



Welcome to the Highway Materials Engineering Course (HMEC) Module A, Lesson 2: Introduction to Quality Assurance Programs. This lesson provides an understanding of the basic elements of a statistically-based quality assurance program and includes an introduction to quality assurance as well as techniques for collecting, organizing, and analyzing data.

A printer-friendly version of the lesson materials can be downloaded by selecting the paperclip icon. A copy of the slides and narration are provided for download.

If you need technical assistance during the training, please select the Help link in the upper right-hand corner of the screen.

## Learning Outcomes



By the end of this lesson, you will be able to:

- Define quality management and key terms related to quality assurance (QA)
- Define the functions of a QA program
- Explain the differences between quality assurance, quality control, and process control

During this lesson, knowledge checks are provided to test your understanding of the material presented.



This lesson will take approximately 30 minutes to complete.



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## Definition of Quality Management



- **Quality Management:**
  - An umbrella term that relates to all aspects of producing and accepting a quality product



The diagram shows a blue and white striped umbrella with the text "Quality Management" written across its canopy. Below the umbrella, a light blue rectangular box contains a list of five quality management components: "Spec Development", "Product Acceptance", "Quality Control", "Communication", and "Training & Certification".

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Now let us get started with an Introduction to quality assurance programs.

Have you ever wondered if a job is done according to specifications, does that guarantee quality? This lesson will help you understand the aspects of producing and accepting a quality project.

Quality management (QM) is an umbrella term that relates to all aspects of producing and accepting a quality product. Quality management includes topics as diverse as specification development and implementation, quality control, product acceptance, training, communications, and laboratory and technician certification.

Image description: Umbrella labeled Quality Management.

## Definition of Quality



- Quality:
  - [Customer satisfaction](#)
  - [Meets requirements](#)
  - [Level of “goodness”](#)



Select each term to learn more.

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As occurs in any evolutionary process, and certainly in specification development, new terminology transpires, and confusion with the new terms is typical. Therefore, before we can begin with the concepts of QA, it is necessary to present definitions of terms that will be used in this module.

A good place to begin a discussion of any aspect of quality is with the definition of quality. This may seem to be an easy task, but in reality the term quality is likely to have different connotations to different people. The *American Heritage College Dictionary* defines quality as a degree or grade of excellence. Is this a good definition for quality as it applies to highway material and construction? How would you define quality?


There are many possible definitions of quality. However, it is likely that your definition can be categorized into one of three definitions. These definitions are often thought of as being related to an organization's progress in employing quality management. They are:

- Customer satisfaction;
- Meets requirements; and
- Level of “goodness”

Select each term to learn more.

Image description: Books.

**Definition of Quality**




- **Quality:**
  - [Customer satisfaction](#)
  - [Meets requirements](#)
  - [Level of "goodness"](#)

Select each term to learn more.

**Customer Satisfaction** X CLOSE


Customer satisfaction recognizes that it may not be sufficient to just meet the minimum specified requirements. If the customer is not satisfied, then you may not be invited to bid on future work for the customer.

It therefore becomes very important that all parties work together to ensure that the requirements are mutually agreed upon and prepared in such a manner that the customer will be satisfied if the requirements are met.

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Customer satisfaction recognizes that it may not be sufficient to just meet the minimum specified requirements. If the customer is not satisfied, then you may not be invited to bid on future work for the customer. It therefore becomes very important that all parties work together to ensure that the requirements are mutually agreed upon and prepared in such a manner that the customer will be satisfied if the requirements are met.

**Definition of Quality**




- **Quality:**
  - [Customer satisfaction](#)
  - [Meets requirements](#) ←
  - [Level of “goodness”](#)

Select each term to learn more.


**Meets Requirements** 

“Meets requirements” is often perceived as appropriate for the highway construction industry where the specifications establish the requirements to be met.

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“Meets requirements” is often perceived as appropriate for the highway construction industry where the specifications establish the requirements to be met.

**Definition of Quality**




- **Quality:**
  - [Customer satisfaction](#)
  - [Meets requirements](#)
  - [Level of “goodness”](#) ←

Select each term to learn more.

