Code 313 Users Manual

NOTICE

Code 313 is NOT intended to serve as a code reference manual or to replace the need to have a copy of the codes. It is simply a calculator for the common calculations used while interpreting industrial radiographs in accordance with ASME 31.3.

It can also be used as a form of second opinion while interpreting to get my opinion of the correct interpretation of the code.

The extent to which you trust these calculations and interpretations is totally up to you. I do not make any guarantees of the accuracy of the calculations and interpretations.

I hesitated for quite a while to release this app worried about the amount of people that like to complain and argue about code interpretations. I also worried quite a bit about mistakes and errors. In the end I decided it was worth it even if some people do not like the app since many more people will get a lot of benefit and use from using the app.

Please watch the video on www.lancehenderson.com to help you decide if you want the app before you purchase it.

I am not able to issue refunds myself if you are not happy. You have to ask Apple for a refund, it is beyond my control.

I hope you do like the app and benefit from its' use. I intend to release versions for other codes soon as well as other apps, like a Geometric Unsharpness calculator.

Thanks,

Lance D. Henderson
ACCP Professional Level III
RT, UT, MT, PT

Home Screen

Weld Thickness

This one is self-explanatory.

You type in the weld thickness of the weld, without any reinforcement or internal protrusion.

A lot of people get confused if they have to add in the weld reinforcement but this number is of the weld thickness only, not including the reinforcement. The simplest way to do this is just use the base metal thickness.

When you touch in this field a keyboard that allows you to type in the thickness with decimal points automatically appears.

The app works if you just type the decimal and then the number after the decimal for welds less than one inch thick, but I recommend typing it in with the zero before the decimal. An example of this would be, ".500" works but I think it is easier to read the results if you type in "0.500".

That is all there is to do on the home screen before you touch the button for the calculations/interpretation you wish to see. When you click one of the buttons the screen will slide off to the right to a special screen for that calculation or interpretation.

Don't worry about getting lost. Every special screen has a "Home" button at the top of the screen to return you back to the home screen.

Cracks and Lack of Fusion

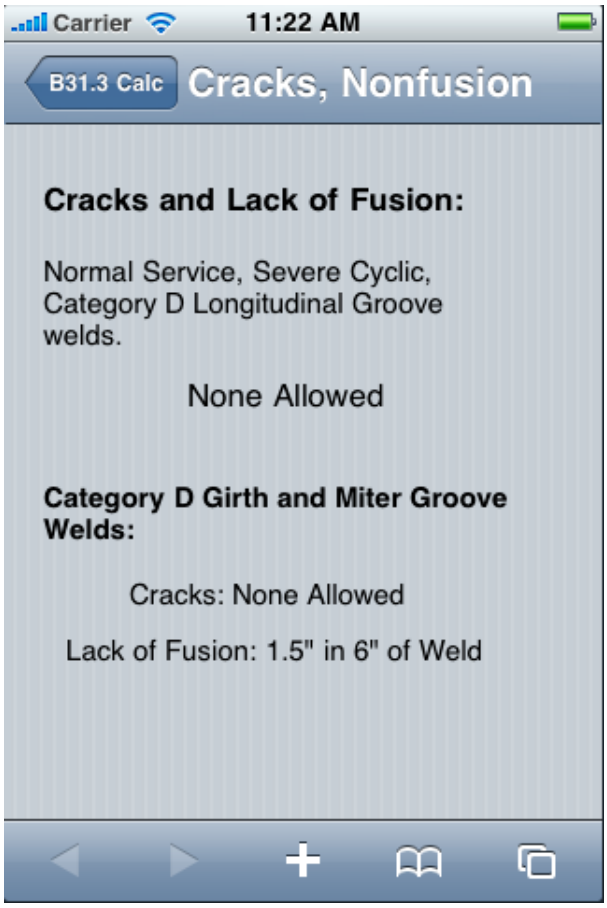
This screen is fairly simple. It simply has cracks and lack of fusion. These are my interpretations of the limitations on them present on radiographs.

There are two basic divisions. The first is for Normal Service, Severe Cyclic, and Category D (Longitudinal Groove Welds only).

The second is for Category D Girth and Meter groove welds.

In the first category no cracks or lack of fusion are allowed.

In the second category for Girth and Meter Groove welds in Category D, no cracks are allowed but you are allowed 1.5” of lack of fusion in a 6” length of weld.



