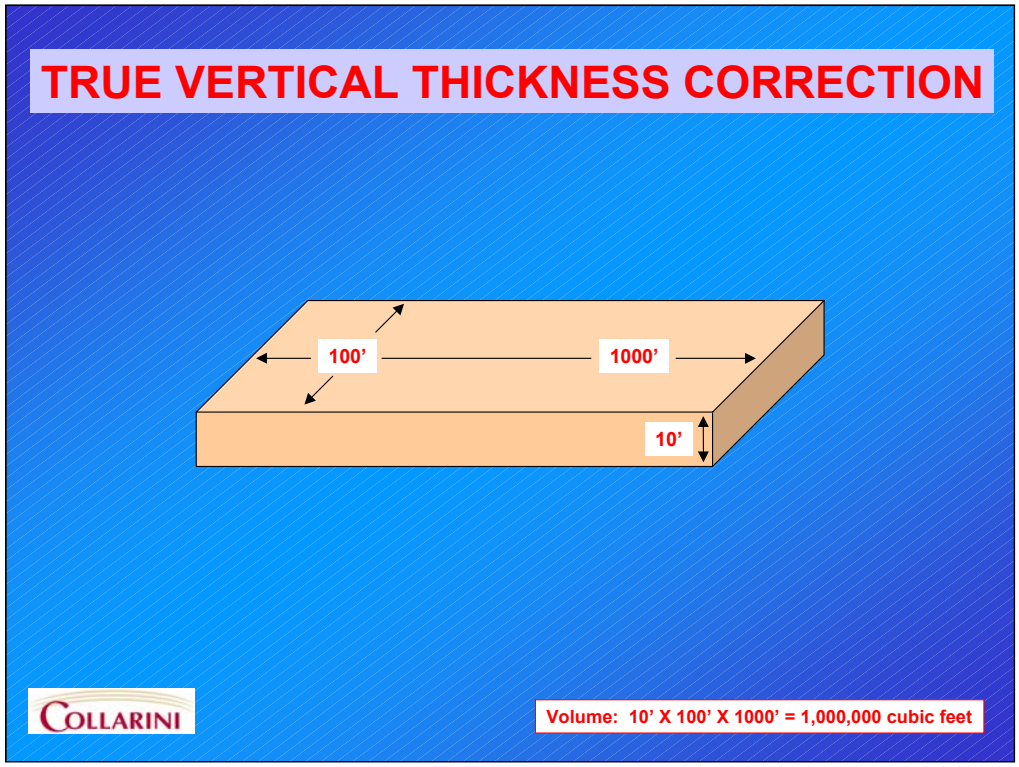
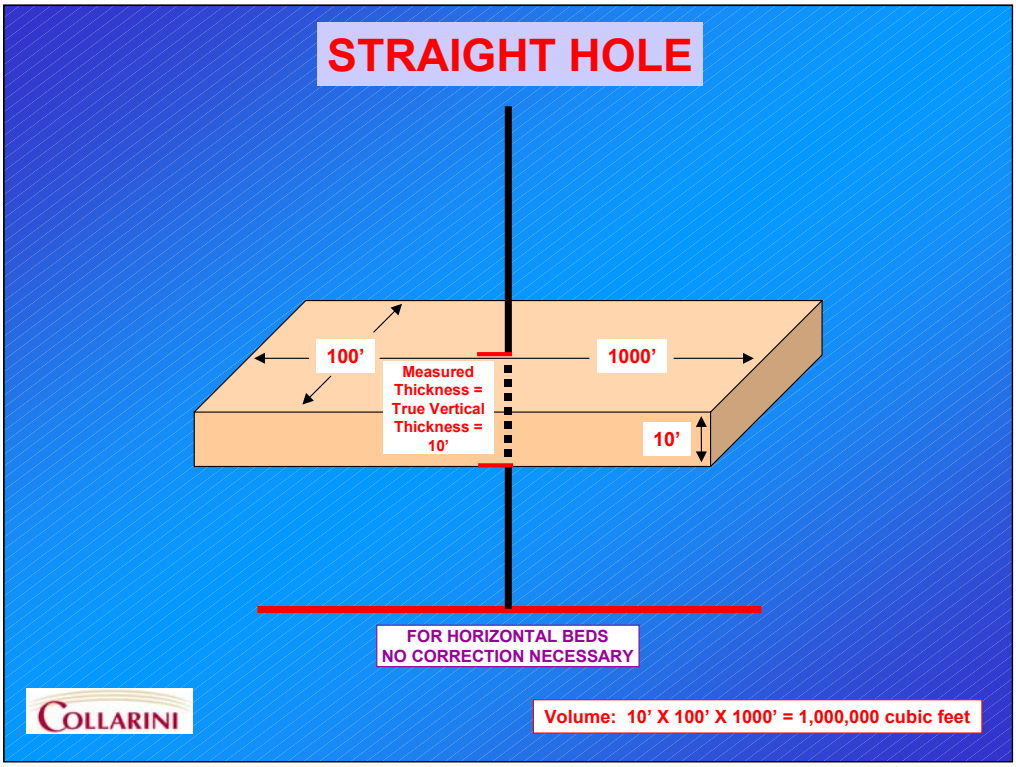
