# Total Quality Management

## Guiding Principles for Application

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ASTM

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**Jack P. Pekar**

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# Foreword

Committee F16 on Fasteners is very concerned with the Fastener Quality Assurance Act (FQA) of 1990, which is expected to be implemented in 1995. F16 is comprised of fastener manufacturers, users, and distributors, all of whom have a large stake in this law. As a consequence, F16 requested and sponsored me to write a manual that would show our members how to comply with the law and remain competitive. But this book goes beyond assisting those in the fastener industry to cope with the FQA. It can be of benefit to any industry or enterprise because it is about total quality management (TQM).

This book was written so that others may share what I have learned during my 30 years in the quality profession. It is a book that presents principles and guidelines that, when applied, can be used to develop and implement a total quality management system. Today, more than ever, we in the business community face challenges at every turn from every corner of the world. Those businesses that survive will be those that demonstrate leadership and innovation and listen to the voices of their customers.

Those who practice the teachings in this book have a better chance than most to achieve success. They may find the journey difficult and cluttered with obstacles that impede their progress, but, if they are true leaders, their message will be heard. They must not and will not be discouraged for they must lead us to and through the new global market.

# Acknowledgment

I wish to thank all those who helped provide background information for this book. The list includes companies I've worked for past and present, people I worked with in the past, those with whom I currently work, and family members. There are a few whom I wish to give special thanks. I could not have completed my manuscript without my very talented administrative assistant, LaVerne Craven. The topics on futuristic quality planning and supplier partnerships are in large part an adaptation of programs developed in concert with my manager, Gary Fitzgerald, Kennametal's MWM Quality Manager. But most of all, I want to thank my wife, Liz, for all the encouragement I received while writing and editing this book. It took considerable time away from our personal life, but she never complained because she saw the value this work would provide to those who accept the challenge it presents.

# Acronyms

| | |
|---|---|
| ANSI | American National Standards Institute |
| ASME-FAP-1 | Quality Assurance Program Requirements for Fastener Manufacturers and Distributors |
| ASQC | American Society of Quality Control |
| ASTM | American Society for Testing and Materials |
| CMM | Coordinate Measuring Machine |
| CPI | Critical Performance Indicators |
| E&I | Empowerment and Involvement |
| FAC | Fastener Advisory Committee |
| FMEA | Failure Mode and Effects Analysis |
| FQA | Fastener Quality Act |
| HRC | Hardness Rockwell C |
| JIT | Just in Time |
| NIST | National Institute of Standards and Technology |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| P&IC | Production and Inventory Control |
| PIE | Plan, Initiate, Evaluate |
| QFD | Quality Function Deployment |
| R&R | Repeatability and Reproducibility |
| SCD value | Severity rank times the Capability rank times the Detection rank |
| SEM | Scanning Electron Microscope |
| SPC | Statistical Process Control |
| SPQP | Service/Product Quality Planning |
| SQC | Statistical Quality Control |
| TCQ | Total Cost of Quality |
| TQM | Total Quality Management |

# Introduction[1]

## THE PATH TO TOTAL QUALITY

THERE IS NO single path to achieving total quality within an organization. There are no hard and fast rules to follow to become a world class company. The only constant are basic guidelines, that, when followed, lead to success. This is because all organizations have their own cultures, people, and technologies. What may work well for one company will not necessarily work for another. These guidelines are as follows.

### Leadership Commitment

The leadership of an organization must be committed to continuous improvement. This commitment must be visible throughout all layers of management. Management must "walk the talk." Only when management is committed will employees excel at what they do. It takes time to change work cultures and work habits, but with perseverance the message of enlightened management will prevail. Employees want to do a good job. All they need are the right tools and the right systems. These can by supplied only by management.

### Customer Focus

The organization must be customer focused. Everyone in the organization must understand that without the customer there would be no purpose to their work, no paycheck, no capital investment, and no company picnic. What must also be understood is that the external customers are served by the internal customers (employees). There is, therefore, a need to focus on the requirements and expectations of *both* internal and external customers. One of the first steps management should take in this regard is to conduct surveys of external and the internal customers. Employees (internal customers) should be apprised of the results of external customer surveys. A truly committed management team will also allow employees to see the results of internal surveys. This brings "the good, the bad, and the ugly" to the table for discussion. The good can be improved upon. The bad can lead to opportunities for improvement. The ugly must be addressed through open, two-way communication with cross-functional teams to find solutions.

