

## Pre-Visit Activity Sheet- Teacher Guide Find & Fix Failure Points



Students who demonstrate understanding can:

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Introduce the idea of engineers and what they do.** Engineers are people who design solutions to problems. Engineers fail all the time when they are trying to find the best solution to a problem. Failing is important because it helps engineers figure out how to make a solution that works. To do that engineers need to find their *failed solution’s failure point*.

### 1. What is a failure point?

The point in a system where, if it fails, the whole system fails. As engineers, we want our solutions to fail so we can pay attention to how and where they fail. That will allow us to improve our designs at those points so that we can improve our solutions and make sure they can withstand multiple tests.

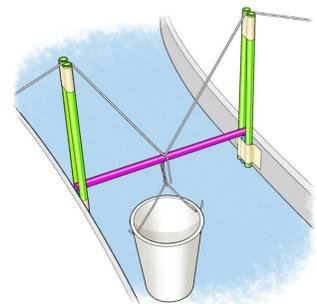
*Engineers have to be able to spot failure points and then try to fix their solution.*

### 2. How do engineers find and fix failure points in a solution they're trying to develop?

Engineers would need to make a plan to test the structure (i.e, a bridge) and see if they can find failure points first. One way that engineers test the solution in its early stages is to build a small model of it.

### 3. If you were an engineer building a bridge, what would you do to test for failure points?

Test whether the bridge can hold a certain amount of weight. Keep track of how much weight the bridge holds as we pile weights on its deck. Keep adding weights until we find the amount of mass that makes the bridge collapse. The failure point will be the specific weight at which the bridge is no longer a good solution.



### In Conclusion:

### 4. What are some of the steps that engineers go through when they're trying to find and fix failure points?

To figure out whether a solution is successful engineers make a plan or an organized series of steps to accomplish their goal. Part of this plan includes isolating a variable and then changing that one variable in a series of trials or tests. Once their solution fails one of those trials, they have found a failure point.

# “Roller Coasters: An Inventor’s Journey”

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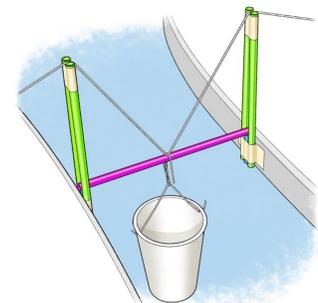


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