be protected from deleterious contamination and from rain, snow, and wind during welding. Welding shall not be performed on wet surfaces.

**NB-4420 RULES FOR MAKING WELDED JOINTS**

**NB-4421 Backing Rings**

When used in components other than piping, backing rings shall conform to the requirements of **NB-4240**. Backing rings shall not be used in piping unless removed after welding and the inside surfaces of the roots are examined by a magnetic particle or liquid penetrant method, in accordance with **NB-5110**, and meeting the acceptance standards of **NB-5340** or **NB-5350**. The material for backing rings, when used, shall be compatible with the base metal. Permanent backing rings, when permitted by **NB-3352**, shall be continuous, and any splices shall be made by full penetration welds. Spacer pins shall not be incorporated into the welds.

**NB-4422 Peening**

Controlled peening may be performed to minimize distortion. Peening shall not be used on the initial layer, root of the weld metal, or on the final layer unless the weld is postweld heat treated.

**NB-4423 Miscellaneous Welding Requirements**

(a) Before applying weld metal on the second side to be welded, the root of full penetration double welded joints shall be prepared by suitable methods, such as chipping, grinding, or thermal gouging, except for those processes of welding by which proper fusion and penetration are otherwise obtained and demonstrated to be satisfactory by welding procedure qualification.

(b) If the welding is stopped for any reason, extra care shall be taken in restarting to get the required penetration and fusion. For submerged arc welding, chipping out a groove in the crater is recommended.

(c) Where single-welded joints are used, particular care shall be taken in aligning and separating the components to be joined so that there will be complete penetration and fusion at the bottom of the joint for its full length.

**NB-4424 Surfaces of Welds**

**NB-4424.1 General.** As-welded surfaces are permitted, except for inertia and continuous drive friction welding where the flash shall be removed to sound metal. For piping, the appropriate stress indices given in Table **NB-3681(a)-1** shall be applied. However, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, and abrupt ridges and valleys to meet (a) through (f) below.

(a) The surface condition of the finished weld shall be suitable for the proper interpretation of radiographic and other required nondestructive examinations of the weld. In those cases where there is a question regarding the surface condition of the weld on the interpretation of a radiographic film, the film shall be compared to the actual weld surface for interpretation and determination of acceptability.

(b) Reinforcements are permitted in accordance with **NB-4426.1** for vessels, pumps, and valves, and **NB-4426.2** for piping only for those welds that do not require preservice examination.

(c) Undercuts shall not exceed \( \frac{1}{32} \) in. (0.8 mm) and shall not encroach on the required section thickness.

(d) Concavity on the root side of a single-welded circumferential butt weld is permitted when the resulting thickness of the weld meets the requirements of Article **NB-3000**.

(e) If the surface of the weld requires grinding to meet the above criteria, care shall be taken to avoid reducing the weld or base material below the required thickness.

(f) Diometrical weld shrinkage is permissible provided an acceptable ultrasonic examination can be performed.

**NB-4424.2 Preservice Examination.**

(a) The surface finish shall be 50 Ra or better for a distance of at least \( 2t^{26} \) plus 4 in. (100 mm) or 6 in. (150 mm), whichever is greater (Figure **NB-4250-2** or Figure **NB-4250-3**), from the edge of the weld crown on at least one side of the weld where an ultrasonic examination is required.

(b) Provide welds a circumferential clearance distance of 15 in. (375 mm) (minimum) for long seam welds. This measurement shall be from the toe of the weld.

(c) A reference system shall be established for all piping and vessel welds subject to surface or volumetric examination.

(1) For piping, each side of each weld joint shall be permanently marked at a minimum of two points in suitable increments from the edge prep. These marks shall be repeated at 90-deg intervals around the pipe. For welds joining pipes to components, other than vessels where punching is not feasible, punching on the pipe side only is permitted.

(2) For vessels, each side of each weld joint shall be permanently marked at a minimum of two points in suitable increments from the edge prep. These marks shall be repeated along the weld length at 1 ft (0.3 m) intervals for vessel to nozzle welds, and at 3 ft (1 m) intervals for all other vessel welds that are subject to preservice examination.

**NB-4425 Welding Items of Different Diameters**

When items of different diameters are welded together, there shall be a gradual transition between the two surfaces in accordance with **NB-4250**, unless greater slopes are shown to be acceptable by analysis in accordance with **NB-3200**. The length of the transition may include the weld.