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Taking a reading on an E-Grade staff accurately and accurately is only the first part of completing a successful leveling run or crossing. It is important that your E-Grade staff readings are listed down accurately and in the correct format in a field book. This will allow you and everyone else to control your leveling work. There are two common methods of booking levels in a field book, and these are:- The height of the Collimation Method Rise and Fall Method Both methods of ordering readings of a leveling run are the same. That is, the first reading of any setup is a lookback and would be booked in the column marked Back Sight. The final reading taken on any setup is a Fore Sight and would be booked in the column marked Fore Sight. All readings taken between first and last readings on any setup would be an Intermediate Sight and would be booked in the column marked Intermediate. Leveling Traverse or Run Use the example from the post How to perform a leveling cross or run we would complete the book field as follows using the Rise and Fall Surveying Method. The first part of the booking process is to complete the header of the page. It is important that the date is recorded (you can also record the time). Record what the leveling run is for, in this case it is for Station Control. And record your starting position and where you intend to finish the leveling run. In the example below, we used a spreadsheet version instead of a Chartwell Survey Level Book. The spreadsheet is available from Lichfield Surveys Supplies Ltd. In the image below you can see the information we have captured and have noted the readings of the first part of the leveling traverse. At the start of the leveling traverse, we would note down reduced level and Station ID that we would start from. In this example I have noted down reduced level as 105.545 and in The Distance Column I have noted Datum A. (Depending on the information you need, you can insert the distance read to the staff in this column, but I use the comments column for additional information like working off the top of the curb levels.) Our first treatment taken is our Back Sight, this is 2.596m, and is listed in the Back Sight column in the book. The second reading is 2.489m and is on an intermediate view (point B) and is noted in the intermediate column and B is listed in the distance column. The third treatment taken is 1.958m and is on an Intermediate Sight (point C) and is listed in the intermediate column and C is noted in the distance column. The forward (and last taken on this setup) reading is 3.045m and is on a Fore Sight (point D) and is listed in the Fore Sight Column and D is listed in the Distance Column. For this post I have used Rise and Fall Spreadsheets courtesy of Lichfield Survey Supplies Ltd, so the numbers are compiled as I enter them. Rise and Fall Booking Method 1 Rise and Fall Booking Method Moving the auto level to the next one our first reading is a return to point D. The reading of 1.157m is noted in the Back Sight Column. Note that this is done on the same line as fore sight reading taken in the previous setup. The second reading on this setup is the last, so is a Fore Sight and reading of 0.865m is entered listed in the Fore Sight Column and E is listed in the Distance Column as we read Point E. Rise and Fall Booking Method 3 We now move Auto Level to our last setup for this leveling run. Our first reading to point E of 3.754m is registered in the Back Sight Column on the same line as the Fore Sight Reading taken in the previous setup. Our next reading is Point F, which is an intermediate reading of 2.452m and is listed in the intermediate column and F is entered in the distance column. Our last reading for this leveling traverse is at Datum B, which is 1.965m and is listed down in the Fore Sight Column and Datum B is recorded in The Distance Column. These are all the readings we take for this leveling crossing and we can now figure out the increase and fall and then the reduced levels for this race. With the increase and decrease method of booking a leveling cross or run we have to first compare the relative readings we have just taken. We need to determine whether the basis for E-Grade staff has increased or decreased in height between two different metrics. We must remember that a lower figure on a subsequent reading of E-Grade staff means that the bottom of the E-Grade Staff has (Rise) increased, and also a greater number on a subsequent reading on E-Grade staff means that the base of E-Grade Staff has (Fall) fallen. In our example we have Intermediate Sight (2.489m) smaller than Back Sight (2.596m), this is an increase of 0.107m, which is listed in the Rise Column. The increase of 0.107 m is then added to the reduced level from Datum A (105.545+0.107) to provide 105.652 m as a reduced level for point B. We have two more calculations to do on this setup, we have a more Intermediate Sight and a Fore Sight. We are following the same process as before, where we have to decide whether we have an increase or decrease between readings. For the next Intermediate Sight we again have a lower reading on E-Grade Staff, which means a number needs to be entered in the increase column again. This is (2.489-1.958) 0.531m, and this is then added to the previously reduced level giving (105.652 +0.531) a reduced level of 106.183 for point C. The last point of this setup is Point D, as we have a Fore Sight of 3.045m. This reading on E-Grade Staff is larger than the previous point C reading (1.958m) and thus would be recorded (3.045-1.958) in the autumn column as 1.087. This would provide a reduced level of point D as (106.183-1.087) 105.096m. Rise and Fall Booking Method 2 Once Auto Level has been moved and setup again we have to take the first E-Grade staff reading (by and note this in the Back Sight Column, in this case the number for is listed down for Point D. Rise and Fall Booking Method 3 This time we don't need to find out anything, it's purely a reference to the next calculation. We then have a Fore Sight reading of 0.865m for Point E. Once again we have a lower reading on E-Grade Staff, which means a number must be entered in the increase column, but this time we (1.157-0.865) 0.292m as when added to the previously reduced level (105.096) to give 105.388m for Point E. Rise and Fall Booking Method 4 Once auto level has been moved and setup again we need to take the first E-Grade staff Reading (of the setup) and note this in the Back Sight Column, in this case the figure of 3.754 m is listed down for point E. Again we don't have to figure anything out, it's purely a reference for the next calculation. We have two more calculations to do on this setup, we have a more Intermediate Sight and a Fore Sight. We are following the same process as before, where we have to decide whether we have an increase or decrease between readings. For the next Intermediate Sight we again have a lower reading on E-Grade Staff, which means a number needs to be entered in the increase column again. This is (3.754-2.452) 1.302m and this is then added to the previously reduced level giving (105.388 +1.302) a reduced level of 106.690m for Point F. The last point on this leveling traverse is Datum B, as we have a Fore Sight of 1.965m. This reading on E-Grade Staff is again lower than the previous point F reading (2.452m) and thus would be recorded (2.452-1.965) in the increase column as 0.487. This would give a reduced level of Datum B as (106.690 -0.487) 107.177m. Rise and Fall Booking Method 5 At this point it would be best practice to compare our calculated level of Datum B with the known value for Datum B to ensure that leveling traverse has been done successfully. If we didn't know what the reduced level for Datum B was upfront, then we would need to close the traverse by going back to Datum A. The advantage of using the increase and fall method of booking is the easy check for potential errors in Back Sight and Fore Sight readings. These controls are highlighted in yellow in the spreadsheet and are automatically calculated for you If the spreadsheet is to be used in this example, then it can be found on the Lichfield Survey Supplies website. LSSL Rise and Fall Level Book Spreadsheets that work out the rise, fall and reduced levels of your leveling cross automatically from your Back Sights, Intermediate Sights and Fore Sights. Related Articles The best 5 Automatic (Dumpy) Levels for under £200 Height of Collimation Method 5 ways to achieve accurate leveling recommended automatic levels. Do not forget to check the price and availability of the increase and autumn level book. Join the Constructor to ask questions, answer questions, write articles and in contact with others. VIP members get additional benefits. Do you have an account? Sign in

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