

Guide to Quality in Preconstruction Engineering



FEBRUARY 2003

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Executive Summary

There is no question that quality is both desirable and necessary in preconstruction engineering. Because of the nature of the preconstruction products, processes, and services, it is not easy to define, develop, or measure the quality of some of those elements. Each product is unique—one of a kind—never produced before and potentially never to be produced again in exactly the same manner. Each preconstruction product may involve different standards, needs, processes, and procedures. There are many phases in preconstruction engineering, such as right-of-way, utilities, geometric design, drainage design, structures, etc. Each one is most likely the responsibility of a different person or group of persons, team, or squad, within the state transportation agency or of different consultants. Therefore, it is easy to see that to assure quality in the end products of the preconstruction engineering process (i.e., plans ready for bids), each and every one of the various steps, products, or processes along the way must entail quality.

In 1992, the entire highway industry joined together to establish the National Quality Initiative (NQI)—known since November 2000 as the National Partnership for Highway Quality (NPHQ)—and to develop a National Policy on the Quality of Highways. Each member organization* has pledged to support that policy by making a continuing commitment for quality products, information, and services through:

- ❖ Proper design, construction specifications related to performance, adherence to specifications, use of quality materials, use of qualified personnel, and sufficient maintenance;
- ❖ Constant improvement of highway engineering technology by increasing emphasis on cooperative research, implementation, and technology sharing;
- ❖ Flexibility, coupled with responsibility, for designers, contractors, workers, and suppliers;
- ❖ Adequate assurances of quality achievement in planning, design, construction, maintenance, and operations by owner agencies;
- ❖ Incentives that reward achievements and innovations in providing a demonstrated level of value-added quality; and
- ❖ Cooperative development of quality management systems and specifications between federal, state, and local agencies, academia, and industry.

Quality in preconstruction is an integral part of this national policy.

This guide is intended to be a reference for agencies to use in furthering their quality improvement programs by providing information on possible approaches for developing,

measuring, and achieving quality in their preconstruction programs. It is not intended to be a “how-to” manual. This guide is a natural follow-up to the previous two guides developed by the task force.

The first one, AASHTO Guidelines for Preconstruction Engineering Management, published by AASHTO in 1991, was developed to assist in attaining the highest levels of operational and organizational efficiency in the accomplishment of each state’s transportation program goals and objectives. The second one, Guide for Contracting, Selecting, and Managing Consultants in Preconstruction Engineering, published by AASHTO in 1996, was developed as a reference for agencies to use in further developing their consultant programs, organizing, and training their staffs, selecting consultants, developing consultant contracts, and managing their consultant program and workforce.

Together, this document and the two documents mentioned above contain a wealth of information to assist in developing and maintaining efficient and effective preconstruction engineering programs and processes that provide quality products and services throughout the process. Consequently, the traveling public—the ultimate customers, the users of the transportation facility—benefit from high-quality plans and specifications for constructing a high-quality transportation facility.

As an initial step in the study and development of this guide, the task force asked all states to provide information on their programs or processes on quality in preconstruction engineering. Some states provided the task force with information that not only included specifics on how to obtain a quality preconstruction engineering product, but also on how to measure and assess progress. The one thing that was clear from the responses was that, although most states are doing something to assure quality in the preconstruction products and processes, there is a definite lack of information on how to measure and identify needs, as well as how to evaluate progress.

This guide begins with a chapter that provides some definition for quality in preconstruction engineering followed by chapters on developing and assessing quality, for both products and processes.

Defining quality for a process and products that are as complex and varied as in preconstruction is challenging. Basically, quality comes from the combination of doing many things properly. One way to look at it is from the customer’s point of view. Quality is doing what it takes to achieve customer satisfaction. Have we achieved identified goals and addressed the customers’ issues?

Customers in the preconstruction engineering process include a great variety of individuals and organizations. Among them are the public, designers, data providers, utility organizations, resource agencies, plan reviewers, construction and maintenance personnel, and town, county, and municipal officials. The customer identification process is dynamic and the goal of quality preconstruction process is the continuing awareness of who the customers are and anticipating, and meeting or exceeding, their needs and expectations. To achieve that, the job must be done right the first time, every time, and we must always look for ways to improve. It also requires pride in one’s work along with communication, cooperation, and teamwork, with a common commitment to excellence.

Another set of factors in defining quality is the budget and the schedule, i.e., “on time and on budget,” can be major factors in obtaining a quality product. How well those factors are accommodated in the preconstruction process is critical to the quality of the end product.

Chapter 2 of the guide discusses how to achieve quality in both the process as well as the product. Although quality may be evaluated at the end of the development process, it is determined at every step from the beginning of that process. The quality of each step affects the next. To develop the necessary processes and procedures to achieve quality, it is imperative that the quality initiative has the top administrative-level support and is one of its top priorities. That support means, among others, providing adequate staffing, providing training to develop and maintain a highly qualified staff, efficiently using resources, and providing the latest technology. To achieve a quality product in preconstruction engineering, it is absolutely necessary to ensure that the process that is in place is capable of producing quality end products. Concepts that may be applied toward developing a quality process include: effective communication, effective scoping, scheduling, reviews, cost versus budget, field revisions, and feedback. These are all discussed in some detail in Chapter 2. This chapter also discusses product quality issues such as: plan review, environmental effectiveness; context sensitive design; project development time; constructability; plans, specifications, and estimates; safety; claims; maintenance; public participation; and value engineering.

