

SCOPE

- I 1.1 This practice covers field erection, testing, flushing, and cleaning of piping systems.
- I 1.2 **An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information is specified in the Job Specification.**

SUMMARY OF ADDITIONAL REQUIREMENTS

- I *2.1 **Table 1** lists the practice and codes which shall be used with this practice as specified by the Purchaser.

TABLE 1

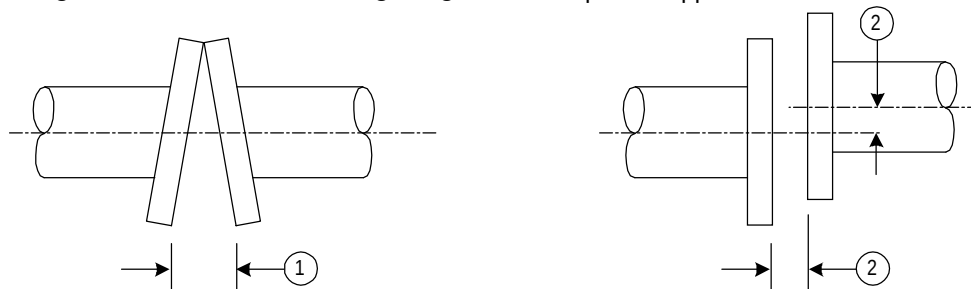
PRACTICE AND CODES	
Practice	
IP 18-8-1	Precommission Cleaning of Steam Generating Equipment and Plant Piping Systems
IP 18-10-1	Additional Requirements for Materials
ASME Codes	
Section I	Power Boilers
B31.1	Power Piping Code
B31.3	Process Piping

ERECTION

- R ↕ 3.1 **Field routed small piping [NPS ≤ 1-1/2 (40 mm)] shall be supported in a manner that will minimize excessive vibration and accommodate thermal expansion of terminal equipment.**
- R ↕ 3.2 **Temporary shipping braces, stops, or other protective devices for expansion joints shall not be removed until installation is completed, including any required adjustments to tie-rods, etc.**

FLANGE JOINTING PRACTICE

- R 3.3 **Alignment tolerances of mating flanges shall be per the applicable code and the following:**



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ITEM	TOTAL TOLERANCE PER FLANGED JOINT	
	NORMAL SERVICE	SPECIAL SERVICES
		a. Design Temperature ≥ 850°F (454°C) or Flange Rating ≥ ASME Class 900. b. Where plastic or elastomeric liner (lapped over the flange faces) provides the gasket for the joint.
1	Per the applicable Code	1/32 in. (1 mm) maximum out of parallel alignment of flanges, measured across any diameter.
2	Per the applicable Code	1/8 in. (3 mm) maximum translation of branches or connections.

IP 3-19-1		Piping Erection, Testing, Flushing and Cleaning (This practice is appropriate for attachment to Inquiry or Purchase Document)	EXXON INTERNATIONAL PRACTICE
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

- R 3.4 **Flange "makeup"** shall be done **without the use of gasket sealing compounds**.
- R 3.5 All **flange bolting** shall be **assembled with thread lubricating compound**.
- R 3.6 **Flanged pipe joints of cement lined type valves**. If it is necessary to grind the lining at the pipe ends to avoid interference with the action of the valve disc (or plate), the lining shall be taper ground and coated with epoxy cement.

ADDITIONAL REQUIREMENTS FOR PIPING OVER NPS 3 (80 mm) CONNECTED TO ROTATING MACHINERY

PIPING ERECTION AND FLANGE ALIGNMENT

- R 4.1 **A detailed piping erection procedure** shall be prepared **for each rotating equipment machinery category to cover**:
- Piping erection sequence.
 - Flange alignment techniques.
- Methodology** shall cover initial and final "cold" alignment, spring support adjustments, and "hot" alignment.
- * The procedures shall be submitted to the Owner for approval. **In addition, procedures and the sequence of alignment for multi-casing compressor trains** shall be mutually agreed to by the contractor, machinery vendor, and Owner.
- R 4.2 **During initial flange alignment**:
- Permanent spring supports shall be locked in "cold load" position during piping erection and hydrostatic testing.
 - No unsupported piping shall be connected to the equipment nozzles.
 - For field-fabricated piping, the makeup of flanged or field welded joints shall be done progressively away from the equipment nozzle.
 - If prefabricated piping sections are used, at least two welds shall be left near the nozzle flanges for final fitting and alignment.
 - Piping shall be free of load-imposing temporary restraints that will result in "cold springing" of the piping.
 - Final bolt tightening of piping flanges near the equipment nozzles shall be done after initial alignment of the equipment nozzle flanges.
 - Local heating to correct minor misalignment is permitted on piping that does not require postweld heat treating.
 - Machined pins furnished with the mating flanges shall be used to align flange bolt holes during field erection of the mating piping.
- R 4.3 **Equipment nozzle and mating flange alignment tolerances** shall be within the following maximum permissible limits:
- For steam turbines and compressors other than reciprocating types**, 1/64 in. (0.4 mm) for all alignment categories listed in **Subpar. b. below**. [For nozzles greater than NPS 24 (600 mm), the machinery vendor shall supply mating flanges.]
 - For centrifugal pumps and other rotating machinery**:

ALIGNMENT DETAIL	MAXIMUM PERMISSIBLE MISALIGNMENT OF FLANGED JOINTS, IN.		
	NPS ≤ 12	NPS ≤ 22	NPS ≥ 24
1. Vertical bolt hole offset	1/8	1/16	1/64
2. Horizontal bolt hole offset	1/8	1/16	1/64
3. Rotational offset	1/8	1/16	1/64
4. Flange face parallelism (across diameter)	1/64	1/64	1/64
5. Flange face separation, plus space required for gasket	± 1/8	± 1/16	± 1/64

Acceptable Metric Equivalents

in.	1/64	1/16	1/8
mm	0.4	1.5	3