



## Single Point Lesson: How to Eliminate Pipe Stress Like a Pro

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June 28, 2025

by Ricky Smith, CMRP, CMRT | Articles, Maintenance and Reliability, Maintenance Planning, Pumps



Maintenance Supervisors: Use this 10–20 minute tool to train technicians, welders, and contractors. Post visibly in the shop afterward.

Pipe stress is caused by the misalignment of the mating surfaces of two pipe flanges, resulting in abnormal internal stress in pump bearings, seals, motor bearings, and couplings, and potentially altering the pump's displacement.

### **General rules that must be followed by maintenance personnel and contractors:**

(If you want to stop self-induced failures)

1. Pipe flanges attached to pumps must be aligned so that the gap does not exceed the thickness of two gaskets or the tolerance established by your company's engineering standards.

2. Pipe flange bolts must drop in without assistance.
3. Cable pullers, come-a-longs, or long bars should not be used when aligning a flange that is connected to a pump.
4. Validate the elimination of pipe stress by following the procedure below.

## Failure Modes Experienced from Pipe Stress on Bearings

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- **Wear** caused by leaking seals
- **Wear** caused by static vibration
- **Indentations** caused by overloading while static
- **Corrosion** caused by inadequate lubrication caused by abnormal loading (seal leaking)
- **Flaking** caused by misalignment and excessive loading

**WARNING:** Ensure your contractors follow the same process to eliminate pipe stress. Pipe stress elimination should be validated during the commissioning of a new pump.

**Follow this process if you want to inspect your pumps, which may have pipe stress:**

1. Align the two shafts between your pump and driver (typically an electric motor) to the tolerance recommended by the equipment vendor or your company's engineering standards.
2. Validate misalignment to ensure the motor and pump shafts are aligned to specification.
3. Disconnect the outlet flange on the pump.
4. Revalidate laser alignment of shafts.
5. If alignment has moved, then you have pipe stress. Do the same for the inlet flange.
6. Make corrections as stated in the following procedures to eliminate pipe stress.

## Elimination of Pipe Stress

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The Ricky Smith Method, as learned from Dan Turner (my maintenance and engineering manager at Exxon during the 1970s)

1. Bolt flanges to the pump and insert a blind flange gasket along with two regular flanges between the pump and the mating flanges. (Cover the hole between the welding area and inside the pump)
2. Attach the welding ground to the flange. (Do not attach ground lead to pump; welding group must always be attached to flange)

**Warning:** Failure to accomplish this task properly will cause bearing failure due to "electric arcing," a failure mode of bearings.

1. Tack-weld the flange into place, then reverse-weld each tack.
2. Allow it to cool for 10 minutes.
3. Reverse-stitch weld on opposite sides of the flange, similarly used for cast iron welding.
4. After initial reverse-stitch welding, then weld normally using the electrode recommended by the American Welding Society (typically E-6010 5P or GTAW).
5. After the root pass, weld in any direction you wish.
6. Allow to cool and then disconnect flange, replace gaskets, and;
  - Validate that bolts will drop into holes without a pry bar
  - Validate gap between flanges is no more than two gaskets thick.

If you have questions, send me an email at [rsmith@worldclassmaintenance.org](mailto:rsmith@worldclassmaintenance.org)

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Ricky Smith, CMRP, CMRT is the Vice President of World Class Maintenance and a leading Maintenance Reliability Consultant with over 35 years of experience. He holds certifications such as Certified Maintenance and Reliability Professional (CMRP) and Certified Maintenance and Reliability Technician (CMRT). Ricky has worked with global companies like Coca-Cola, Honda, and Georgia Pacific, delivering expert maintenance solutions across 30 countries. His career began in the U.S. Army, advancing to leadership roles, including a position at the Pentagon as Facility Investigator for the Secretary of Defense. Ricky is also the co-author of *Rules of Thumb for Maintenance and Reliability Engineers* and *Lean Maintenance: Reduce Costs, Improve Quality, and Increase Market Share*.

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