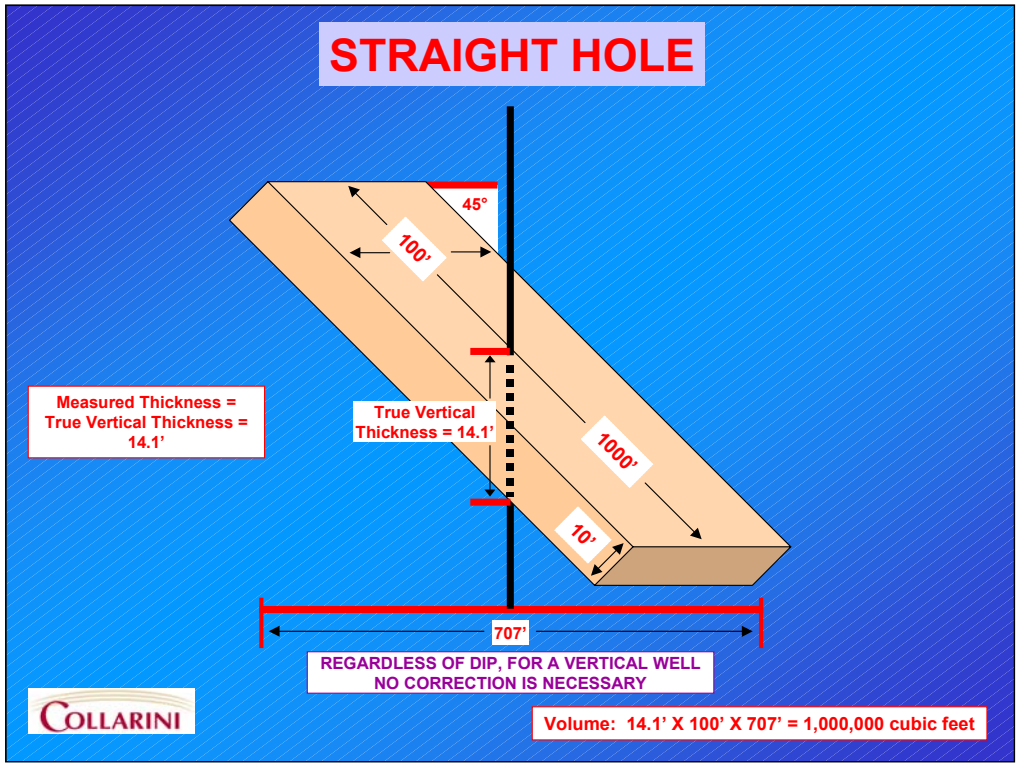