**Level of “Goodness”** X CLOSE

The lowest level definition is level of goodness.

This definition suffers from its subjective nature, meaning that a given level of goodness may be viewed differently by different customers.

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The lowest level definition is level of goodness. This definition suffers from its subjective nature, meaning that a given level of goodness may be viewed differently by different customers.

## Definition of Quality Assurance (QA)



- **Quality Assurance (QA):**
  - **The planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service**
    - QA is one component of QM
  - **Making sure the quality of a product is what it should be:**
    - “Making sure the quality of a product is” is the first part and it deals with conformity to specs
    - “What it should be” deals with the basic engineering properties of the material or construction process



Now let's look at the definition of quality assurance (QA).

QA is one component of QM. QA is made up of many parts and can be accomplished in many ways. A popular definition of QA is those activities that concern making sure the quality of a product is what it should be. This definition has two parts:

1. “Making sure the quality of a product is” is the first part and it deals with conformity to the specifications. This aspect of QA is discussed in this module.
2. The second part—“what it should be”—deals with the basic engineering properties of the material or construction process.

Image description: Approved stamp.



## Quality Assurance Functions



- Three Quality Assurance Functions:



Select each function to learn more.



There are three ingredients in the quality assurance function. They are:

1. Quality Control;
2. Acceptance; and
3. Independent Assurance (IA)

Select each function to learn more.

## Quality Assurance Functions



- Three Quality Assurance Functions



Select each function to learn more.

### Quality Control (QC)

CLOSE

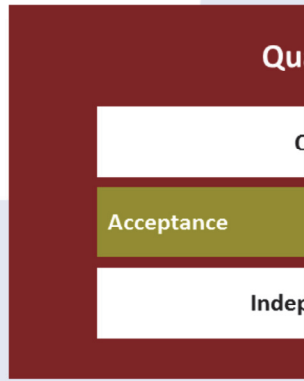
- System used by a contractor to monitor, assess, and adjust their production or placement processes to ensure that the final product will meet the specified level of quality
- Includes sampling, testing, inspection, and corrective action (where required) to maintain continuous control of a production or placement process
- Include all personnel involved in the production process
- Cannot be tested or inspected into a product after the fact; must be present in the product from step one

Quality control (QC) is the system used by a contractor to monitor, assess, and adjust their production or placement processes to ensure that the final product will meet the specified level of quality. QC includes sampling, testing, inspection, and corrective action (where required) to maintain continuous control of a production or placement process. It should include all personnel involved in the production process. Quality cannot be tested or inspected into a product after the fact; it must be present in the product from step one.

## Quality Assurance Functions



- Three Quality Assurance Functions



### Acceptance

X CLOSE

- Process whereby all factors used by the agency (i.e., sampling, testing, and inspection) are evaluated to determine the degree of compliance with contract requirements and to determine the corresponding value for a given product
- Responsibility of the owner (State or Federal agency)
- Cannot overlook inspection as an essential ingredient

Select each function to learn more.

Acceptance is the process whereby all factors used by the agency (i.e., sampling, testing, and inspection) are evaluated to determine the degree of compliance with contract requirements and to determine the corresponding value for a given product. It is the responsibility of the owner (State or Federal agency) and cannot overlook inspection as an essential ingredient.

**Quality Assurance Functions**


HME

- Three Quality Assurance Functions

**Independent Assurance (IA)**  CLOSE

- An unbiased and independent evaluation of all the sampling and testing (or inspection) procedures used in the QA program
- States are required by 23CFR 637B to use independent assurance for FHWA-funded projects on the National Highway System

Select each function to learn more.



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Independent assurance (IA) is an unbiased and independent evaluation of all the sampling and testing (or inspection) procedures used in the QA program. The purpose of the FHWA IA program is to make independent checks on the reliability of the results obtained in acceptance sampling and testing and not for directly determining the quality and acceptability of the materials and workmanship.

