THE HOBSON Update

Volume 7

From the desk of Peter Hobson

Why 10.9 Bolts?

Isn't 8.8 strong enough?

When you buy a bolt you are buying clamp load. Clamp load, the clamping force developed through the tightening of the fastener, is what keeps the joint faces firmly together. It keeps machinery and equipment operating, holds structures together under all conditions of loading which saves accidents and lives. So, the higher the clamp load, the greater the joint integrity, the more secure the mechanism or structure and the safer it is for the most important resource of all, people.

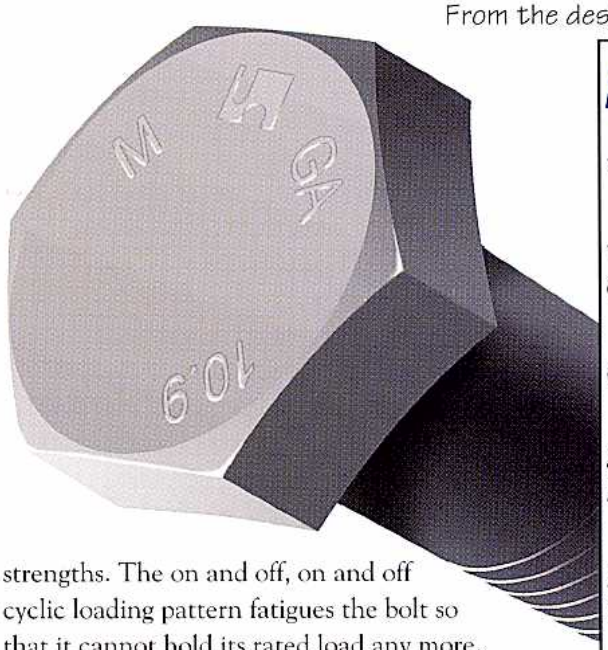
What Are The Advantages?

Clamp Load

Class 10.9 bolts provide much greater clamp loads than ordinary class 8.8 high tensile bolts—much greater than the difference between their Ultimate Tensile Strengths. This because it is the Yield strengths which comparisons have to be made upon, not the Ultimate Tensile Strengths. The differences are in fact:

Bolt Class	Tensile Strength MPa (nom)	Yield Strength MPa (nom)	Index
8.8	800	640	100
10.9	1000	900	141

That extra 41% in clamp load is the central reason why industry needs to look very closely at up-grading from class 8.8 to class 10.9 hex bolts. The 41% extra clamp load guards against the great destroyer of bolts, fatigue. It is common knowledge that parts will fail under repeated loading over a sufficient number of cycles at loads well below their tensile



strengths. The on and off, on and off cyclic loading pattern fatigues the bolt so that it cannot hold its rated load any more.

Increasing the joint interface clamping force to a point above the maximum alternating external (or working load) means that the bolt will not sense any of the external load and so will not be exposed to cycling. Obviously, clamp force can be increased by adding extra bolts. However, this is a clumsy and usually *very* expensive way to go—it is seldom (if ever, these days) seriously considered as a solution.

The widely accepted practice is to upgrade the fastener to handle the extra clamp force. That is, to use a class 10.9 bolt for increased safety and reliability, to use a class 10.9 bolt so that its extra clamping capacity can be utilised to minimise its exposure from alternating external loads which generate fatigue failure.

This is why critical aerospace bolts are made in extremely high strengths—it's a comforting feeling, when passing through severe upper air turbulence, to realise that the bolts in all the critical places are so strong and tightened to such a degree that it is the joints

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Inside...

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Tightening to achieve Clamp Load

The most desirable clamp load in the great majority of applications would be achieved by tightening the bolts to the point where their internal stress (in the thread stress areas, of course) is taken up to but not beyond the yield point. This can only be done in practice by using strain gauges or through the use of very expensive state-of-the-art electronic torque wrenching equipment, such as is used in aerospace and some very high volume automotive engine, transmission and brake system assembly.

In general engineering practice it is a matter of tightening by operator feel, using a torque wrench or employing the turn-of-nut method. As there is not a high degree of accuracy with either operator feel or torque wrench tightening commonly used, it is necessary to make allowance for this in the formula used to produce the tightening (or seating) torque. For this reason seating torques recommended by Hobson Engineering align closely with industry practice and take the internal stress (preload) in the thread stress area to 65% of the Yield strength.

The degrees of accuracy with various methods of tightening are shown in the following table.

