What's the melting point of steel?: A conversation with a chemist about the Brent Spence Bridge crash

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Stefanie Ferguson has a Ph.D. in chemistry. *(Photo: Provided)*

Stefanie Ferguson is a chemistry teacher at GIO International High School in Bowling Green, Kentucky. She has a bachelor's degree in chemistry from Western Kentucky University and a Ph.D. in chemistry from the University of Tennessee-Knoxville.

Below are excerpts from a conversation with Ferguson about the crash and subsequent fire that closed Cincinnati's Brent Spence Bridge. The conversation has been edited for length and clarity.

What happens to a bridge like the Brent Spence when it catches on fire?

The melting point of steel, fortunately, is a lot hotter than what the fire got up to, 1,500 degrees Fahrenheit. That's very hot.There are different degrees and grades of steel, but fortunately, steel melts at 1,500 degrees Celsius. That's just a little less than double the temperature of the fire. So, it's not going to be one of those things where the bridge would just collapse.

Steel is made of iron and carbon, and the good thing is they're very stable. You would just want to get it checked out, and that's something an engineering team would be able to do.

One of the trucks involved in the crash was carrying potassium hydroxide.

That can do quite a bit of damage to anything that would be a carbon base, or that petroleum texture. All the petroleum-based compounds that we use for asphalts – that potassium hydroxide probably did a number on that.

Potassium hydroxide is very caustic. It is a base. The cool thing about that is, in the chemistry lab, if you want to clean stuff, that's what you use. You can clean a lot of nasty things with a solution with that inside it. But in a massive amount on a highway, that could really do some damage.

I always go back to the kitchen. If people buy oven cleaner, that stuff is really nasty, you should wear gloves and such. That is sodium hydroxide, and it's nasty for sure. Potassium hydroxide is a degree worse and harder to deal with. And so, depending on how much time the potassium hydroxide was on the highway, it could start that deterioration process.

Officials said the potassium hydroxide probably contributed to the heat and duration of the fire. Would it have caused any other problems?

It would be very hard to get rid of it, too. If you say, 'OK, we'll just pour water on it, we'll just dilute it down,' well, where's it going? It can go into the environment, and that's not a great thing to do. So it's a tough, tough situation.

I made the joke with a friend, it's hard to find an engineer's worth supply of baking soda to cover up chemical spills like that.

In the 911 call, the truck driver can be heard saying he couldn't get his hazmat paperwork (/story/news/2020/11/12/911-calls-brent-spence-bridge-crash-my-trucks-fire-big-time-god-almighty/6265341002/) before he jumped out of the truck.

I was told this for years as a chemist, it's so important that we give the proper information so everyone knows what we have in our lab, or in this situation, what was on board. We call them material safety data sheets. First of all, it tells what the concentration was, what it was, how much is there, and what we need to do in terms of fire or emergencies, poison control, things like that.

Those data sheets are uniform nationwide, so that part is good. OK, the sheets were destroyed, but do you know what was in here? Chemists and chemical engineers have that information and share that out so law enforcement and the fire department can do their job properly.

This is causing major traffic headaches and taxpayers could be facing hefty repair bills. Is there any good news here?

The good news is, at least you didn't have an issue where this happened in the middle of January or February, where it's very cold outside and you have this high, high temperature from the fire.

Think of it like when you cook, you're not supposed to put certain pots and pans into a hot oven if they're cold. It shouldn't go from your refrigerator straight into the oven because you have a chance of damaging the container.

The same holds true with the bridge. If this were to happen in January, February, say it was sub-zero degrees, that could give more cause for concern. It's a good thing that didn't happen.

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Brent Spence Bridge

- ➜ 911 calls from Brent Spence Bridge crash: 'My truck's on fire big time. God almighty' (https://www.cincinnati.com/story/news/2020/11/12/911-calls-brent-spence-bridge-crash-my-trucks-fire-big-time-god-almighty/6265341002/?utm_source=oembed&utm_medium=onsite&utm_campaign=storylines&utm_content=news&utm_term=6313173002)
- ➜ 'A darn mess': Why the Brent Spence Bridge closure is more than a Cincinnati problem (https://www.cincinnati.com/story/news/2020/11/12/brent-spence-bridge-why-cincinnati-bridges-closure-u-s-problem/6268564002/?utm_source=oembed&utm_medium=onsite&utm_campaign=storylines&utm_content=news&utm_term=6313173002)
- ▶ Video: Aerial view of the closed Brent Spence Bridge (https://www.cincinnati.com/videos/news/2020/11/12/aerial-view-closed-brent-spence-bridge/6271093002/?utm_source=oembed&utm_medium=onsite&utm_campaign=storylines&utm_content=news&utm_term=6313173002)
- ➜ Anderson Ferry transporting as many as 1,000 cars a day after Brent Spence Bridge closure (https://www.cincinnati.com/story/news/2020/11/13/anderson-ferry-transporting-many-1-000-cars-day-after-brent-spence-bridge-closure/6278857002/?utm_source=oembed&utm_medium=onsite&utm_campaign=storylines&utm_content=news&utm_term=6313173002)