



Know Your Reference Elevation for Water Gauge Readings

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When reading individual pressure gauges installed on a water system to determine pressure differential (drop) and calculate flow across an apparatus, the elevation for each individual pressure gauge must be taken into account.

Reference Figure 1

- **Example No. 1:** When pumps are off, gauge A will be read 6 feet lower than gauge B due to the difference in elevation.
- **Example No. 2:** When the supply connection is below the return connection, the inlet pressure, Gauge B, will be greater than the outlet pressure, Gauge A, by the summation of the unit pressure drop and the elevation difference of the gauges. Assume an inlet pressure of 40 feet:

$$B (40 \text{ ft}) - \text{Elevation Difference} (6 \text{ ft}) - \text{PD} (10 \text{ ft}) = A (24 \text{ ft})$$

$$\text{PD} = B - A - \text{Elevation Difference}$$

$$10 \text{ ft} = 40 \text{ ft} - 24 \text{ ft} - 6 \text{ ft}$$

Rule Of Thumb: When supply is below return, subtract elevation difference:

- **Example No. 3:** When the supply connection is above the return, the inlet pressure, Gauge B, will be equal to the outlet pressure, Gauge A, less the unit pressure drop, plus the elevation difference of the gauges.

$$A (40 \text{ ft}) - \text{PD} (10 \text{ ft}) + \text{Elevation Difference} (6 \text{ ft}) = B (36 \text{ ft})$$

$$\text{PD} = A - B + \text{Elevation Difference}$$

$$10 \text{ ft} = 40 \text{ ft} - 36 \text{ ft} + 6 \text{ ft}$$

Rule Of Thumb: When supply is above return, add elevation difference:

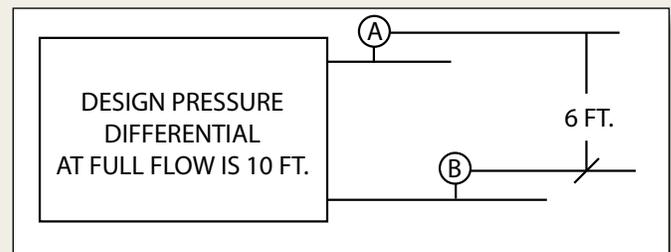


FIGURE 1

The elevation difference is common on large heat exchanger installations and could be as high as six (6) feet or more. If this elevation difference is not taken into account, the calculated flow rate could be off by as much as 25%.

The same pressure differential issue can occur when utilizing a hydronic manometer similar to the Shortridge HDM-300 or Alnor HM670. When taking individual readings with the hydronic manometer, the meter must be kept at the same elevation for each reading. If the hydronic manometer is located at different elevations for the individual readings, the elevation difference must be taken into account for the pressure differential calculation.

If the hydronic manometer is simultaneously connected to both the inlet and outlet of the measured apparatus, the reported pressure differential on the meter is correct and no elevation correction is required. The main concern at this point is the inlet and outlet individual pressure readings.

The inlet and outlet individual pressure readings will still change with reference to the elevation of the meter; however, as noted above, the differential between the two readings will remain the same since the reference point for the individual readings is the same. If the individual inlet and outlet pressure readings of the apparatus under test are reported, then the elevation difference between the readings should be noted and the hydronic manometer elevation/location should be noted.

Next time the opportunity presents itself, connect the hydronic manometer to one side of the apparatus under test and take pressure readings with the hydronic manometer located at different elevations. 🌐