Preload Measuring Method	Accuracy %	Relative Cost
Feel (Operator Judgment)	±35	1
Torque Wrench	±25	1½
Turn-of-Nut	±15	3
Load Indicating Washers	±10	7
Fastener Elongation	±3 to ±5	15
Strain Gauge	±1	20

Table from Industrial Fastener Institute (U.S.A.) Handbook

The turn-of-nut method involves the turning of the nut, beyond 'snug', through a particular angle calculated to produce a chosen stress in the thread. It takes longer to complete than either the operator feel or torque wrench methods, but does offer considerably more accuracy and does not require elaborate or fixed equipment. If required, we can assist with the turn-of-nut angle calculations. The Hobson recommended seating torques for the new range of class 10.9 bolts is as follows:

Thread Size	Thread Pitch	Tensile Strength		Yield Strength		Recommended Tightening Torque†
		MPa	Kn	MPa	Kn	Nm
M24	3	1 040	367	940	332	1 030
M27	3	1 040	477	940	431	1 520
M30	3.5	1 040	583	940	527	2 060
M33	3.5	1 040	722	940	653	2 800
M36	4	1 040	850	940	768	3 590
M39	4	1 040	1 015	940	917	4 650
M42	4.5	1 040	1 165	940	1 053	5 750
M48	5	1 040	1 530	940	1 383	8 640

† For plain finish, as supplied. Please refer to us for details on tightening torques for all other sizes and on the multipliers for various surface coatings.

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Hobson's 1993 Christmas Party

Floating 'round the harbour in style

It was the idea of Kevin Chappell, our Plant Manager, to have the Christmas party cruising our scenic Sydney Harbour. As with any of these events the organiser's job is a thankless one—if it turns out to be a disaster, you hear nothing but complaints and if it turns out to be a great night, not even a word of praise is said! So, on behalf of the team at Hobson's, I would like to thank Kevin for a great night.

The night began with the jostling for the favoured tables and, of course, company. The mature personnel made for the intimate small booths where refined conversation was possible and the alcohol bill kept within reason. Those after a well lubricated evening made for Toupo and Betty's table, where the prerequisite was BYO hip flasks unobtrusively concealed. The young at heart made for the large table in the middle where refined conversation held no credence, where sexual innuendo was rife, where the drinks were going to be exotic and where the alcohol bill was going to resemble the profit figures of five years ago. I might add that this table also was the table where the young and beautiful would reside, and with such stunners as Jacqui, Angela and Tanya, my wife Lisa and I would have felt out of place anywhere else.

> *"The young at heart made for the large table in the middle…"*

This was truly a gala event, with everyone adorning their Sunday best, or on our table, their sexiest outfits. Obviously David (Jacqui's Bo) was overawed by the sight of Three Musketeers—Angela, Jacqui and Tanya—by the glazed look in his eye and the gentle swaying from side to side. I guess the rumour that he had a little too much to drink at his works Christmas lunch may have been true.

Mia & Friend

How the drinks bill was going to be split was a source of concern to me after Angela ordered this green concoction that I am sure was as expensive as it looked. And then, not to be outdone, our own Murphy Brown ordered a fluorescent bubbling brew that made her giggle at each sip, "Ooh, it's so sweet!!"

And then the on board entertainment. Well, um… Ok, lets forget the on board entertainment, apart from a fond memory of some pituitary glands being fully exposed, it was not the highlight of the evening.

After dinner, the young made for the dance floor, the lovers made for a quite corner, the old and old at heart made for the top deck to enjoy the scenery. The mid life crisis age group could not decide where to go, so Kevin was seen at all locations. Horst and his wife had the right idea—they enjoyed the scenery on the top deck and then booked a hotel room for the night upon docking.

Everyone enjoyed the night, including me and although I managed not to make any speeches, I would like to sincerely thank the team at Hobson for the great work they have put in through 1993 and look forward to improving the company with their help in 1994. As with many companies we have a few strained relationships throughout the year, but when all is said and done, we have a great bunch of people at Hobson's!

Hey Kevin, if you don't get off the dance floor, you'll miss the ferry home!!

Betty, Lan & Sam

Kevin & Pam Chappell

Survived The Recession?

Profits Here We Come!

I suppose if you're reading this newsletter the chances are you have survived the recession, and frankly, that is no easy feat. However it would seem axiomatic that if you survived "the recession we had to have" then now the good times are here you are really going to move. Well, I think that this for many won't be achieved quite as easily as it would seem. The companies that have not wasted the absolutely incredible opportunities presented with a recession will be in a fine position, those companies that have been in survival mode I believe will face greater troubles now the upturn has started.

