WELDED JOINTS OF BUILDING DESIGNS

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СВАРНЫЕ СОЕДИНЕНИЯ СТРОИТЕЛЬНЫХ КОНСТРУКЦИЙ

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Аннотация. *В развивающемся мире одну из важнейших ролей играет строительство новых зданий, мостов, различных строительных конструкций. В свою очередь абсолютно все строительные конструкции собираются из отдельных частей. Для того чтобы построенное сооружение прочно стояло многие годы необходимо как можно лучше скрепить его составные части. Для этой задачи на сегодняшний день отлично подходит сварка, а для сложных конструкций необходимо использовать определенные технологии сварки.*

Introduction. There are different classifications of welded joints. They differ according to the following characteristics:

- geometry of the joint elements;
- type of welded joints;
- welding method;
- thickness of the welded elements;
- welding materials.

In most cases, electric arc welding is used for the production of building constructions. Main types, structural components and dimensions of the welded joints are specified in the normative documents. The documents state that there are four typical cases for electric arc welding depending on the type and geometry of the joint:

- a butt joint (two pieces are parallel to one another and are joined side by side);
- corner weld (two parts with their butt ends are joined at a certain angle relative to each other);
- T-joint (one piece is adjacent to another with its butt end. The pieces intersect each other at 90^0);

Research and results. In assembling, indirect welding with the welding of the root joint and welding on steel plates are used [1]. The challenging part of this process is to join the steel plates on the part of the buttered joint. Thus, in hand welding the gap in the assembled joint should be 7±1 mm. If these requirements are met, the occurrence of “moustache cracks” will be excluded. The plate should be thick enough to eliminate burn-through. In the manufacture and assemble, the welding of butt joints is normally done with the application of mechanized

welding methods. The best results are achieved with the use of automatic Submerged Arc Welding (SAW) [2]. We researched this technology through the example of tube welding, Fig. 1 represents the obtained joints.

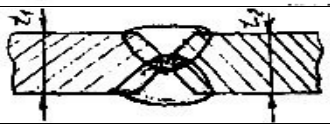
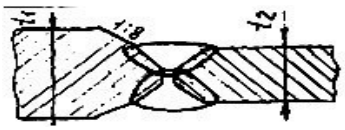
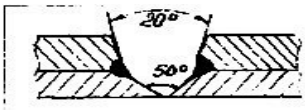
Fig. 1. Joints obtained with the use of the plate

Buttered joints are performed with elements as thick as 16 mm. If the thickness of butt sheets more than 16 mm, double-sided or single-sided grooving is recommended. The parameters of the joint and the modes are chosen to ensure full penetration welding. Joints 1 and 2 are carried out when the difference between the thickness of the sheets is not more than 4 mm. [3].

When it comes to a significant difference in the thicknesses, the joints of either type 3 (one-way bias) or type 4 (two-sided bias) are recommended. In bridge construction, a slope of 1:8 is applied for stretched elements and a slope of 1:5 is applied for compression elements. Slopes are performed with the help of cutting or gouging in line with the requirements of surface roughness.

Table. 1

The most typical butt joint used in welded constructions.

№	Sketch of the joints	Description of the joints	Marking the joint
1		The joint of the sheets of the same thickness without eccentricity and bevel edges	C7
2		The joint of the sheets of the same thickness without eccentricity, but with bevel edges	C15
3		The joint of sheets of different thicknesses with double-sided bias. For stretched elements 1:8, to compressed elements 1:5	C15
4		The joint of sheets of different thicknesses with two-sided bias. For stretched elements 1:8, for compressed elements 1:5	C15
5		The joint of the sheet pack with two-sided bevel edges. The contact surfaces are sealed at the joint.	DIN18800
6		The joint of the sheet pack with one-sided bevel edges. The contact surfaces are sealed at the joint.	DIN18800

The thickness of the weld deposit is 7-8 mm. In automatic welding during the assembling of this section one should avoid full penetration of the zone injected.

In the construction of steel structures, the main scope of welding work accounts for the execution of corner welds [4]. These joints by weight of weld deposits come up to more than 90%. Approximately 40% of the joints are estimated joints; their dimensions are established in the design in accordance with strength calculations. And about 60% are structural joints [5]. Thus, the rational design of corner joints has a great potential to improve the quality and efficiency of welding production.

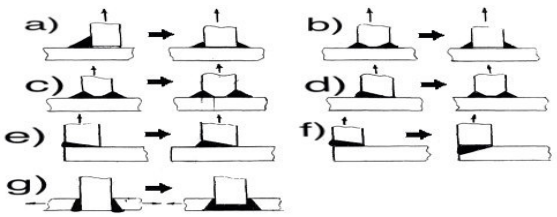


Fig. 2, the types of corner welds

Conclusion. Thus, it was revealed that in the design of welded joints (where one experiences tensile stress through-the-thickness of the sheet) corner and t-joints welding should be applied to reduce the risk of layered cracks. To achieve the best results, it is necessary to use:

- double-sided corner joint and minimize the concentration of deformations at the top of the weld joint (Fig. 2, a);
- joints without beveling with the least possible amount of weld deposit to replace the joints with full penetration (Fig. 2, b);
- double-bevel groove (Fig. 2, c);
- T-joints instead of corner joints (if possible) (Fig. 2, a).

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