

Get to the Root of the Problem: Root Cause Analysis (RCA) Explained

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Ever get tired of those pesky dandelions in your otherwise lush yard? The weeds are the obvious problem, but have you ever thought about the underlying, or “root,” cause? That might not be so obvious. In reality, there are usually multiple “roots” to most problems, even in the construction materials testing (CMT) industry.

Root Cause Analysis (RCA) is a detailed process that leads to the discovery and elimination of the true, underlying cause(s) of a problem. The ultimate goal of RCA is to prevent a problem from recurring, which saves time, money and resources. A short-term fix of the obvious symptoms, like tackling the dandelions with your John Deere tractor, is a bandage and usually does not prevent the problem from happening again. The “weeds” will grow back. That is why it is typically necessary to dig deeper.

For AASHTO-accredited laboratories, RCA should be included in corrective action reports for low proficiency sample ratings, and for nonconformities noted in the AASHTO re:source and CCRL on-site assessment reports. There are many complicated and time-consuming techniques available to determine RCA, such as the Ishikawa fishbone diagram and cause mapping. However, perhaps the easiest way to determine the root cause of a problem is to simply ask “why?” several times, a process commonly known as “The Five Whys.” Let’s take a look.

The Five Whys technique was initially developed by Sakichi Toyoda for the Toyota Industries Corporation to incorporate in their manufacturing methodologies. By repeating “why?” five times, the nature of a problem and, more importantly, its solution should become clear. Although simplistic, this technique can be applied to most problems, and is often effective because it promotes deep thinking. Five iterations of “why?” is generally enough to determine the root cause, but fewer than or greater than five may be more effective in some cases.

Let’s go back to the dandelions and try The Five Whys technique to determine what happened:

The problem: Dandelions have overtaken my yard.

1. **Why?** The dandelions multiplied and spread when they went to seed.
2. **Why?** I did not eradicate the first few dandelions properly before they went to seed.
3. **Why?** I thought pulling the dandelions by hand would work, but the roots fractured and the darn things regenerated!
4. **Why?** I wasn’t aware of the special processes needed to effectively remove the dandelions at the root.
5. **Why?** I did not research dandelion prevention ahead of time.

And there is the root cause of my dandelion problem - I didn’t do my research, plain and simple. Note that the root cause points toward a process (or lack thereof), rather than a quick fix. Identifying that process is one of the most important aspects of the Five Whys. The solution to the dandelion problem? Do the research well in advance and be prepared! Do you see how uncovering the root cause layer by layer ultimately led to a solution in this case? Stopping at the first “Why?” (the dandelions went to seed) would have identified one cause of the problem, but not necessarily the ultimate, or root, cause.

Now let’s take a look at a common problem found during an AASHTO re:source assessment. Will The Five Whys technique crack this case, too?

The problem: The temperature of the oven presented was not maintained at $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$). The temperature ranged from 80 to 90°C .

1. **Why?** The heating element in the oven was not operating properly.
2. **Why?** The heating element was caked with dirt and grime.
3. **Why?** The inside of the oven had not been cleaned in years.
4. **Why?** Laboratory personnel were unaware that the oven needed to be cleaned regularly.
5. **Why?** The laboratory's preventive maintenance plan did not include oven cleaning.

Root cause determined!

While it was initially determined that the heating element was broken, merely replacing the heating element is just a bandage. Installing a new heating element would not necessarily prevent the problem from recurring, which is the ultimate goal of RCA. The new heating element is likely to become dirty again if the oven isn't cleaned regularly, thus requiring multiple (and costly) replacements. By digging just a little deeper below the surface, we were able to discover the real cause of the problem – the lack of a preventive maintenance plan for ovens. Again, the root cause pointed toward a process that didn't exist. We were also able to develop a solution – implement a preventive maintenance plan for ovens. An additional benefit is that the solution (preventive maintenance) may also apply to other equipment, possibly eliminating future problems of a similar nature.

The Root Cause Analysis umbrella includes many different tools, processes and philosophies. Regardless of the specific type of RCA that you choose to utilize, remember that there is just one true root cause for any given problem. Over time, the process of determining root cause can morph from a reactive method of solving an existing problem to a proactive way of preventing problems from occurring in the first place.

RCA can be a frustrating and seemingly endless task to undertake, but a little perseverance will go a long way towards the ultimate reward – the total elimination of a problem. So now, what to do with all those dandelions? Make them into wine!