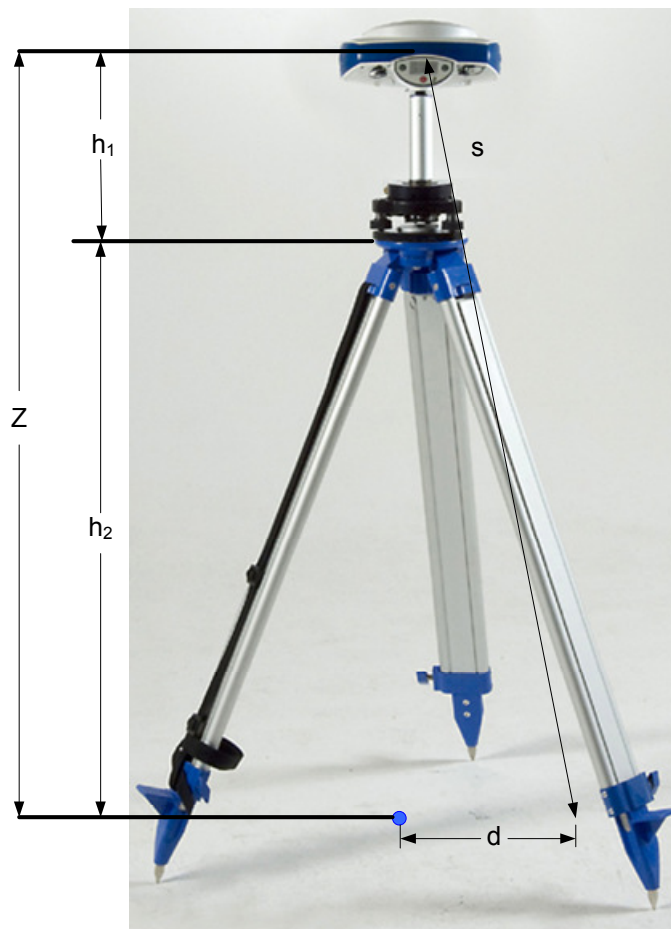


Potential Error in HI Measurements Due to Bending of Measurement Tape

The location of the ProMark 500 HI measurement hook has been suspected in causing slant-height measurement error whenever the tape touches the tripod head during the slant-height measurement. Magellan Quality has evaluated the potential error caused by any obstruction between the measurement hook and the ground point to be measured. This note documents the expected error.

The following diagram illustrates the situation.



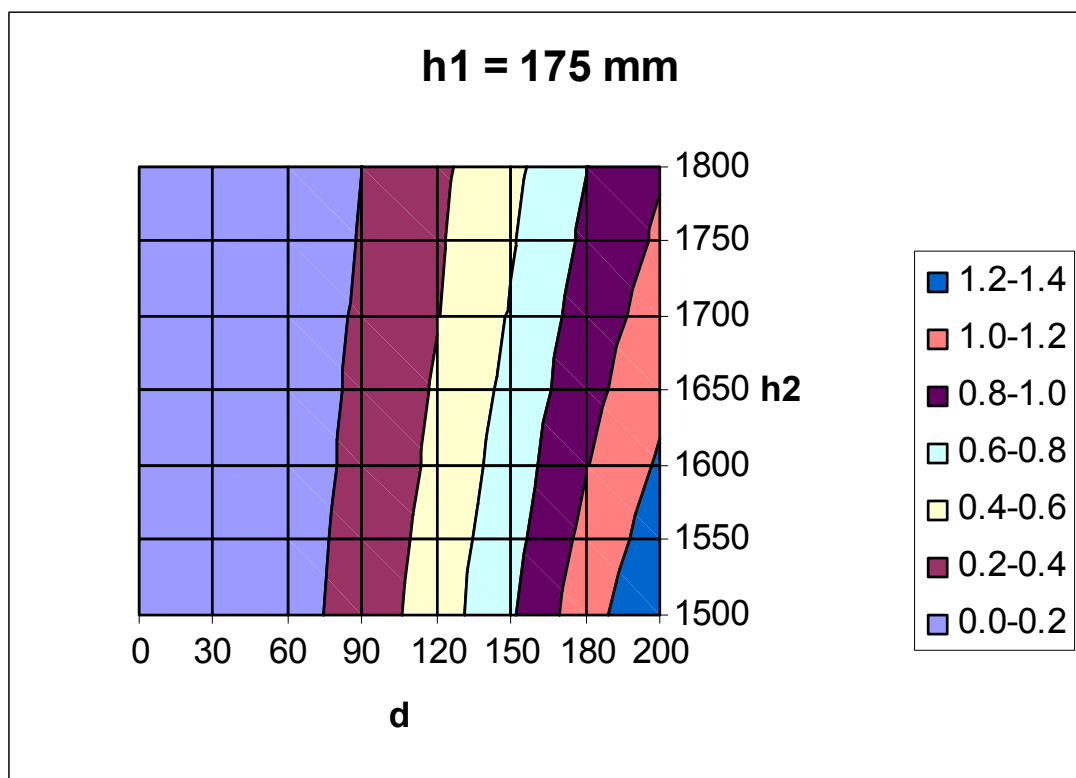
The surveyor wants height Z and is measuring slant-height s . There is an obstruction somewhere between the ProMark 500 height measurement hook and the point on the ground being measured. To calculate the error induced in the measurement s owing to the inability to measure directly to the point, one needs to know the following three values:

