100% Inspection Is Not QA

BY DAN KAUFMAN

The best assurance of quality is through adherence to a well-designed program.

ON THE SURFACE, writing certification criteria looks like a relatively simple process. A group of volunteers, all of prescribed backgrounds, just have to agree on what criteria are important. Selecting the words to convey criteria should not be difficult. We all speak the same language don't we? The answer is no, we don't, and while we may all want the same goal, namely, a quality structure that meets the design requirements, getting to the goal can take many different paths.

One common path to confusion is highlighted by the use of the acronym QA, which stands for Quality Assurance. The American Society for Quality defines QA as "all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence a product or service will fulfill requirements for quality." This can be more easily explained as that part of an organization that plans how quality criteria are going to be attained. The actual inspection is QC, or Quality Control, which means checking to determine if the desired quality has been achieved.

The various departments of transportation (DOTs), and building code officials throughout the United States use "QA" to represent third-party inspection that is applied to the fabrication of materials for their project. (See Figure 1 on page 59.) That's one difference with the generally accepted use of the term QA. Many of these public agencies require 100% inspection of the pieces to be shipped. In those cases, that creates a second discrepancy with accepted quality principles, specifically the reliance on 100% inspection.

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> —*Statistical Quality Control*

The discussion of the validity of 100% inspection vs. acceptance sampling has been going on for quite some time. H.F. Dodge, a Bell Labs statistician who spearheaded efforts to apply statistical theory to sampling inspection, wrote in 1948: "One trouble with 100% inspection, where it is practicable, is that the inspector merely cleans up the faults of others, sorting the good from the bad, and the production man takes it as a matter of course if just individual articles are returned to him for repair. But if a whole lot is returned to him, as when lot sampling is used, and he is required to undertake the entire corrective action, the steady outward flow of product is interrupted. If there are many lot rejections, he must get busy to find and eliminate it in order to avoid further lot rejections. This is an indirect power of sampling—it forces correction of the process, where the fault lies."

An objective of 100% inspection is to offer the illusion that 100% perfect materials will result. This has been shown many times to be a false conclusion. The easiest demonstration to prove this is to have several reliable people take a written page and separately count the number of times a specific alphabetic character appears on the page. See how well everybody agrees, and if they don't all agree, do it again. This gets old in a hurry.

"It is common knowledge that on many types of inspection, even several 100% inspections will not eliminate all of the defective product from a stream of product a portion of which is defective," wrote Eugene L. Grant and Richard S. Leavenworth in the 4th edition of *Statistical Quality Control*, published in 1972. "The best protection against the acceptance of defective product is, of course, having the product made right in the first place. Good sampling acceptance procedures may often contribute to this objective through more effective pressure for quality improvement than can be exerted with 100% inspection. Some sampling schemes also provide a better basis for diagnosis of quality troubles than is common with 100% inspection."

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Figure 1

		Fabricator/Erector	Owner/Jurisdictional Authority
Historical Structural Steel Definition	QA Quality Assurance	N/A	Special Inspection required by the Owner/Jurisdictional Authority to approve products and processes.
	QC Quality Control	Planning and system activities in a quality system so that quality requirements for a product will be fulfilled. Observation techniques and activities used to fulfill requirements for quality.	N/A
Current ISO/ASQ/ AISC Certification Definition	QA Quality Assurance	Planning and system activities in a quality system so that quality requirements for a product will be fulfilled.	Special Inspection required by the Owner/Jurisdictional Authority to approve products and processes.
	QC Quality Control	Observation techniques and activities used to fulfill requirements for quality and approve products and processes.	N/A

The definitions of Quality Control and Quality Assurance reflect the historical usage within the sphere of the structural steel construction industry where the owner of a project wants inspection independent of the fabricator or erector. It is unique to this industry that the terms QA and QC are used to identify, separately, quality activities by the ownership/independent party (QA), and the contract fabricator or erector (QC).

Because human nature isn't going to change soon, there will continue to be people who believe that 100% inspection should be required, especially if there is a fear of being accountable for why a piece, any piece, was not inspected, when it easily could have been. Does this sound like a public project? How will anything less than 100% inspection hold up in court, or in the press?

It needs to be brought up again that engineers design with safety factors. In some cases the project owner specifies the amount of safety factor. The safety factors are intended to overcome some unforeseen events, such as defects. Engineers can plan on some level of defects, and will continue to do so because we still have humans working on projects.

The last I heard most courts are accepting scientific evidence. Quality statistics and quality planning have been a science since before World War II, and the science of quality is growing, not shrinking. Several industries in the United States have seen dramatic decline as a result of competitors using quality principles to maximize profitability, and therefore dominating the market. Making decisions based on the use of Control Charts is an example of a quality principle that had a major effect on industry. Using sound and accepted quality principles is not showing an intent to deceive. It's an attempt to "do the right thing."

Now this is not intended to be a condemnation of public officials and agencies, because they are independently trying to meet the needs of their constituencies. They need to retain public confidence or some key heads will roll. They are responsible for the public safety as well as the public *perception* of safety, which is a difficult line to walk. It's made more difficult by shrill undocumented claims of bad quality and those whose interests are served by unfounded fears.

AISC Quality Certification is intended to help improve the entire fabrication and erection industry by requiring adherence to basic quality principles. The AISC criteria require a company to have in its system the backbone of an accepted quality program, including management commitment and review, internal audit, and corrective action. We know it is working because two or three years after a company achieves certification and is finished with "the job they had to have," the certified company is seeing that it is operating better. We are hearing that feedback, and we are hopeful that over time the third-party "QA" inspectors are going to find fewer and fewer defects. MSC