> *"... if you survived "the recession we had to have" then now the good times are here..."*

The first problem will be supply. For many a recession means reducing ones own stocks and "living" from the suppliers stock on a day to day basis. This works reasonably well, however as economic activity increases the suppliers stock are going to be strained and also they will not be able to dispatch every order the same day and hence the end user will not receive the same service.

The second problem will be cash flow. Greater sales, more stock, less cash. This I believe will finish off a few fastener merchants (non Hobson!) that should have gone earlier, and perhaps a good thing for all concerned.

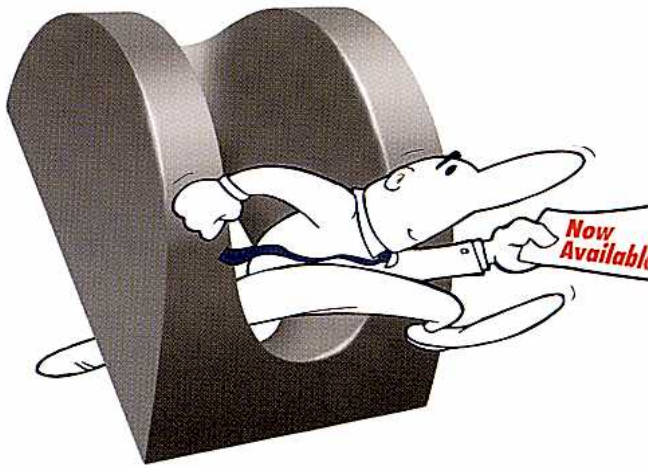
The third problem will be reserved for those companies that have survived the recession by excessively cutting prices without addressing their internal systems. It is service that will win in the upturn, not a few percent points in place of service! The price cutters who don't go under will fall back into obscurity until the next recession.

Fastener Distributor Takeover Season Begins

How safe are you?

Have you heard all the rumours regarding takeovers yet? The large companies, especially the public companies, will be on the look out for businesses that hold good market niches or market shares. These companies need to have Australian wide distribution centres and they don't all have that. My guess is that medium sized distributors in Queensland and Sydney will be taken over this year by one of the larger players in the market. It must be done soon to be capitalise on the upswing and minimise the purchase price.

I also would not be surprised to see a few manufacturers be taken over, maybe not this year, but I would think in the next five years there will be some major changes in the industry.



Wind Bracing Brackets

M12/M16, M20 & M24 Sizes

All are Zinc Plated Malleable Cast Iron

"Don't put off for tomorrow what you can do today, because if you enjoy it today you can do it again tomorrow."

Part Numbers

New, easy to remember, numbers!

What can take only a few hours to decide and yet be a source of aggravation for a life time? I guess many people would say marriage and some even what associates with it (maybe not hours to decide!) but the answer I am after is "Part Numbers". Yes, those seemingly unimportant little groups of characters that define an item.

It has always been embarrassing for me to run an organisation and not to know the part number of every product or, in fact if the truth be known, any product. However, I just don't have one of those minds that remembers groups of numbers, especially when they are illogically grouped.

When a computer system was first introduced in our company, some 18 years ago, a fully numerical part number system was devised. The code was made up of 13 characters that were logically defined. As our company has grown and our product range increased, these numerical part numbers became a nightmare to keep logical.

It was my opportunity when we started to implement a new computer system last year to totally overhaul our part number system. A system that was totally logical, a system that was alpha numerical, a system that I could know the part number of every product! So with the help of our resident actuary genius (Peter Whiting), we developed a system. The only draw back was the loss of typing efficiency over a fully based numerical code and, of course, the sales team knowing off by heart the old codes. It was all too much for Bill who spent a whole Saturday typing in their old codes as aliases for the new. Although, when he thinks I'm not watching, Bill is often seen using the new codes–especially on the newer products.

The new codes are arranged as follows:

- 2 character–Product group
- 2 character–Material
- 1 character–Coating
- 1 character–Thread type
- 4 character–length

So, M10 x 3 metre mild steel ZP allthread has a code of ASMSZCM103000, where

- ☞ AS = Allthread Steel
- ☞ MS = Mild Steel
- ☞ Z = Zinc plated-Clear
- ☞ C = Metric Coarse Thread
- ☞ M10 = Nominal Size
- ☞ 3000 = Length in millimetres

A few more examples:

- ☞ NHMSGW025 stands for 1/4" BSW Hot Dipped Galvanised mild steel hex nut (NH stands for Nut Hex)
- ☞ NP2HPU250 stands for 2-1/2" UN8 grade 2H nut (NP stands for Nut Petro)
- ☞ BH10PCM300130 stands for M30 x 130mm Class 10.9 Hex Bolt (BH stands for Bolt Hex)

The system is simple, logical and will be absolutely fabulous for our rapidly growing product range.

