Re: Questions regarding maximum yield strength for standard hardened steel dowel pins

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- *From*: jbuch <jbuch@xxxxxxxxxxxxxxxxxxxxx>
- *Date*: Wed, 01 Mar 2006 17:34:30 −0600

John2005 wrote:

> Hello everyone,
>
> I would like to ask if anyone could please help me with the following situation.
>
> I am using a standard hardened steel "pull out" dowel pin from www.mcmaster.com as a bearing shaft. I need to know the maximum load the dowel / shaft can support without taking a permanent set and/or becoming permanently deformed or bent. I need the shaft to always spring back to its original position after the load is removed.

Make sure that the loads never get very close to yielding the shaft, if you only knew the yield strength of this catalog article.

> I emailed Mcmaster, but they were not able to give the maximum Yield strength of the dowels.
>
> Does hardening increase the maximum Yield stress? If so, is there a way to calculate or estimate how hardening affects the yield stress ? If I know the yield stress, then I can compare the maximum yield to the bending stress given by my beam design program, and I think this will tell me if the dowel can support the load without taking a set.
>
> Here is what Mcmaster said about the dowels and material...
>
> "Hardened Steel− Made from hardened steel such as C1541, or 4037 and 4140 alloy steel. Core Rockwell hardness is C47−C58 (surface hardness is RC 60). Shear strength is the amount of force that the side of a pin can withstand before breaking. Single shear strength is the amount of force applied against a fastener in one place causing the fastener to break into two pieces. Single shear strength is 130,000 psi. An internally threaded tapped hole in one end of these pins lets you pull them out with a removal screw or a threaded puller such as 92330A (see

> page 3083) and reuse them. All meet ASME B18.8.2. Length tolerance is ±.010"."
>
> I would appreciate any advice or suggestions on how I can get a close estimate on this, and what would be a reasonable safety factor to apply. Nobody could get hurt if the device fails, but I just need it to be reliable. I have to consider several factors when choosing a shaft size, and everything fits in a tight space.
>
> There are tradeoffs and space constraints when going to a bigger shaft, so I need to know how to estimate this in order to make the best compromise. It's desirable to use the smallest shaft diameter possible, that will support the load with a reasonable safety factor & not take a set.
>
> Thanks for your help.
> John

You might be learning a good lesson here.

You picked a part from a catalog.

The catalog dealer tells you he doesn't know what material it will be made of.......

He tells you that the surface hardness is evidently fairly well known.

However, he tells you that the interior hardness can vary quite a lot.

Since there is an empirical correlation between ultimate strength and the hardness, you know that the untimate strength can vary a lot.

You can figure out how much the strength variation could be by google searching for "Correlation hardness ultimate strength rockwell c" meaning that you are looking for the correlation between ultimate tensile strength and the hardness as measured on the Rockwell "C" scale.
You will be able to see that there is an enormous strength difference between Rockwell C47 hardness and C58 hardness.

You may therefore assume that the tensile strength will be equivalent to that of Rockwell C47 − at a minimum.

There is also an emperical correlation between hardness and yield strength, so you can repeat all of the above to give you an estimate of the yield strength of whatever alloy you end up with.

Remember, the manufacturer told you that you might get any of a number of alloys.

The lesson I would take away is to not buy a "part" and then use it for a different purpose than intended.... unless I had some way to become assured of the minimum mechanical properties of the "part" so one could do an analysis.

Without having the properties of the part, analysis might not be very meaningful.

A number of people make bearing shafts for various purposes, and maybe that is the way to go. At least the catalog from a bearing shaft outfit might have the appropriate bearing shaft data.

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I can imagine a way to use a metallic zipper as a sort of continuous switch.

I wouldn't expect to get much help from the zipper industry with my questions on the electrical characteristics of zippers..... because the zipper industry makes fasteners, not electrical switches.

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Good luck.

I would approach the problem using the bearing shaft catalogs first and foremost.

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1) Eat Till SATISFIED, Not STUFFED... Atkins repeated 9 times in the book
2) Exercise: It's Non−Negotiable..... Chapter 22 title, Atkins book
3) Don't Diet Without Supplimental Nutrients... Chapter 23 title, Atkins book
4) A sensible eating plan, and follow it. (Atkins, Self Made or Other)
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