

# ASK DR. GALV

**Q** I've got a worried customer who says my hot-dip galvanizing job has rendered his steel unusable. I know that the galvanizing was not the source of his problem, but he refuses to believe me. How do I sort out this whole mess?

**A** This situation occurs quite frequently, especially in situations where fabricators and specifiers are not familiar with the process of hot-dip galvanizing. They are not aware of some of the design considerations of the process that sometimes require special attention. However, they have undoubtedly heard of some other fabricator having galvanizing problems and failures. From this they have developed misconceptions and apprehensions to the quality of galvanized coatings, which, in turn, causes them to jump to conclusions ultimately blaming the hot-dip galvanizing as the cause of any type of failure.

These situations are best alleviated by good documentation and communication between all involved parties. If you galvanize steel that ends up with problems during erection or service and the problems are blamed on the galvanizing, the first step is to consult all parties involved to discuss the situation. Find out what the source of the complaint is and determine whether it can be fixed, then, try to determine the cause of the problem to prevent it from happening in the future. Also, remember to keep documented copies of any communication between you and the involved parties (i.e. email, faxes, pictures, memorandums, etc.).

As an example, one galvanizing company called us a short while ago with a not so typical story. Some I-beams that were galvanized exhibited cracking in the web of the I-beam. The pictures below show how severe this cracking became. The second beam almost cracked into two pieces. The galvanizer immediately identified the problem to his customer and then the fun started.

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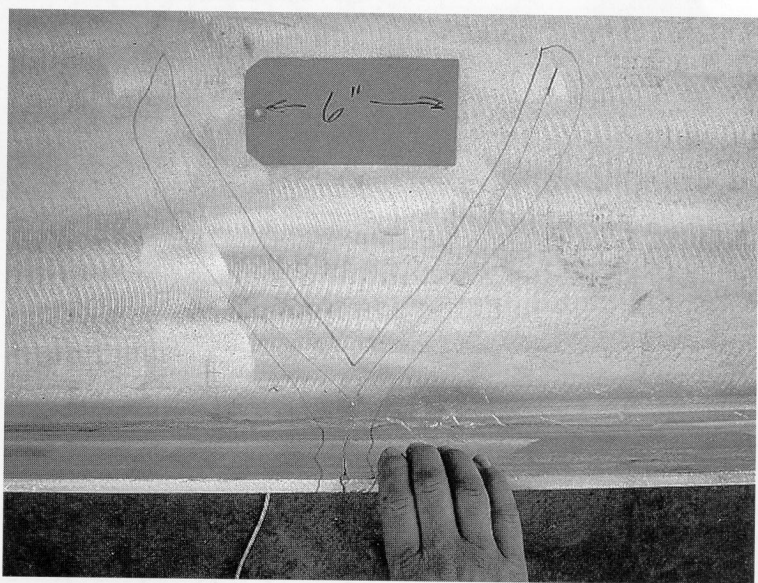


Figure 1. I-Beam with Y-shaped crack in the web of the beam.



Figure 2. I-Beam with web and flange crack.

Once all the involved parties were contacted with the details of the situation, the first step was to test those beams that had already been galvanized and were on the yard at the galvanizers as well as those that were delivered to the job site. The beams were tested with magnetic particle to locate cracks that are not visible to the naked eye. Out of the 20 beams that had been galvanized, seven showed evidence of cracking. Now the problem seemed to be getting bigger.

The next step was to call in all of the interested parties including the steel manufacturer and its metallurgist. The first question was whether the cracked beams could be fixed. The group wanted to know the extent of the cracking. The black beams that were on the galvanizer's lot were examined and one of the beams had a visible

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crack before hot-dip galvanizing. It was time for a detailed examination of the beams. Four black beams were spot checked with magnetic particle testing and all four showed evidence of cracks in the flange area. The number of micro cracks that were found by magnetic particle testing was in the hundreds and there was a pattern to the cracking. The cracks were located along the flange of the beam every ten feet. This was almost the same pattern as the stamped logo of the steel manufacturer, but the logos appeared every five feet. The steel manufacturer reported to the group that their logo pattern was indeed every ten feet, in the same location as the cracks.

The steel manufacturer described the process of producing the beam and the logo pattern was hot stamped every ten feet along the flange. The beams were then cold bent before galvanizing to produce a curve in the beams. The cold bending process had put so much strain on the areas around the logos that micro-cracks had developed. The steel metallurgists then told the group that the hot-dip galvanizing process was not the cause of the cracks and had actually helped find the cracks before the beams were put into service. The other logos that were seen between the stamped logos were generated during the bending process and they did not have cracks.

The solution to this particular problem would be to grind out the cold-formed logos prior to galvanizing to prevent strain-age embrittlement of the I-beam after the galvanizing process. If the micro cracks that were formed from the cold-worked logos are ground out, this will eliminate the potential for strain-age embrittlement.

Documenting failures with pictures and other evidence of communication with the involved parties ensures prompt and accurate assessments of the failure and, ultimately, will show where to improve the process in the future. Handling worried customers who are blaming galvanizing for their failures is a situation that most galvanizers will have to handle. Dealing with these situations objectively and backing up claims with laboratory testing and documentation will ensure a prompt and accurate answer to the cause of failure and, hopefully, prevent any accusations or finger-pointing.