Assuring Project Quality

An Online Continuing Education Course for Engineers

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Introduction

Quality Assurance (QA) is about proper planning, training, execution, monitoring, and documentation of the activities associated with engineering design, construction, manufacturing, delivery of professional services, site studies and implementation of environmental projects. For large projects where safety of workers and the general public are major issues, the size and complexity of the QA program is commensurate with the intricacy of the project. However, the principles presented in this course are applicable to virtually any size project or activity.

The philosophy of a Quality Assurance (QA) program is based on three primary objectives:

1. Plan on doing it right.
2. Do it right the first time.
3. Document what you did.

Item 1 should be a no-brainer. Hopefully anyone intending to design and/or build a structure, manufacture a product, conduct site investigations, or do environmental clean-up plans to do it right.

Item 2, do it right the first time, is an important management issue. Doing it over again after a failure usually costs money, erodes goodwill, and damages your reputation, and may open the door to lawsuits and liabilities ranging from breach of contract, delay of schedule, or, even worse, injury or loss of life. Implementing a QA program should allow you to identify problems early and take appropriate corrective action before the problem grows to critical proportions. Finding and correcting problems early is the next best thing to not having problems in the first place.

Item 3 is probably the most overlooked yet critical concept. Documentation takes time and effort, and therefore costs money. However, it provides a critical paper (or electronic) trail that allows you to reconstruct what actually happened, and not rely solely on the often-unreliable recollections and memories of the people involved. Furthermore, it should be remembered that even if you did everything right and something happens later that is out of your control, somebody may still point a finger at you. Having formal QA procedures in place and documentation that your procedures were implemented may well save you from serious expenses and legal distractions down the road.

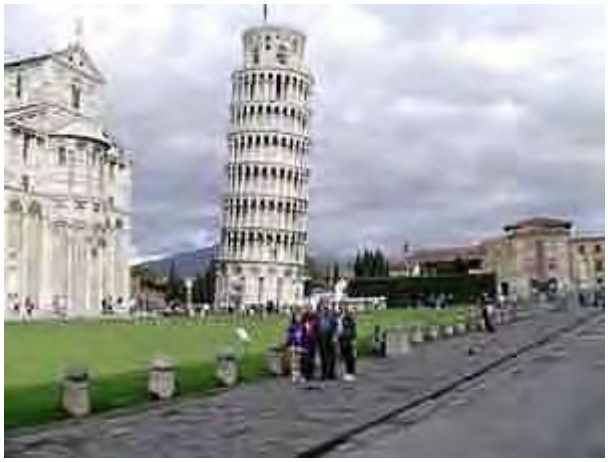

Figure 1 - *The Tower of Pisa is one famous example of a structure that did not perform satisfactorily in service.*

Components of a Formal QA Program

The Federal Regulations that were originally developed to control the design, construction and operation of nuclear power plants identified a series of 18 "criteria" or components that need to be addressed in developing a comprehensive quality assurance program. The 18 criteria are now formally published in Title 10, Part 50, Appendix B of the Code of Federal Regulations (10 CFR 50, Appendix B). The concepts formalized in these regulations provide an excellent framework within which to develop a quality assurance program for virtually any type of project. The same principles apply to the engineering design and construction of structures, the manufacturing of products, providing professional services, and the implementation of site assessments and environmental projects such as hazardous waste clean-up.

The 18 criteria identified in the federal regulations are:

1. Organization
2. Quality Assurance Program
3. Design Controls
4. Procurement Document Control
5. Instructions, Procedures and Drawings
6. Document Control
7. Control of Purchased Material, Equipment and Services
8. Identification and Control of Materials, Parts, and Components
9. Control of Processes
10. Inspection
11. Test Control
12. Control of Measuring and Test Equipment
13. Handling Storage and Shipping
14. Inspection, Test and Operating Status

15. Nonconforming Materials, Parts, or Components
16. Corrective Action
17. Quality Assurance Records
18. Audits Surveillance and Managerial Controls

Each of these 18 criteria is addressed below. For each criterion, three questions are answered:

1. What does this criterion address?
2. Why is this criterion important, and
3. How is this criterion implemented?

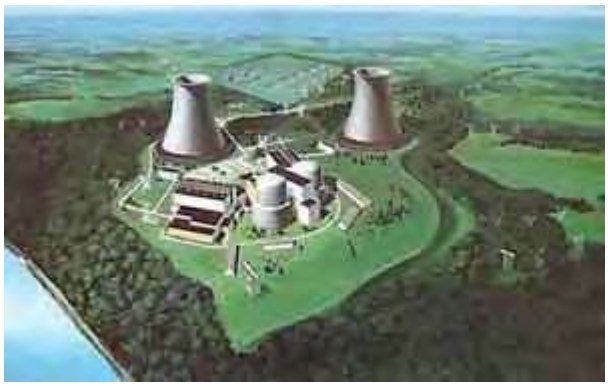

Figure 2 - *A complex project such as a nuclear power plant is required by federal law to have a comprehensive QA program that addresses all 18 criteria. However, the principles of QA are applicable to and beneficial for all types and sizes of projects dealing with the design and construction of structures, the manufacturing of products and the performance of professional services.*

Criterion #1: Organization

What?

This criterion addresses the project organization and the functions of the QA personnel including their responsibilities and level of authority. The project organization includes not only your staff, but also staff from suppliers and subcontractors.

Why?

The most critical component of any QA program is people. Everyone involved in the QA process needs to know exactly what their duties and responsibilities are, who they report to on QA matters, and what level of authority they have to identify, report, and correct problems. If things go wrong, you don't want everybody claiming, "that wasn't my job!".

How?

An organization chart is developed for every project. The position and role of QA personnel should be clearly delineated and the persons performing QA functions should have sufficient authority and freedom to identify problems and initiate corrective action in a timely manner. To maintain his/her independence from the project, the QA manager should report directly to corporate management.

If your organization uses outside suppliers and/or contractors, the QA chain of command must be extended into their operations. The QA process involves everyone and transcends corporate divisions and organizational boundaries. Names of people should be included on the organization chart. When staffing changes are made, the chart should be updated.

For each position on the organization chart, a functional description should be developed outlining the individual's responsibilities and authority. For example, does an individual have the authority to reject a shipment of incorrect materials from a supplier, or does he/she have to contact their supervisor first?

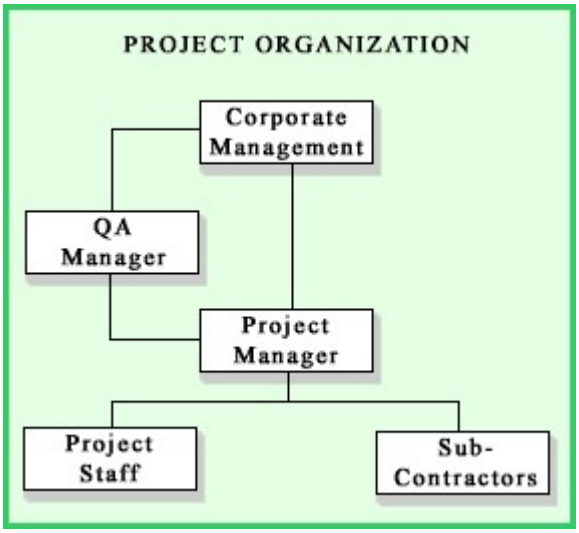

Figure 3 - *A possible organization structure showing the principal QA position on a project.*

Criterion #2: Quality Assurance Program

What?

This criterion reflects the need to think through all the elements of the overall QA program and to document: 1) the aspects of your designs, structures, products, services, or activities that fall under the QA program and 2) the details of QA program implementation. This document is the roadmap to guide you from concept to reality.

Why?

Without a roadmap, the QA program is just an idea. Developing and formalizing the roadmap requires you to think through what you want the QA program to accomplish and to define the steps required to reach your objectives.

How?

A Quality Assurance Program Plan is written prior to initiating the work. The plan should systematically address each of the 18 criteria discussed in this course, and has several major objectives:

1. To identify which aspects of your organi… …e QA program. For example, the QA program may apply to t… …apply to an environmental si… …uman resources departmen…

2. To a… …with procuremen… …vices, this criterion is no…

3. To dev… …efore the activity starts. …lures for activities that a… …n special forms to track a… …nditions.

4. To addre… …affecting quality. Determin… …gram as designed?

Everyone involved … …rogram Plan. Also, with tim… …hen they do, the original prog… …g the changes. Once a yea… …still on track. What worked and what didn't? Think of…