Stacking or Piggybacking of Headed Studs

The practice of Stacking studs by welding one (or more) studs on top of each other is commonly known as "piggybacking". This technique is frequently used on steel to concrete embedment connections.

Stud welding of one stud to the head of another stud produces a full strength weld. The ultimate failure will occur in the shank of the stud, not in the weld. The ultimate strength of a stud welded to the head of a stud will be the same as for a stud welded directly to the base plate.

Several tests have been conducted on stacked studs. Nelson Stud Welding in Germany participated in the tests done at the University of Bochem. These test results showed that the tensile and shear capacities for the stacked studs developed the expected ultimate capacity for the stud diameter, embedment lengths tested and the concrete strengths used in the test.

In Europe, a compressible felt or rubber washer is commonly used under the head of the bottom stud. This washer assures that any tensile load will not be applied to the first head but will be resisted by the second head deeper in the concrete. When no washer is used, depending on stud length, concrete strength, stud spacing, etc. the shear cone stress and cracking may begin under the first head, but then the load will transfer to the second head deeper in the concrete and this will develop and determine the ultimate capacity of the embedment. If the lower stud is long enough to develop the strength of the stud no washer is needed. The use of washers has not been considered necessary on stacked studs that have been used in the United States.

The piggybacking method was approved by the German Institute for Construction and it is included in the **Committee European Bautecknique Guide** (Approval **Z21.5-1982**) for the design of fastenings in concrete. This is now a Euro Norm.

The use of stacked studs is recognized in the United States by the **California Department of Transportation, Bridge Code, Section 55-2.02, Steel Structure.** It reads, “When stud type shear connectors longer than 8 inches are to be used, they may consist of 2 or more shorter studs of the type shown on the plans connected together by full penetration welds.”

Stud welds are full penetration welds. The fact that stud welds are full penetration welds is shown by the reduction in stud length that occurs during the process.

We hope this information on stacking of studs is of assistance.