Incomplete Penetration

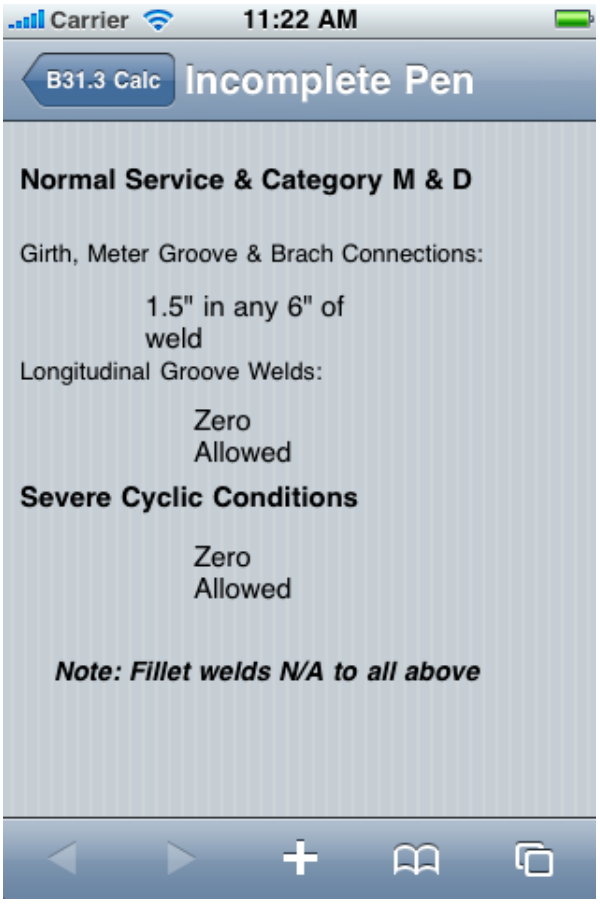
This screen also has several divisions. The code can be quite complicated at times.

There are two major divisions. The first is for Normal Service and Category M & D welds. This is further subdivided into two sections. The first has requirements for Girth, Meter Groove & Brach Connections. In this case 1.5" of incomplete penetration is allowed in a 6" length of weld. This rule is commonly know in the industry.

The second subdivision is for Longitudinal Groove welds and is not as commonly known. In these welds zero incomplete penetration is allowed.

The other major division is for Severe Cyclic Conditions. The requirement here of zero allowed applies to all but fillet welds.

Fillet welds are not applicable to the requirements of this screen.



Internal Porosity

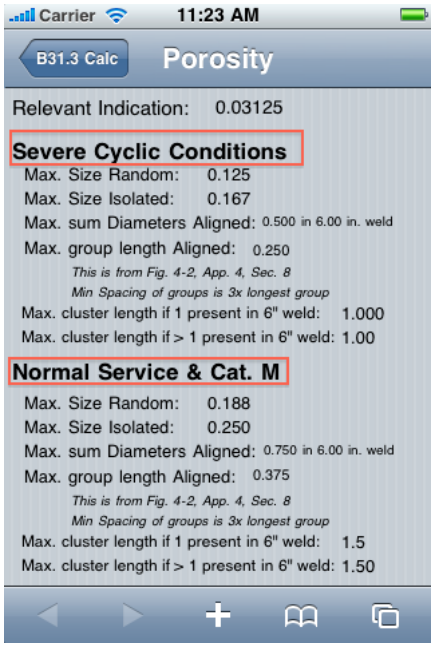
This screen is one of the most complicated in the application. In actuality there are only four numbers used most of the time. I debated not including all of the calculations and just putting the most common calculations in but I decided to put the other calculations in for the occasional times they are needed.

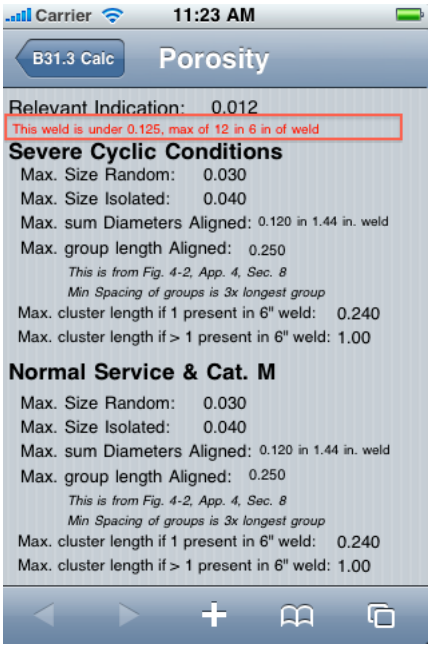
There are two major divisions on this screen. One is for Severe Cyclic Conditions and the other is for Normal Service and Category M welds.