“The system is simple, logical and will be absolutely fabulous for our rapidly growing product range.”

Are You on Our Mailing List?

The Hobson Update is free of charge and is produced to provide interesting information to our fastener distributors and their customers. If you would like to be included on our mailing list, please complete and return the following form.

Title _____ Firstname _____

Surname _____

Position _____

Company _____

Address _____

_____ Postcode _____

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Why 10.9 Bolts?

Continued from Page 1...

that are absorbing those bumps and *not* the bolts. The principles are no different on the ground and this makes the decision to upgrade to class 10.9 bolts a very wise one.

Resilience

In practice, of course, it is usually to be expected that the bolt will sense some of the external load. Because of their very much higher clamp load capacity, this will be very much less in the case of class 10.9 bolts by comparison with class 8.8 alternatives. Nevertheless, since there is likely to be some 'give' or compression in the joint material (as this is most usually a bit softer than the bolt), the bolt will in fact be marginally exposed to the repeating external load. Its capacity to absorb this energy, or its resilience, therefore becomes a factor.

Since resilience varies with the stress at the limit of proportionality (PL) [we will take the yield point (YP) as this is close to the (PL)], it can be shown that class 10.9 bolts are a little over 100% more resilient than class 8.8 ones. For example, taking the nominal yield strengths given above, class 10.9 bolts are:

$$\left(\frac{900^2}{640^2}\right) = \left(\frac{810\,000}{409\,600}\right) = \text{Roughly twice 8.8 bolt's resiliance}$$

So, 10.9 bolts are about 100% more resilient than class 8.8 ones. Of course, to find the resilience of particular bolts, the examples need to be worked through the threaded and unthreaded volumes (which have to absorb the energy). Use the published 10.9 and 8.8 bolt yield stresses for the comparisons between otherwise similar bolts in the two classes. The following table gives a few examples of the actual relationships taking Hobson class 10.9 and elsewhere published class 8.8 yield strengths as the basis for comparison. Please refer to us for information on any other size of interest.

Bolt Size	Internal Energy (Joules)		Percentage Difference (Approx)
	Class 10.9	Class 8.8	
M24 x 120	79	39	103
M30 x 200	208	102	103
M36 x 300	453	223	103
M42 x 350	728	359	103
M48 x 400	1 095	540	103

> *"The principles are no different on the ground and this makes the decision to upgrade to class 10.9 bolts a very wise one."*

What About That Old Ductility Bogey?

There still exists a concern in the minds of some people that bolts above class 8.8 do not have enough ductility. It is their fear that failure would be more sudden with higher strength bolts because of their lower percentage elongation characteristic under laboratory tensile test conditions—conditions which require the bolts to be pulled through the elastic and plastic extensions on their way to failure, so that percentage elongation can be measured.

In the few cases where permanently fixed bolts are intentionally tightened well into the yield zone, doubters would have a point. But the fact is, in nearly all cases, they are not.

The facts are: 1) it is the clamp load produced by the bolts which holds joints together; 2) therefore, the stronger the bolts the greater the clamp load; 3) most fastener failures occur through fatigue—i.e. the failure of bolts through repeating loading, on and off, over and over, even at stresses well below their ultimate tensile strengths; but 4) when the joint faces are always held firmly and solidly together by very strong bolts producing a total clamping force greater than the highest dynamic external load, the bolts will only sense a very small part of the external load.

That is, they cannot stretch and relax, over and over, until they fail due to fatigue to anything like the extent a lower strength bolt would. Consequently, although class 8.8 bolts may well show a higher percentage elongation than class 10.9 ones, they would be subject to earlier fatigue failure, bolt for bolt, because of their inferior clamp load capacity. Clearly, the only way a joint could be similarly clamped (total kN) with class 8.8 bolts would be to use more of them.

This is why aero-space bolts are made as strong as they are. Who would care to fly in an aircraft held together in the critical areas with class 8.8 bolts. In that industry they go well beyond class 10.9. In fact, right up to (and even beyond in some cases) 1800 MPa UTS bolts. Were it not for their prohibitive cost and associated sourcing difficulties, such bolts might even find a very special industrial application here and there.

