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Initial and Current Inspection of Welds in Structures

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Annotation: This article examines preliminary inspections during the inspection of defects found in welds and joints. The article describes the control tools used to monitor equipment and devices, the technology, assembly, and assembly of workpieces, as well as the qualifications of welders. Based on the results, factors for improving the quality of welds and joints are shown. The article also discusses issues of preventing defects arising during the welding and assembly of structures.

Keywords: weldability, rust, rolling, electron rod, flux, gas generator, reducer, layer, standard, coating, protective gases, cracks high quality welded joints, it is necessary to control the starting materials (base metal, electrodes, welding wire, fuses, shielding gases, etc.).

The quality of the starting materials is determined based on the certificate data, for which their compliance with the requirements of the given technological process of welding the product is determined. In the presence of external defects , as well as in the absence of certificates, the use of starting materials is allowed only after chemical analysis, mechanical tests and weldability tests.

The castings are inspected for the presence of visible main metal voids, sinkholes and cracks. Particular attention is paid to the areas to be welded. These areas must be thoroughly cleaned of dirt, paint, rust and other contaminants. The rolling is checked for the presence of layering, casting, and uniformity of sheet thickness. The electrode coating is checked for uniformity of thickness, cracks and other mechanical damage.

the electrode and coating, ease of slag separation, and the quality of weld formation (flowability of molten metal, spatter). Electrodes must meet the requirements of applicable DS.

that are unsuitable for this welding technological process, and for the absence of burrs, test welding is performed using appropriate fluxes or shielding gases to determine the quality of the materials according to the above-mentioned indicators. When checking the fluxes, the size and uniformity of their particle size, the absence of impurities and other inclusions are determined. The shielding gases are checked for the absence of harmful additives and moisture.

Weldability is the property of a metal (or metal alloys) to form a joint that meets the requirements of the design and operating conditions of the product under the specified welding technology. Before testing the initial materials for weldability, a decision must be made on the use of one or another material in the welded structure. In accordance with the above, weldability is controlled in two cases: when selecting materials and developing welding technology, i.e., during the design stage of production; when launching materials into the production process, i.e., during technological preparation of production. The second check is related to deviations that may occur during the melting of the base metal, wire, as well as deviations of electrodes and fuses from the values in the certificate.

Control of devices and equipment. The quality of welded joints largely depends on the proper operation of the welding equipment. The purpose and task of this type of control is to ensure that the welding equipment is maintained in working condition in accordance with the passport data of each device or machine.

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Machines and devices for arc welding must ensure stable arc ignition, the required accuracy and correctness of welding mode adjustment. These parameters must be carefully checked each time before starting the device and during production.

In gas welding, checking the gas supply sources is of paramount importance. For example, monitoring the operation of acetylene gas generators is aimed at ensuring that clean and dry gas is supplied at normal temperature and constant pressure.

To do this, check the gas mains, water barriers and pressure regulators. It is necessary to constantly check the tightness of the burners to the valves and hoses. Excess oxygen or fuel does not allow the gas to pass through. When monitoring the operation of reducers, it is necessary to pay attention to the constancy of the working pressure, their sensitivity to adjustment, throughput and resistance to freezing.

The readings of control and measuring instruments are checked by comparing them with the readings of standard instruments and measuring instruments. The quality of the welded joint largely depends on the quality of the special tools and devices used. The assembly devices must provide the required strength and rigidity, accurate, fast and reliable fastening of the elements of the welded structure; the required degree of accuracy of all dimensions of the welded part, assembly, item; installation of the welded object in a convenient position for welding, etc.

Technology control. Technological parameters are usually given in a technology or technological card, which is compiled and approved by a specialist in the field of welding with appropriate qualifications. Control during the production process is of great importance to ensure the quality of the manufactured product.

of devices, equipment, devices, tools and necessary tools, as well as the progress of the welding operation, each welder allows for timely detection of welding defects and taking measures to eliminate the causes of their occurrence. Control of the technology of manufacturing welded products includes checking the workpieces prepared for welding, the serviceability of welding equipment, the assembly of products for welding, the condition of welding materials, the welding device and compliance with the established procedures for welding. The workpieces prepared for welding are checked for their shape, dimensions and geometry of the cut, as well as for the absence of dirt, rust and moisture on their surfaces.

Control of welders' qualifications. Careful and planned control of the preparation of parts for welding and the welding area will not be effective without checking the level of welders' training. For a number of productions (for example, welding pipes during assembly), more than 70% of defects occur due to the fault of welders. Therefore, it is necessary to know their qualifications at all stages of the technological process of manufacturing structures. For this, it is necessary to check medical, physiological and qualification indicators. First of all, the qualifications of welders must be taken into account before they are allowed to perform certain welding operations. In addition , welders must be periodically re-tested during the production process.

External inspection is used to check the preparation and assembly of workpieces for welding, the performance of seams during welding, and the quality of finished welded joints. As a rule, all welded products are controlled by external inspection, regardless of other types of control . External inspection is in most cases sufficiently informative and is the most expedient and operational method of control.

