VRISHAL ENGINEERING PRIVATE LIMITED

PROCEDURE FOR DIMENSION & DISTORTION CONTROL

CLIENT: AARTI INDUSTRIES LTD, JHAGADIA, ZONE-4

PROJECT: CORAL-2

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1 SCOPE

This procedure is applicable for the project: CORAL-2 PROJECT

2 PURPOSE

The purpose of this procedure is to control distortion during welding & dimension of the end product during Piping fabrication.

3 DISTRIBUTION & INTENDED AUDIENCE

AIL: AARTI INDUSTRIES LTD, JHAGADIA, ZONE-4

AIL-TPI

VEPL: VRISHAL ENGINEERING PRIVATE LIMITED

4 ABBREVIATIONS

Abbreviations	Definitions
ASTM	American Society for Testing and Materials
QA/QC	Quality Assurance/Quality Control

5 GENERAL

Distortion or deformation can occur during welding as a result of the non-uniform expansion and contraction of the weld and base metal during the heating and cooling cycle. Stresses form in the weld as a result of the changes in volume, particularly if the weld is restrained by the fixed components or other materials surrounding it. If the restraints are partly removed, these stresses can cause the base material to distort and may even result in tears or fractures. Of course, distortion can be very costly to correct, so prevention is important.

- It shall be ensure that, dimensions of all fabricated components, assemblies and sub-assemblies are within tolerance range as specified in the approved fabrication drawings and procedures.
- Inspect the fit-up thoroughly as per approved drawings. Special attention should be on critical dimensions. In case the dimensions are not within the limits of intermediate tolerances, corrective actions to be taken before welding.
- QC engineer shall inspect and verify the dimensions after welding completion.

6 TYPES OF DISTORTION

There are various types of distortion and dimensional change including longitudinal; transverse; angular; twisting and bowing. Two or more types of distortion may occur at the same time.

7 REMEDIES TO AVOID DISTORTION

The effects of weld shrinkage can never be entirely eliminated but you can keep them to a minimum by taking a few practical steps as follows:

- Reducing the metal weld volume to avoid overfill and consider the use of intermittent welding.
- Minimizing the number of weld runs.
- Positioning and balancing the welds correctly round the axis.
- Using back step or skip welding techniques, which involves laying short welds in the opposite direction
- Making allowance for shrinkage by pre-setting the parts to be welded out of position.
- Planning the welding sequence to ensure that shrinkages are counteracted progressively.
- Shortening the welding time.

8 SHRINKAGE CONTROL

To prevent or minimize weld distortion, methods must be used both in design and during welding to overcome the effects of the heating and cooling cycle. Shrinkage cannot be prevented, but it can be controlled. Several ways can be used to minimize distortion caused by shrinkage.

Do not over weld:

- The more metal placed in a joint, the greater the shrinkage forces. Correctly sizing a weld for the requirements of the joint not only minimizes distortion, but also saves weld metal and time. The amount of weld metal in a fillet weld can be minimized by the use of a flat or slightly convex bead, and in a butt joint by proper edge preparation and fit up. The excess weld metal in a highly convex bead does not increase the allowable strength in code work, but it does increase shrinkage forces.

- In general, if distortion is not a problem, select the most economical joint. If distortion is a problem, select either a joint in which the weld stresses balance each other or a joint requiring the least amount of weld metal.

9 PRECAUTION FOR DIMENSIONAL CONTROL

- Effective groove design as per approved WPS & PQR.
- Use of suitable & calibrated measuring devices.
- Weld sequencing to minimized distortion affecting dimension.
- Proper support to joints.
- Accurate estimation of weld shrinkage while working out on component dimension and intermediate tolerance.

10 PROCEDURE FOR DIMENSION CHECK

The procedure for dimensional check should be worked out considering the geometry, size, complexity and function criticality of the component / sub-assembly / assembly. The method for check and inspection should be same.

11 DIMENSIONAL CONTROL INSPECTION ON THE FOLLOWING

- Linear & Angular dimensions
- Slope
- Level
- Perpendicularity
- Ovality & circumference
- Straightness
- Weld joint dimensions etc.