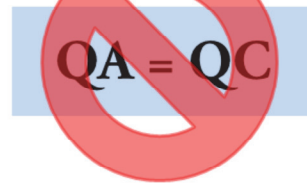
States are required by 23CFR 637B to use independent assurance for FHWA-funded projects on the National Highway System (NHS). This regulation only covers projects that are on the NHS. It requires testing personnel that perform any verification testing (Lesson 13) or quality control testing (Lesson 9) used in the acceptance decision, be covered by an IA program regardless of the agency.

Image description: Personnel performing quality testing.

## QA is Not Equal to QC



- According to FHWA guidance, quality assurance, or QA, is the program or system that leads to acceptance of a product
- Quality control, or QC, is just one aspect of a QA program—and it is the contractor’s responsibility
- Agency’s responsibility is to accept the product
- Important to be using the correct terminology and to be sure you are referring to the correct item when these terms are used




Use of the terms “QA/QC” or “QC/QA” is incorrect



It is important to know that quality assurance (QA) is not equal to quality control (QC). According to FHWA guidance, quality assurance is the program or system that leads to acceptance of a product. Quality control is just one aspect of a QA program and it is the contractor’s responsibility. The agency’s responsibility is to accept the product. It is really important to be using the correct terminology and to be sure you are referring to the correct item when these terms are used. Thus, the use of the terms “QA/QC” or “QC/QA” is incorrect.

Image description: Chalkboard and QA is not equal to QC.

## Quality Control vs. Process Control




Quality Control

VS

Process Control

- In previous years, the terms quality control and process control were used interchangeably
  - QC data should be sampled randomly. So what should a contractor do if the QC result is outside expected limits? If another “check” sample is taken, that is not random. So the definitions were clarified in the recent TRB Glossary of Transportation Quality Assurance Terms.



Select each term to learn more.

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This screen will discuss the difference between quality control and process control. In previous years, the terms quality control and process control were used interchangeably.

However, as discussed in Lessons 4 and 9, QC data should be sampled randomly. So what should a contractor do if the QC result is outside expected limits? If another “check” sample is taken, that is not random, so what is it and how should the results be recorded? The definitions were clarified in the recent Transportation Research Board (TRB) Glossary of Transportation Quality Assurance Terms to separate the two processes.

Select each term to learn more.

## Quality Control vs. Process Control



Quality Control VS Process Control

**Quality Control**  CLOSE

As stated in previous slides, quality control (QC) is defined as the system used by a contractor to monitor, assess, and adjust their production or placement processes to ensure that the final product will meet the specified level of quality.

QC includes sampling, testing, inspection, and corrective action (where required) to maintain continuous control of a production or placement process.

Select each term to learn more.

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The system used by a contractor to monitor, assess, and adjust their production or placement processes to ensure that the final product will meet the specified level of quality. QC includes sampling, testing, inspection, and corrective action (where required) to maintain continuous control of a production or placement process.

## Quality Control vs. Process Control



Quality Control VS Process Control

CLOSE

**Process Control**

Process control is a method for keeping a process within boundaries and/or the act of minimizing the variation of a process.

Process control activities may include sampling, testing, inspection, and corrective action performed by a contractor in addition to QC requirements to improve the likelihood that the final product will meet the specified level of quality.

Select each term to learn more.

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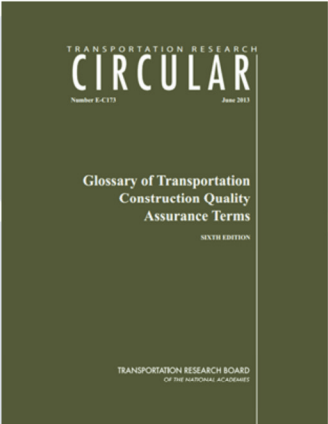
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Process control is a method for keeping a process within boundaries and/or the act of minimizing the variation of a process. Process control activities may include sampling, testing, inspection, and corrective action performed by a contractor in addition to QC requirements to improve the likelihood that the final product will meet the specified level of quality.