The most commonly used numbers in each division are the isolated and random indication calculations. The other numbers only come in play for clusters or aligned indications.

This is one of the areas where you really need the code with you to help understand the rules for aligned indications and for the comparison drawings showing the allowable distribution of indications.

There is a line only visible when the weld thickness is under 0.125" that indicates in those situations only 12 indications are allowed in a 6" length of weld.

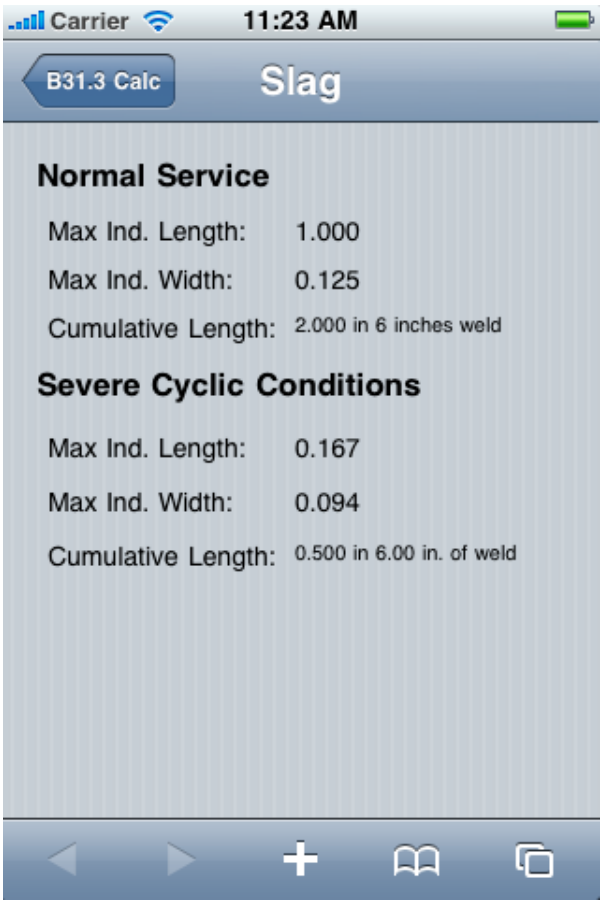




Slag Inclusions

This screen is very simple and to the point. It is simply divided into Normal Service and Severe Cyclic sections.

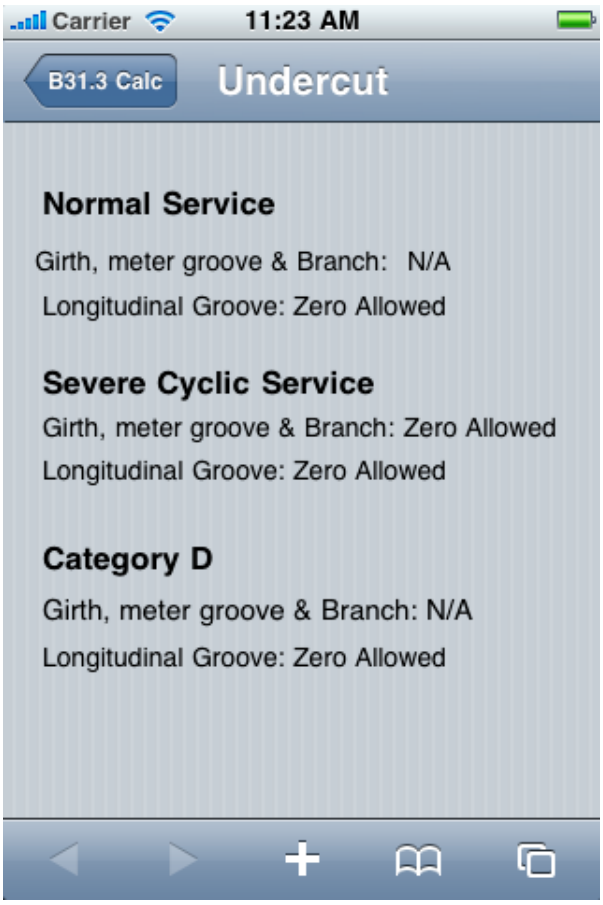
In each section there is a maximum length and width, as well as a max cumulative length.



Undercutting

This one is pretty straightforward also. It has three major divisions. One is for Normal Service, another for Severe Cyclic, and the last for Category D welds.