There is, of course, always concern about the percentage elongation of materials used in the manufacture of structural items (RSJ's, etc.) and things such as chain slings and crane hooks. Here it is most important for plastic deformation to be evident should this arise. But with bolts used under dynamic load conditions, as most are, deformation needs to be avoided *as far as is possible*. This is done by choosing a sufficiently high strength class to allow properly tightened bolts to include clamp loads so high that they minimise the extent to which they sense the fatigue failure producing external dynamic loads.

It is not only aero-space joints which are subjected to severe dynamic loading—general engineering is full of them. So is manufacturing. If ever there was a cause for concern about the cost and consequences of fastener failure, it would be in the huge stamping dies used in the automatic industry. These dies are very expensive, take a long time to set up and have to absorb enormous repetitive impact loads whilst in use on long production runs. You won't find the automotive industry using class 8.8 bolts to hold together these tools today.

Quality Standards

Hobson class 10.9 Hex Head Bolts are produced to the very highest standards in every respect. Apart from all the usual rigorous tests necessary for very high tensile bolts (dimensional and thread fit tolerances, through-hardness and final physical properties, geometry and grain flow in points of stress concentration such as in thread roots and head-to-shank junction), every bolt is routinely subjected to magnetic particle inspection to test for possible very fine hairline cracks, invisible to the eye.

So for increased joint integrity, up-grade your connections by specifying Hobson 10.9 bolts. *There just is no substitute for quality and reliability.*

Class 10.9 Hex Head Bolts

Now Available As A Stock Item

Ready for your call, we now have in stock class 10.9 Hex Head Bolts in a wide range of lengths and diameters between M24 & M48. These bolts have all the advantages of class 10.9 bolts but are priced like our competitor's inferior class 8.8 products.

To complement their high strength, Hobson class 10.9 bolts should only be used in conjunction with the following high strength nuts which are also in stock:

Hobson Class 10.9 Bolt Size	Recommended Nut Selection
M24	Class 10 Nuts
M27	Sampson Nuts
M30	Class 10 Nuts
M33	Sampson Nuts
M36	Class 10 Nuts
M39	Sampson Nuts
M42	Class 10 Nuts
M48	Class 10 Nuts

Sampson nuts do not have quite the same hardness as class 10 nuts, but they do have sufficient additional thickness (being heavy hex nuts) to have the necessary proof loads to associate with class 10.9 bolts. Sampson nuts are standard Hobson stock items and consequently we are able to recommend these for M27, M33 and M39 sizes with significant cost advantage to users.

> *"Hobson class 10.9 Hex Head Bolts are produced to the very highest standards in every respect."*

Hobson Update Question Time

$200.00 Up for Grabs

Question time again. As in the past, the first *correct* answer faxed in will win gift vouchers to the value of $200.00.

Question 1

What sizes of "D" brackets do we stock?

Question 2

Who has the only stock of AS1110 class 10.9 Hex bolts made with rolled threads, from 4140 material, that carry a 100% magnetic particle inspection ?

Question 3 (the hard one!)

What made the Great do the things they did?

Following is a play on the names of some famous people. Your task is to correctly name *each* person along with what they are famous for. Be careful—you've got to get them all right to win!

> "Be careful– you've got to get them all right to win!"

Was it:

Being hounded that made
Johann Sebastian bark;

Smoking that made
Rimsky Korsa cough;

Lack of practice by students that made
Isaac stern;

The start of daylight saving in
Germany that made
Conrad add an hour;

The length of sea journeys that made
Madam Butter fly;

Need to reduce staff that made
Arturo toss Canini

Something rather unexpected that made
Sir Adrian bolt;

Tough economic times that made
Sir John barber Ollie;

A heavy school bag that made
Franz list;

A bump on the head that made
Deng Xiao ping;

A great flea plague that made
Dimitri Shostakov itch;

and

Good snow that made
Igor Stravin, Peter Ilyich Tchaikov
and Ignacz Paderew ski?

Please fax your answers to (02) 899-5551. Model answers will be published in the next Hobson Update.

Answers to Volume 6 quiz!

How did you go?

The answers are:

1. 609 Metres
2. 17,956
3. Xylan 1070
4. 304 Metres

And the winners were...

- **Craig Evans** from *Newcastle High Tensile* was awarded the $200.00 for the first *correct* entry.
- **Glenda** from *EDL* in Seven Hills was awarded a consolation prize of $50.00—a mispelt Xylan cost her first place.