12 MEASURING INSTRUMENTS

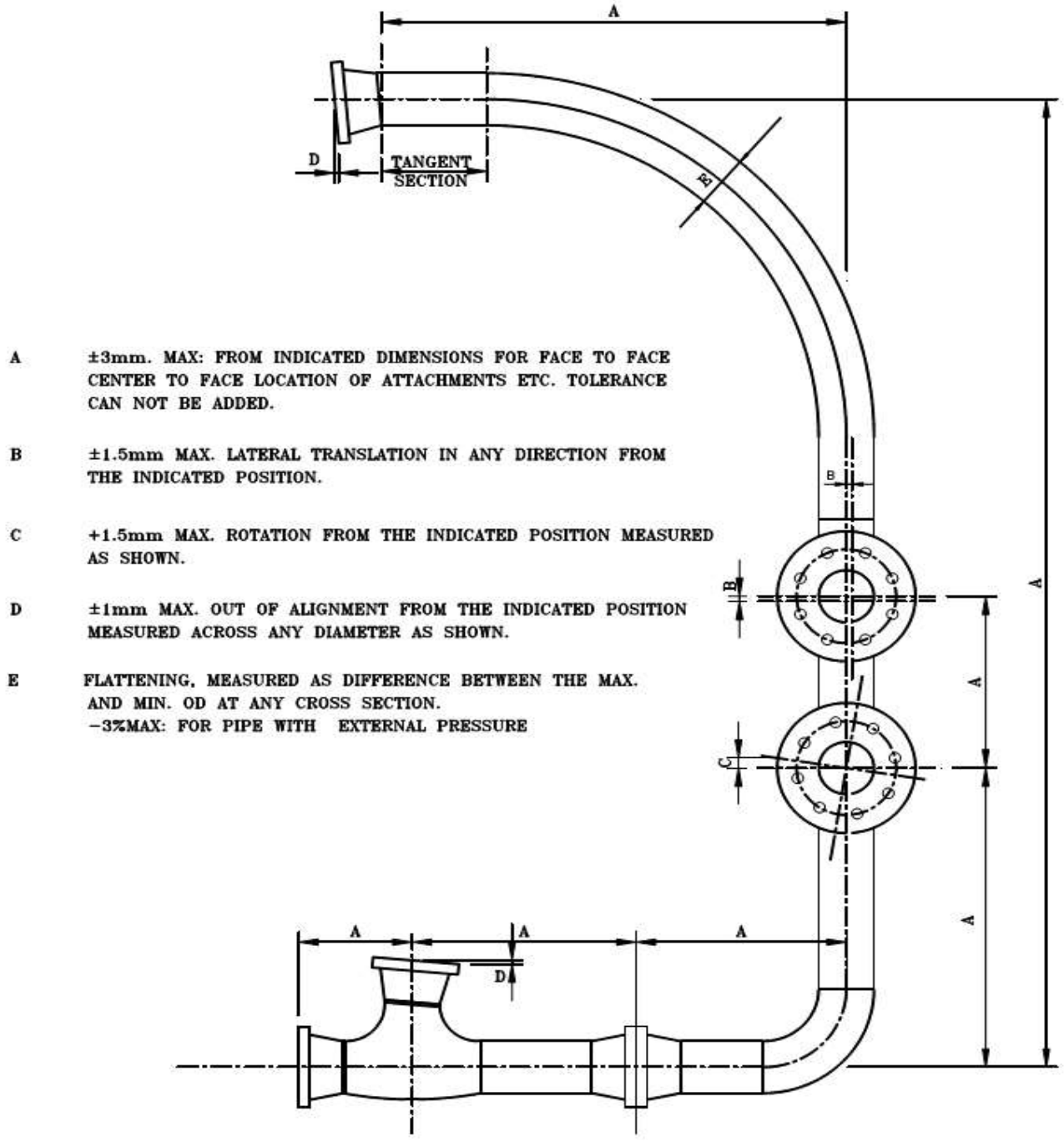
All instruments used for measuring the dimensions shall be calibrated.

- Levelling Instruments
- Measuring tape
- Spirit level
- Right Angle
- Universal Gauge etc.

13 FABRICATION TOLERANCE FOR PIPING

Dimensional tolerance for fabricated piping shall be conformed to those shown in attachment-I

ATTACHMENT - I



A	±3mm. MAX: FROM INDICATED DIMENSIONS FOR FACE TO FACE CENTER TO FACE LOCATION OF ATTACHMENTS ETC. TOLERANCE CAN NOT BE ADDED.
B	±1.5mm MAX. LATERAL TRANSLATION IN ANY DIRECTION FROM THE INDICATED POSITION.
C	+1.5mm MAX. ROTATION FROM THE INDICATED POSITION MEASURED AS SHOWN.
D	±1mm MAX. OUT OF ALIGNMENT FROM THE INDICATED POSITION MEASURED ACROSS ANY DIAMETER AS SHOWN.
E	FLATTENING, MEASURED AS DIFFERENCE BETWEEN THE MAX. AND MIN. OD AT ANY CROSS SECTION. −3%MAX: FOR PIPE WITH EXTERNAL PRESSURE

FIGURE-1
DIMENSIONAL TOLERANCES