## Quality Control vs. Process Control




For these definitions and more, select the link to the TRB Glossary (2013):  
<http://onlinepubs.trb.org/onlinepubs/circulars/ec173.pdf>

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This document contains terms of common usage and accepted practice. The Circular was generated by a subcommittee of the TRB's Management of Quality Assurance Committee (AFH20).

The purpose of this publication is to provide a reference document for usage of transportation construction QA terminology. It is hoped that this publication will foster improved communications among those who are involved in transportation construction QA.


This publication is divided into four parts: an index, a glossary of transportation construction QA terms, a list of abbreviations and symbols, and a list of references. The major part is the glossary. The terms selected for definition include many terms that are frequently misinterpreted, misunderstood, or are generally confusing. The definitions provided are often more than basic definitions; they attempt to clarify the sources of confusion.




For these definitions and more, select the link to the TRB Glossary (2013):  
<http://onlinepubs.trb.org/onlinepubs/circulars/ec173.pdf>

**Select all that apply. The three components of quality are:**



- a) Meets specifications
- b) High value
- c) Level of productivity
- d) Level of goodness
- e) Customer satisfaction
- f) Level of efficiency

 **Knowledge Check** Try again Submit Clear

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Select all that apply. The three components of quality are:

- a) Meets specifications;
- b) High value;
- c) Level of productivity;
- d) Level of goodness;
- e) Customer satisfaction; and/or
- f) Level of efficiency.

Select all that apply. The three components of quality are:



- a) Meets specifications
- b) High value
- c) Level of productivity
- d) Level of goodness
- e) Customer satisfaction
- f) Level of efficiency




Knowledge Check Debrief







The three components of quality are: a) Meets specifications; d) Level of goodness; and e) Customer satisfaction.

**True or false? Quality control (QC) is the responsibility of the contractor.**

a) True  
 b) False



 **Knowledge Check** Correct - Click anywhere to continue **Submit** **Clear**

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True or false? Quality control (QC) is the responsibility of the contractor.

- a) True; or
- b) False.

True or false? Quality control (QC) is the responsibility of the contractor.



- a) True
- b) False




Knowledge Check Debrief







The correct answer is a) True.

**Select the three components of a QA program:**



- a) Independent Assurance
- b) Quality Control
- c) Specifications
- d) Implementation
- e) Acceptance


 **Knowledge Check** Try again Submit Clear

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Select the three components of a QA program:




- a) Independent Assurance;
- b) Quality Control;
- c) Specifications;
- d) Implementation; and/or
- e) Acceptance.

**Select the three components of a QA program:**




- a) Independent Assurance
- b) Quality Control
- c) Specifications
- d) Implementation
- e) Acceptance

  **Knowledge Check Debrief**

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The correct answers are a) Independent Assurance; b) Quality Control; and e) Acceptance.


**Select the correct statement:**





a) QA is just one aspect of quality control

b) Quality control is just one aspect of a QA program

c) The terms QA and QC can be used interchangeably

 **Knowledge Check** Try again Submit Clear

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Select the correct statement:

- a) QA is just one aspect of quality control;
- b) Quality control is just one aspect of a QA program; or
- c) The terms QA and QC can be used interchangeably.



Select the correct statement:



- a) QA is just one aspect of quality control
- b) Quality control is just one aspect of a QA program
- c) The terms QA and QC can be used interchangeably



### Knowledge Check Debrief



The correct answer is b) Quality control is just one aspect of a QA program.

## Learning Outcomes Review



You are now able to:

- Define quality management and key terms related to quality assurance
- Define the functions of a QA program
- Explain the differences between quality assurance, quality control, and process control

Return to the module curriculum to select the next lesson. To close this window, select the "X" in the upper right-hand corner of your screen.



You have completed Module A, Lesson 2: Introduction to Quality Assurance Programs. You are now able to:

- Define quality management and key terms related to quality assurance;
- Define the functions of a QA program; and
- Explain the differences between quality assurance, quality control, and process control.

Close this lesson and return to the module curriculum to select the next lesson. To close this window, select the "X" in the upper right-hand corner of your screen.