

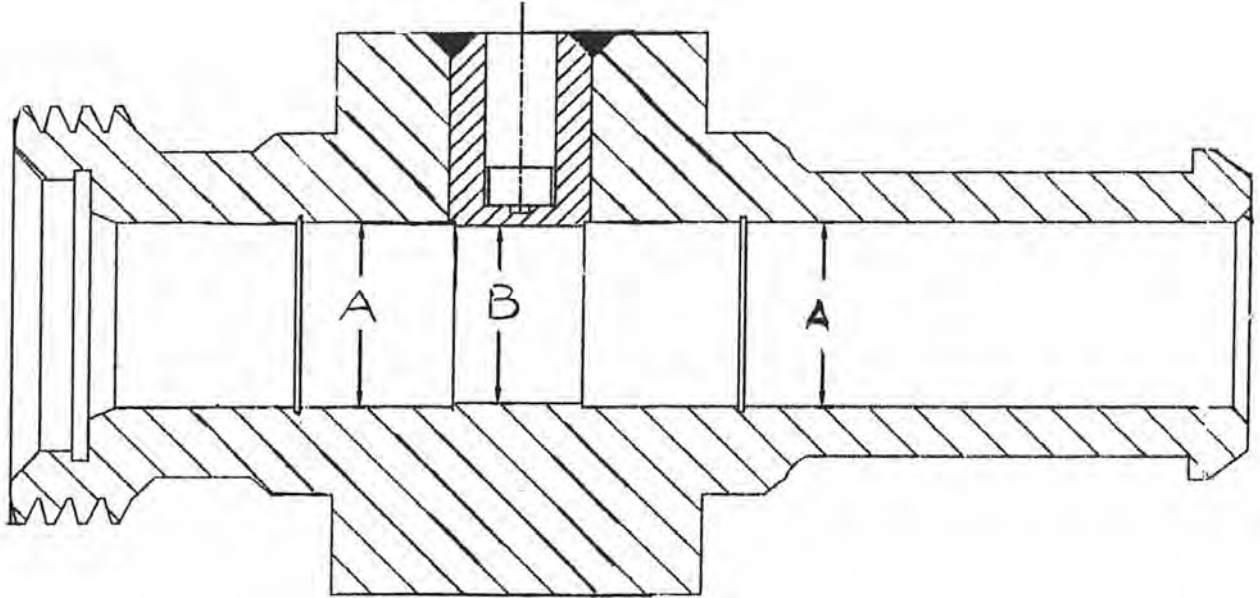
WEAR LIMITS ON WECO STYLE HIGH PRESSURE METERS

The WECO or Wing Nut style liquid and gas turbine flow meters have a pressure rating of up to 15,000 PSIG with a maximum associated temperature of 300°F when new. The question may arise as to the pressure rating or limits on pressure as the bore of these meters are worn during service. This is a relevant question due to the fact that some services for these meters are on abrasive fluids being pumped at high velocity. In such high pressure piping systems it is common practice in the oil and gas industry to routinely inspect the wall thickness of the piping and piping components to establish the amount of wear and, where appropriate, to de-rate the pressure holding capacity of the piping or device in accordance with the indicated wear per the manufacturer's recommendation. It is also typical to have a maximum allowable wear limit specified in such system components.

In the case of Hoffer WECO turbine flow meters, the limitation on wear is not a pressure related limit but an assembly tolerance limit. The internal design of the WECO turbine meter has two primary bores that are illustrated in the attached Drawing #1. The two bores are the inlet and outlet bores (Dimension A) and the platform bore (Dimension B). Bore A is where the internal hanger assemblies of the meter (inlet and outlet) are fitted and held in place with snap rings, the grooves for which are also shown in Drawing #1. Bore A is where the rotor of the turbine resides in the meter housing. The fit between the outside diameter of the hangers and Bore A is a light (hand assembly) press fit. This fit prevents the hangers from spinning inside the meter body during operation. The tolerance between the O.D. of the rotor blades and Bore B is also critical to proper operation of the meter. If the blade tips are too close to the I.D. of Bore B they will be slowed by being within the boundary layer of the fluid which will follow close to the I.D. of the meter. If the blade tips are too far away from the I.D. of Bore B there will be excessive fluid bypass resulting in inaccurate measurement and significantly reduced flow measurement range.

In both cases the point at which Bore A or Bore B become too large for the meter to operate properly has been determined by Hoffer to be 0.020" beyond the maximum new built bore tolerances for each. In the case of Bore A, once the wear reaches this point, the hanger assemblies can no longer be secured properly and will be easily spun by the process fluid resulting in severe damage or destruction to the internal components. In the case of Bore B, the measurement accuracy of the meter and its operating range will be impaired to the point that the meter can no longer be used with new or used rotors. In neither case does the amount of wear needed to create these meter performance issues have any measurable effect on the actual pressure rating of the meter. Once these points of wear have been reached the meter body will no longer serve its primary function as part of a flow meter and should be removed from service.

Below Drawing #1 is a chart indicating the maximum values for these two bores. Once these limits are reached the meter will have reached the limit of its service life, without any degradation in pressure rating, and should be replaced.



Drawing #1

| WECO Meter Size: | “Bore A” Maximum Allowable Dimension: | “Bore B” Maximum Allowable Dimension: |
|------------------|---|---|
| HO2X1 | 0.921" | 0.897" |
| HO2X1 1/2 | 1.392" | 1.334" |
| HO2X2 | 1.846" | 1.773" |
| HO3X3 | 2.662" | 2.601" |