Each division has the limits for Girth, Meter Groove and Brach connections, and also for Longitudinal Groove welds.



Concave Root

Concave Root is also commonly referred to as “suck up”.

This screen is an interpretation screen rather than calculations. The code doesn’t tell you how to interpret this section. It just tells you that the total weld thickness, including the reinforcement, cannot be less thick than the wall thickness.

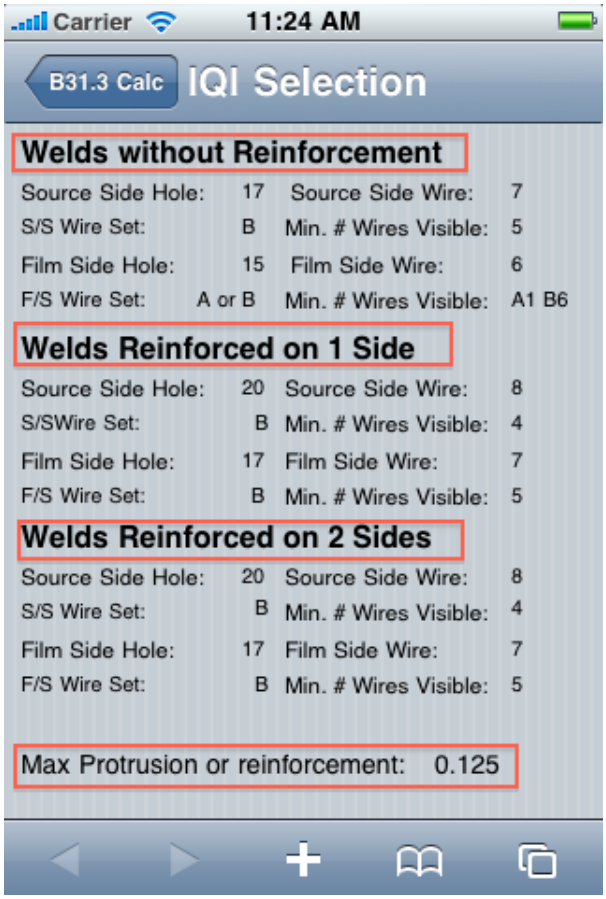
The problem is that radiography is a 2D technology so the actual thickness can’t be measured. It is common practice for this discontinuity is to consider any section of the weld that is measurably of a lower density than the adjacent base metal, to be thinner than the base metal and rejectable. I agree with this interpretation and practice.

This is based on the fact that if the weld had an equal amount of thickness it would not be of a lower density than the base metal.

This works for concave root since it is a relative comparison. There are other sections of the code where a depth of a discontinuity is mentioned, like for incomplete penetration. In these cases you cannot interpret this on the radiograph since it does not measure the actual depth of the indication. In these cases the interpretation must be by visual inspection.

IQI Selection

IQI's are also known as Penetrameters. This screen may be the most complex one in the application.



Use this screen with CAUTION!!

The screen is divided into three major divisions. The first is for welds with no reinforcement. The second is for welds with reinforcement on one side and the third is for welds with reinforcement on both sides.

The calculations in the app for welds with reinforcement are the MAXIMUM allowed by the code! The code says you are allowed to add the "estimated" reinforcement. It doesn't require you to measure the reinforcement. In practice, people always estimate it to be the maximum allowed. Just be aware that sometimes this moves you up to a larger IQI by just a thousandth of an inch. Use these numbers with caution, and pay attention to the actual welds you are shooting. If there isn't much reinforcement maybe you shouldn't move up to the next size if it is close.

We need to mention some of the disagreements that exist in the industry. In B31.3 it defines limits on weld reinforcement and on internal protrusion. In my interpretation that means internal protrusion is not reinforcement. This interpretation is strengthened in other sections of the ASME code where this is either implied or in one case explicitly stated.

I decided to make the application neutral as to this interpretation so it has all three calculations. This also covers welds actually welded from two sides rather than one.

Two numbers listed in the calculations may cause some people confusion without watching the demo video on my website.

The first of these is the wire set. This just tells you, if using a wire IQI, which of the sets are acceptable.

The other is the "Min. # Wires Visible" number. This is how many wires must be visible in the weld to show the designated wire.

Imagine the wire is a number 6. Wire size 6 exists in both the A and B sets. In the B set it is the smallest wire. That means you should be able to see all six wires in the B set to insure you are looking at the correct one. The A wire is also in the A set as the largest one. In this case if you see one wire in the weld you know it is the correct one. This just helps keep you from looking at charts and counting every time.