Two of the questions asked most frequently are: “What is the difference between measured thickness and true vertical thickness?” and “How does the difference affect reservoir volume calculations?” The following presentation is an example of how not making a proper correction can affect volumetrics.

Let’s start with a nice, simple volume to work with. In our example, we have a reservoir that is 10 feet thick, 100 feet wide, and 1,000 feet long. It is not very large, but 1,000,000 cubic feet is a nice easy number to work with. Using this example, we know that no matter what our reservoir dip is or what angle or direction our well is drilled, we need to get 1,000,000 cubic feet for our reservoir volume.

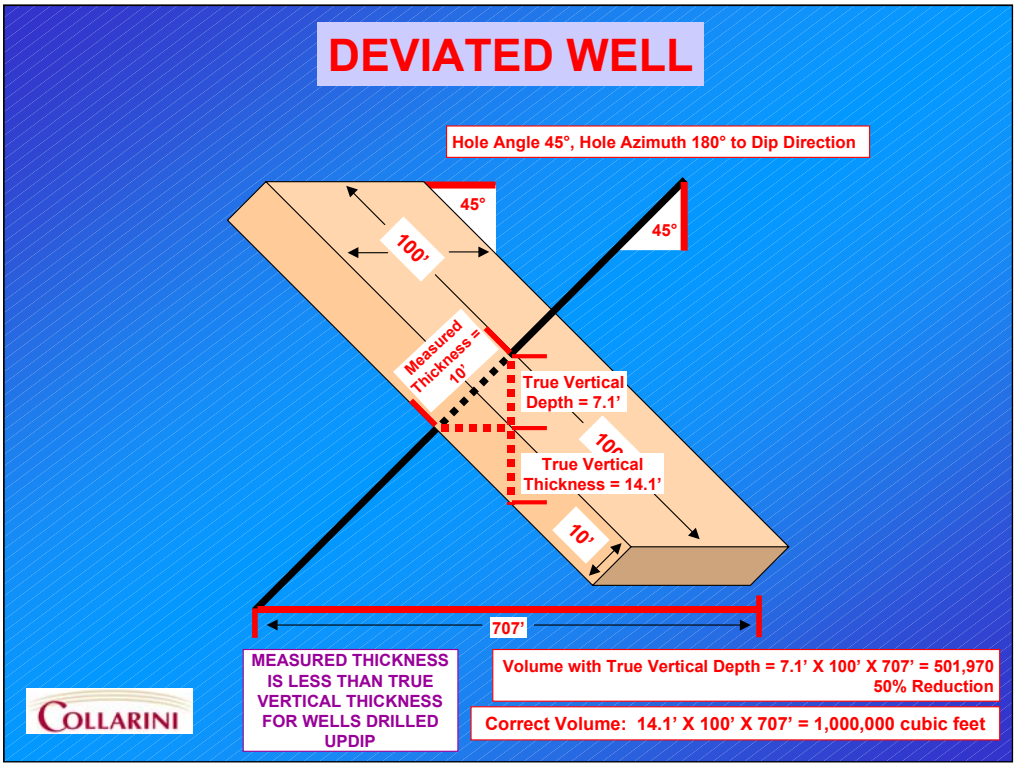


In this slide, our volume remains horizontal. Our well is vertical; therefore, the measured thickness equals the TVT and no correction must be made. Anytime the bed dip is zero, no true vertical thickness correction needs to be made.



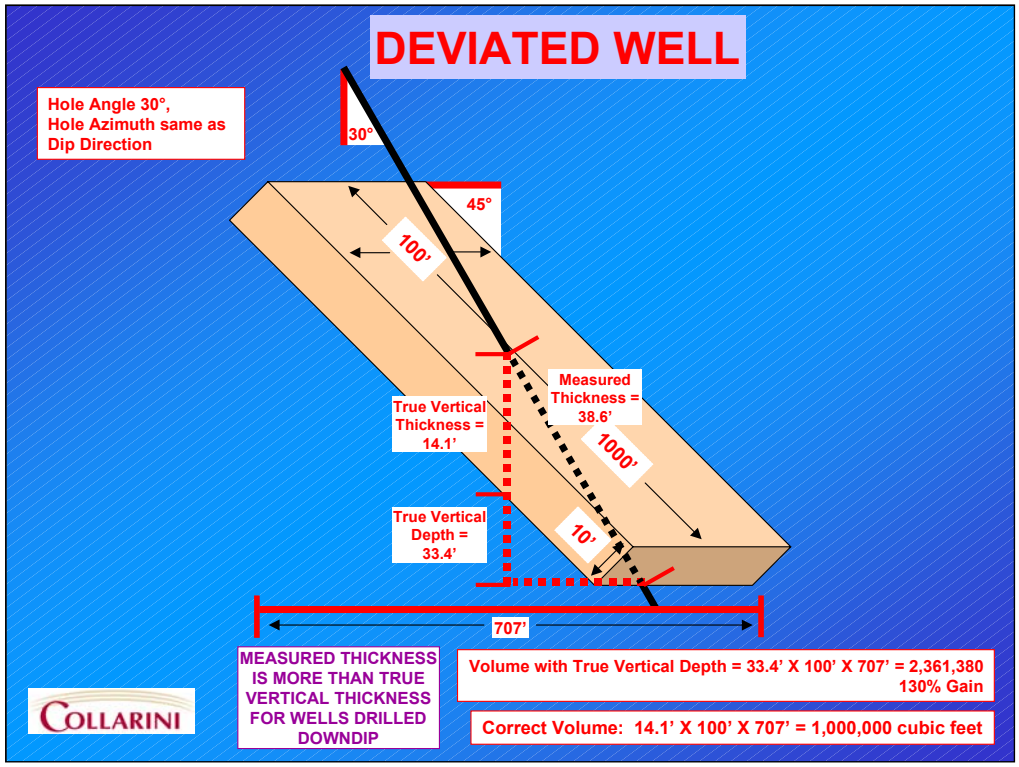
Pretend we're drilling on the flank of a salt dome. Let's rotate our volume until it is at a 45 degree angle. We'll leave the well vertical.

In this example, our MT is now 14.1 feet, but because our well is vertical, it is still equal to our TVT. Our width is still 100 feet, but our length is now shortened to 707 feet. 707' x 14.1' x 100' equals 996,870 cubic feet, if you are an engineer, or 1,000,000 cubic feet, if you are a geologist. In all cases with a vertical well, MT = TVT and no correction has to be made.



Now, let's drill a directional well with a hole angle of 45 degrees drilled perpendicular to our volumes dip direction.

Our MT is now shortened and is only 10 feet. If we use a TVD log or make a simple TVD correction to get the vertical thickness, we would get only 7.1 feet. The TVT, however, is still 14.1 feet as it was in the case of the straight hole. If you used the TVD log to determine the thickness, you would underestimate your volume by 50%. In instances where deviated wells are drilled perpendicular to dip, the correction from the measured thickness to the TVT is a net increase.



Now, let's set up our platform so we'll be drilling downdip.

In this example, we have a 30 degree well drilled parallel to the dip of our volume. Now the measured thickness is 38.6 feet. If we simply measure from the TVD log, we get 33.4 feet. The true vertical thickness, however, is still 14.1 feet. If you use the TVD log thickness, the calculated volume is 2.36 million cubic feet; a 130% gain in your volumetrics.

In cases where deviated wells are drilled in a downdip direction, the change from measured thickness to true vertical thickness is a net decrease.

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