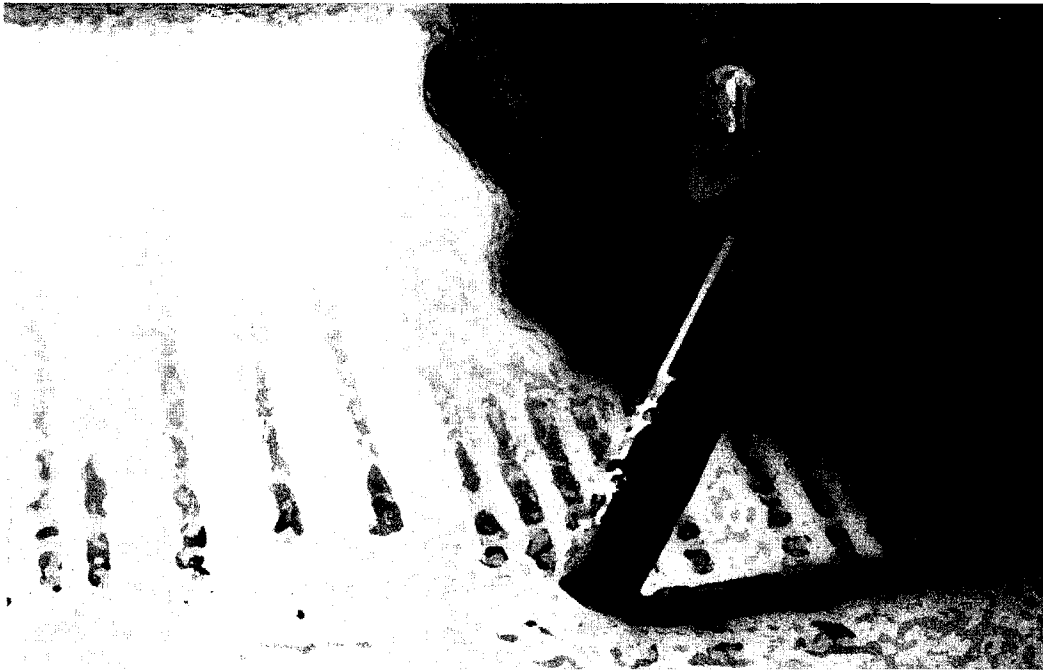
One of the more difficult issues on achieving quality is identifying not only achievements and progress, but also problems that need attention. So, how do you know your process is producing a quality product? What to measure and how to measure it? What information to collect and how to use it? Chapter 3 addresses these questions by discussing some typical data collection and analysis methods that can be used to examine some of the quality factors discussed in Chapter 2. These assessment measures must be developed for both processes and products. Chapter 3 also gives examples of data presentation and analysis techniques, such as pareto charts, cause-and-effect diagrams, histograms, etc., that can be used to display and analyze data on the process or the product itself.

Chapter 4 concludes that quality is a never-ending journey. That journey consists of many small steps towards established quality goals, always moving the goal ahead to keep the journey going. Quality is not just something to be achieved, but should be ongoing and part of daily operations. The quality journey requires us to incorporate improvements to work processes and products on a continuing basis. In an ideal world, we might one day reach the end of that journey, i.e., perfection. However, we operate in an imperfect world with contradicting and changing needs. Therefore, the best we can do is to always try to get closer and closer to the end of the journey, with the full knowledge that we may never reach it.

*The NPHQ member organizations are:

- ❖ American Association of State Highway and Transportation Officials
- ❖ American Concrete Pavement Association
- ❖ American Consulting Engineers Council (ACEC)
- ❖ American Public Works Association (APWA)
- ❖ American Road and Transportation Builders Association
- ❖ American Traffic Safety Services Association
- ❖ Associated General Contractors of America
- ❖ Asphalt Institute
- ❖ Federal Highway Administration
- ❖ National Aggregate Association—National Stone Association (NSA)
- ❖ National Asphalt Pavement Association
- ❖ National Ready Mixed Concrete Association





Chapter 1: Defining Quality

Few would dispute the need for quality in products and processes and most would agree that quality is essential to ensure customer satisfaction. After all, people usually desire quality in the services and items they purchase.

Applied to preconstruction engineering, it is easy to agree that quality is both desirable and necessary. However, getting beyond merely paying lip-service to quality requires a definition of the term, and a rather specific discussion of how quality is an essential part of a preconstruction engineering program.

What Is Quality

So what *is* quality? The dictionary defines quality as:

- ❖ Peculiar and essential character
- ❖ An inherent feature
- ❖ Degree of excellence
- ❖ Superiority in kind