h_1 = vertical height from measurement hook to obstruction

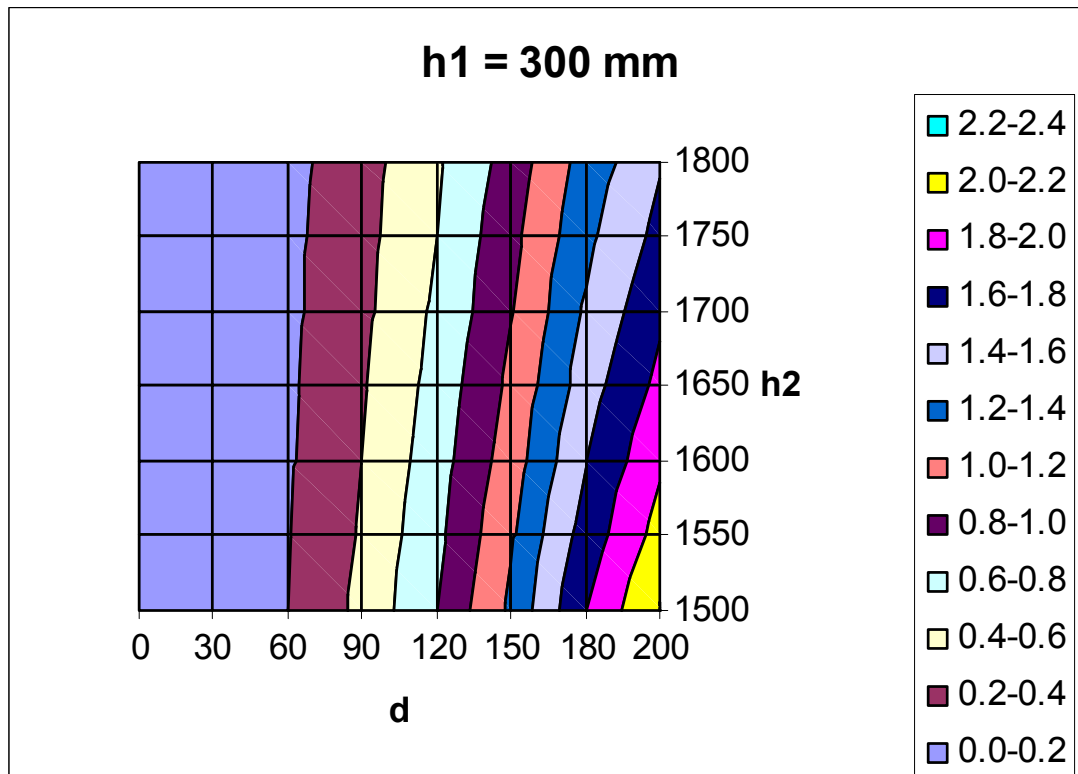
h_2 = vertical height from obstruction to point on the ground

d = offset distance from the point on the ground to where the tape meets the ground *without touching* the obstruction.

For the case where h_1 is 175 mm (typical when the HI extension that is shipped with the ProMark 500 is used), and where h_2 is between 1500 and 1800 mm, the following chart shows the error induced when the tape is shifted by the amount d from the true point. It can be seen that the error due to bending the tape exceeds 0.5 mm only when the distance d is greater than 100 mm to 120 mm, depending on the height of the tripod.



For the case where $h_1 = 300$ mm, the following graph applies. It is seen that the error is made greater when h_1 is increased.



In conclusion, it is clear that the error induced by bending of the measurement tape is negligible in most situations. Care should always be taken to prevent bending the tape during slant height measurement, but small amounts of bending cause negligible error.