

Ultra Heavy Gauged Square Tube “JFE Kakuhot” for Excellent Designing[†]

welded by electric resistance welding, followed by forming them into a square cross sectional shape. These are respectively called the welded square box, the pressed column, and the rolled column, and their general dig

Meanwhile, for the joints of beams and columns, reinforcement of the joint is often eliminated by using heavy gauge square steel tubes.

To fabricate ultra heavy gauge square steel tubes of small cross section that satisfy these requirements, the above-described method of using the welded square box has been tried. A small cross sectional area, however, decreases the inside space and so hand-welding is needed, but this increases the cost.

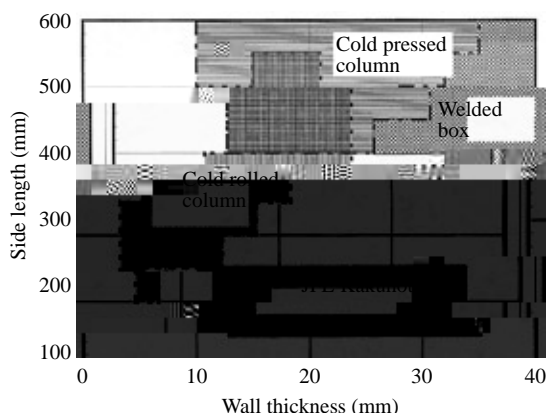


Fig. 1 Size range and kinds of square steel tubes

JFE Steel has therefore developed “JFE Kakuhot” which is an ultra heavy gauge square steel tube of small cross section fabricated using the seamless steel tube manufacturing process.

2. Characteristics of JFE Kakuhot

2.1 Manufacturing Method

JFE Kakuhot is manufactured using a seamless steel tube manufacturing line. That is, the hot sizing mill (Fig. 2) which is the final step of the manufacturing process, reshapes the mother pipe of circular cross section cross section into a square one.

The hot sizing mill has a tandem arrangement of mill stands with grooved rolls, thereby forming a mother pipe and its large outside diameter is reduced to a small specified outside diameter. The product is manufactured by applying an existing 8-stand sizing mill of 2-roll type. A circular cross section of the mother pipe is formed into a square cross section by the last four stands in the sizing mill.

2.2 Dimensional Characteristics

Figure 3 shows an example of the product, which has a cross section of 250 mm in side length and 35 mm in wall thickness.

It is generally considered that when manufacturing a square steel tube by roll forming or press forming, it is difficult to satisfy both corner sharpness and side fatness. However, JFE Steel has achieved both requirements simultaneously by making full use of the hot-

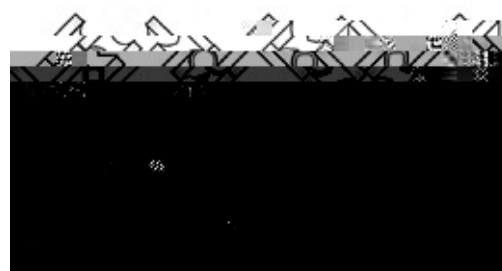


Fig. 2 Schematic drawing of forming JFE Kakuhot using hot sizing mill

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forming process for the seamless steel tubes and optimizing the forming conditions through an experiment¹⁾ using a high strength production facility and a calculation using the rigid plastic finite element method²⁾. The corner radius R and the side fatness on the cross section of the product manufactured by the technology are given in **Table 1**. For the joint of a beam and column, the dimensional requirements may become severe in some cases, requiring a corner radius R of $n\sqrt{A}$ $n\sqrt{A}$ _ give a

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