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? CRACKED COPES IN BEAMS

thread172-3945

Steel Fabrication

Miscellaneous Metals Fabrication Carbon Steel, Stainless & Aluminum



OC Decorative beams

Sales and Installation of false Beams/Columns/Rafter Tails

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apiguy (Visitor)

20
Dec
00
12:28

DOES ANYONE HAVE ANY EXPERIENCE WITH COPES BEING CRACKED IN GALVANIZED BEAMS?

Ron (Structural)

20
Dec
00
18:44

Do the cracks extend through the galvanizing into the base metal? Check this first.

Have the beams been loaded yet or are you seeing these cracks just after the galvanizing? If loaded, what is the loading and is it repetitive/dynamic? What is the radius of the cope?

★ **HochwaltPE** (Structural)

26
Dec
00
12:20

I haven't experienced this personally, but there was a good article on this in the October 1995 Issue of Modern Steel Construction. The article was by Thomas J. Langill and Tom Schlafly and was titled "Cope Cracking in Structural Steel After Galvanizing."

AISC should be able to provide you with a reprint of this article. Their [technical support](#) folks may also be aware of more recent information on this topic.

ziggy (Visitor)

26
Jan
01
16:28

In addition to the '95 article, AISC issued a bulletin on this problem. The bulletin is dated December 9, 1999. In that bulletin AISC supplied an incident reporting form to identify observable trends and develop some solutions for crack avoidance.

AISC's Engineering and Research department issued the bulletin and form.

[apiguy](#) (Mechanical)

5 Mar
02
17:09

How strange!!!!!!! I just signed up and when I returned back to this site, I found your thread. I had quite an experience with cracks in copes last year. We inspected 36 beams and 23 were found to have cracks in them. I performed dry magnetic particle inspection to verify the length. As we ground the cracks out several of the thicker beams had "pockets" just below the cope in the bottom of the radius. Rewelding the beams was tricky.(new crack propagation) We finally found a procedure that would work:

1. Grind the galvanizing off.
2. Prepare a small U-groove on one side of the web.
3. Fill this groove with 7018-A1 weld metal with approximately 1/8 reinforcement.
(If you are in a colder region preheat may be required)
4. Backgrind the crack on the other side of the web to good new weld metal with the same U-groove.
5. Perform Dry Magnetic Particle inspection to verify complete removal of the crack.
6. Again, fill this groove with 7018-A1 weld metal.
7. Grind the reinforcement back to the original web thickness and perform Dry MT again as a final check.

This solved our crack problem. As far as I know there is no documentation to support at which phase of production is causing the cracking whether it is the coping operation or the galvanizing operation. Our beams came from 8 different countries and 3 suppliers. We were able to eliminate a single manufacturer as the culprit and that was about it.

I hope this information helps.If you have any pictures I would love to see them. email to rschram@pharmacia.com

[RMPE](#) (Structural)

8 Mar
02
17:03

I've heard of this problem also from a local fabricator that apparently just occurred out of the blue on a specific project but was occurring frequently. Of course, everybody was pointing fingers but and no final determination was made, but a similar repair was recommended:

1. Strip off galvanizing
 2. Drill hole at end of each crack
 3. Sawcut out cracked areas
 4. Bevel edges
 5. Dye test edges to verify all cracks have been removed
 6. Fill with suitable weld material
 7. Grind all edges and surface smooth
 8. Mag test finished welds
 9. Recoat degalvanized areas.
- I was not directly involved nor do I know how it turned out, but was interested.

jrmack (Structural)18
Mar
02
23:01

I may be a little late on this thread, but Ron asked a good question. He was concerned with fatigue. If your problem was caused by fatigue, your repair may look great, but it may be temporary. The radius of the cope must be at least 1/2" without the weld (a stress riser). With the weld, I don't know but certainly more than 1/2".

apiguy (Mechanical)19
Mar
02
15:43

Well I have to say I have made a slight error. I posted the original thread and then inadvertently responded to my own thread over a year later. A lot of good ideas though...The beams we inspected were brand spankin' new and had not been subject to any loads. The folks of the galvanizing industry are studying this problem and the International Lead and Zinc Research Organization (ILZRO) has published a report ZM-396 "Control of Cracking in Galvanized Structural".

If anyone has this report, I'd be curious to know what their findings were.

Chris Murgatroyd (Visitor)13
Aug
02
11:51

Cope Cracking or Liquid Metal Assisted Cracking. This has been recognised in the UK and it effects more than just copes on beams. It also effects the heat affected zones in welds. Basically it occurs during the galvanizing process and it needs three factors. These are a susceptible microstructure, stress and a liquid metal. Zinc is the liquid metal and cannot be avoided (unless you use zinc rich paints). The stress comes either from residual stress or thermal stress during galvanizing. On one project in the UK out of 120 areas inspected 83 has cracks. One extended for 850mm, Or >33". The most serious cracks are not visible and can only be located by NDE. This problem needs greater appreciation and more publicity.

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