure data from which a stress-strain diagram may be drawn. More detailed information can be found by looking at ASTM F606 Section 3.6.3.1 or by contacting an accredited test lab.

W J

June 21, 2012 at 5:13 pm

Example 1: Area of rectangular cross section
width (w) = 0.505 in.
thickness (t) = 0.5 in.
Area (a) = W x T
AREA (A) = 1.5 X 0.5
AREA (A) = 0.75

LOAD =12500 LBS
AREA = 0.2 IN. 2
Tensile = 12500 x 5
tensile = 62500
Must be an easier way of computing this Tensile Stength of Steel in question.
most of the time I deal with ASTM OR API CODES
SUCH AS X70 OR X65 FOR USE IN THE GAS AND OIL PIPELINE.

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zewde tegenu

October 5, 2015 at 1:44 am

please attach the detail calculation of steel hollow section pipe SHS40x40x2.5 where thickness is 2.5
a, tensile strength
b, yield strength
c, cross sectional area

Dane McKinnon

October 8, 2015 at 8:41 am

@Zwede- I am sorry, but we do not have any information on hollow pipe.

Donald E Brundage Architect

February 21, 2012 at 7:55 am

What is the shear strength required for an expansion bolt into concrete with a load of 3,500 # axial load. In what book is it shown in. can I download it on any website. What would be that website or manufacturer be?

Dane McKinnon

February 21, 2012 at 11:48 am

@Donald E Brundage – I would try to contact the International Code Council or look on their website; they write a lot of the specifications for expansion anchors and those types of construction products.
http://www.iccsafe.org/Pages/default.aspx

Ranjeet

December 4, 2011 at 11:25 pm

what is proof strength of material and how is it calculate,have any formula

Dane McKinnon

February 14, 2012 at 1:54 pm

@Ranjeet – there is not a one-size-fits-all formula for proof stress. Many ASTM specifications have published tables for proof load values, but not all do. Normally, the proof load values are about 90-92% of yield,but that can vary.

Ryan Mozingo

August 9, 2010 at 9:09 am

could you give me an estimated weight just for comfort is it atleast 5000 lbs per bolt

Jonathan Waltner

August 9, 2010 at 9:39 am

@Ryan Mozingo – Unfortunately, the value that you are looking for is impossible to calculate with any accuracy. We have an FAQ that addresses the difficulty of calculating strength values for lag bolts.

If you are looking for a generic calculation, I can offer a strength calculation based on a mild steel rod. A 5/8″ lag bolt has a minor diameter of 0.471″, which calculates to a stress area of 0.17497 sq. in. Applying the formula for calculating tensile strength for a mild steel bolt, we get a value of 10,500 lbs. for the ultimate tensile strength of a 5/8″ mild steel bolt. The shear strength, which I think you are concerned about would be about 60% of that value. **Unfortunately, there is no way of verifying what grade your bolt is, or what steel your bolt is made out of, so there is absolutely no way of verifying the validity of the above information**. I would consult an engineer and have your bolts tested if you are concerned about safety.

Ryan Mozingo

August 9, 2010 at 8:36 am

i was curious if you could tell me how much weight a 5/8 inch by 12 inch lag bolt can hold up i have a tree stand 21 feet in the air so i would like to tell people this so they feel more comfortable thank you for your time