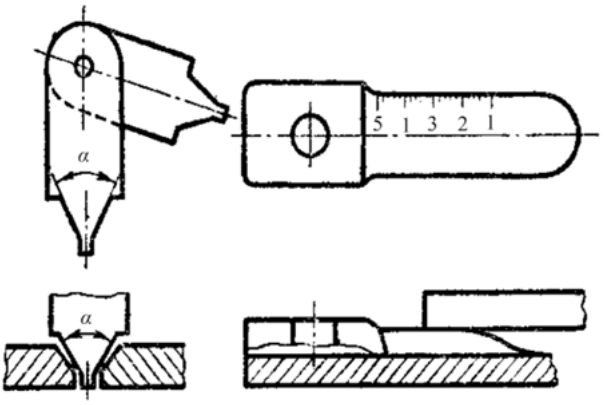
Inspection of preparation and assembly. External inspection of welded materials is carried out to detect (and determine the absence of) dents, scratches, burn marks, rust spots, etc.

The quality of preparation of the ends for welding and the assembly of the blanks are checked. The main controlled dimensions of the parts (items) assembled for welding include the gap between the ends and the non-interference of the ends.

- for end-to-end connections without separating the ends: the gap between the ends (gap) is the non-passage of the ends and the separation angle is for connections with separated ends;

- the overlap width and the distance between the sheets for overlap-overlap joints; the distance between the sheet and the tip, the angle between the elements being welded, as well as the angle of the ends and the deviation for joints with a non-transition; the distance between the elements being welded and the angle between them for corner joints.

Special templates or a universal tool (Figure 1) are used to measure and check the above parameters.



a) b)

Figure 1. Template for checking the assembly of welded joints:

a – for end-to-end connection; b – for overlap connection.

Details, assemblies or items assembled for welding that deviate from the technical conditions or the established technological process are rejected. Control tools, procedures and methods are provided for in the technological process of production.

Monitoring the welding process. At this stage, the welder, in addition to controlling the welding procedure (current, voltage, welding speed, etc.) and stable arc burning, monitors the correct execution of the rolls in multilayer seams.

At this stage, it is especially important to carefully inspect the first layer, even if the number of layers is arbitrary. The quality of the welding of the first layer is assessed, if necessary, under a magnifying glass, and capillary or magnetic defectoscopy is sometimes used to assess the quality of the structures performing the required function.

Inspection of finished products. External inspection with the naked eye or with a magnifying glass initially identifies defects in the welds, such as cracks, cuts, gaps, air spaces (holes), burrs, leaks, and areas of weld failure below the weld. Most of these defects are usually unacceptable and must be corrected. The inspection also determines the shape of the welds, the distribution of the burrs, and the general nature of the metal distribution in the weld. is also specific to the spatial position in which the welding is performed.

The evenness of the rods indicates the welder's work, his ability to maintain a constant arc length and weld at a uniform speed. The unevenness of the rods, the variation in the width and height of the weld, indicate a change in the arc power, frequent stops during the welding process, and unstable arc burning.

May have poorly welded areas, voids, slag and other defects. In vertical and overhead welding, the unevenness of the welds, bumps, low-rises and melted areas are sharply expressed. In vacuum welding, the outer surface of the welds is smooth, shiny, without burrs , and has the appearance of a molten metal strip. In welds made of titanium and other active materials, the color of the run and the size of the color zone are controlled.

Welds are often compared with special standards in terms of appearance. The geometric parameters of the welds are measured using templates or measuring instruments (Fig. 2). Careful external observation is usually a very simple operation, but it can serve as a highly effective means of preventing and detecting defects. Only after external inspection has been carried out and unacceptable

defects have been prevented, internal defects in welded joints are controlled using other physical methods.

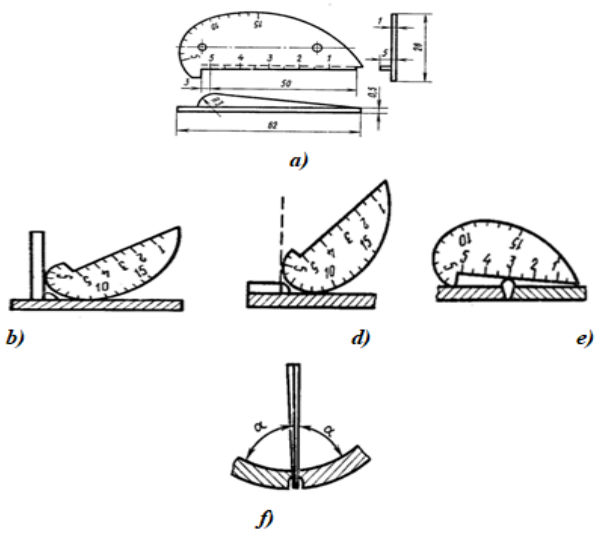


Figure 2. Universal template :

a- general view, b, d - measuring the balance of the corner seam, e - three-pointed star measure height, f - measure distance.

Careful external inspection is usually a very simple operation, yet it can serve as a highly effective means of preventing and detecting defects. Only after external inspection has been carried out and unacceptable defects have been prevented, should the welded joints be inspected by other physical methods to detect internal defects.

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