### Training

The organization must assess the current skill level and awareness of total quality principles of all employees. The idea is to start with top management and move through the organization. Begin by training top management; with their commitment and knowledge of total quality, it will be easy to train those who follow. This training will pay high dividends at every level in the organization. Through training, we assure that our employees have the necessary skills and technical knowledge to perform their jobs effectively. We can also count on them to be effective participants in contributing to the total quality process. Information should be provided to employees describing educational programs available to them through various professional organizations and community colleges. By creating an awareness of these opportunities, the organization demonstrates its commitment to a continuous improvement of employee skills.

### Empowerment and Involvement

Soon after the commencement of training, management must provide opportunities for employees to apply what they have learned. They need to test their skills. They will not and should not be content with the way things are. Every aspect of their job should be evaluated and measured against the new paradigms. This will bring new challenges to their supervisors. The supervisors, in turn, through their own training will now be equipped with the attitudes and analytical skills to consider their suggestions. They will no longer feel the threat of losing control.

### Measurement

Before those of us in management can find out if we have made improvements, we need to know where we were. If we don't have historical data to let us know, we must at least determine where we are through a short-term study.

The first step is to define the organization's critical performance indicators (CPIs). Critical performance indicators are defined as *those measures that contribute to customer satisfaction*. There are several tiers of indicators in any organization, and they can be broken down as primary, secondary, and tertiary. Examples of first-tier CPIs include On Time Delivery, Customer Satisfaction Indicators, and Cost of Quality. Second-tier CPIs are measures that contribute to the first-tier CPI's. Examples of second-tier CPIs to *On Time Delivery* may be *quote turn around, manufacturing lead time reduction*, and *supplier performance*. Third-tier CPIs are the em-

ployee involvement action items. Examples of third-tier CPIs for *manufacturing lead time reduction* could be (1) set up reduction and (2) scrap and rework reduction. CPIs are discussed in detail in Chapter 2.

## Recognition and Awards

Everyone appreciates a pat on the back after they have achieved a noteworthy goal or successfully completed a difficult or important task. This encourages further participation by the employee and shows other employees that their efforts are appreciated. When a team has met an established goal, the entire team should be recognized.

The form of recognition should fit the accomplishment; in other words, the value of the recognition should be commensurate with the value of the accomplishment. Too, when recognition is given, it should be consistent. To assure consistency, a panel of management and nonmanagement employees should be established to set up a recognition program to acknowledge those individuals and/or teams who meet company objectives.

## Communication

This last guideline is by no means the least important. The organization must communicate with the work force, their suppliers, and their customers. I cannot provide enough differentiation among this trilogy to say one is more important than the other. All participants in this trilogy of communication must interface for an organization to be truly successful. Within the organization, employees at all levels need information on continuous improvement projects so they can become aware of progress, their contribution, and the effect these projects have on critical performance indicators.

Business goals must be communicated to suppliers. Suppliers should be viewed as extensions of the organization who contribute to the overall success of continuous improvement. They should be part of decisions to utilize purchased services. Suppliers are specialists in their fields of expertise; therefore, their input should be required when decisions are made to use them. World class purchasers understand the difference between price and value. As purchasers (customers) we expect, and should demand, products that contribute to our success.

The voice of the customer must be heard. Customers are the reason we are in business. Without customers, no provider of goods or services could survive. To understand customers' needs, we must listen to their messages. Invite existing and potential customers to your facilities and ask them to apprise your teams of their business objectives. Let them tell you how you can assist them in achieving their goals.

# Contents

# Part 1: Management's Responsibility

# Management's Role

THE PRIMARY ROLE OF MANAGEMENT is to provide employees with the leadership necessary to meet the goals of the organization. This leadership must reflect the principles of total quality management. These principles were presented in the Introduction: *leadership commitment, customer focus, training, empowerment and involvement, measurement, recognition and rewards, and communication.*

## LEADERSHIP COMMITMENT

Management must first examine how they manage. Is their style tailored to encourage input from other managers and departments? Or is their style that of not allowing other departments or disciplines to influence their decisions? In other words, do they operate as team leaders or as *silos*? When I refer to managers operating as silos, I mean that they stand alone within the organizational structure by excluding input from other managers or departments. This concept is explained further below.

### Silos

Management in the past relied on experts in given disciplines to develop systems and procedures to guide the organization. These experts headed up their own departments (silos) and had specialists working for them who created the culture and systems for the *silo master*.

The silo master made it clear to all other silo masters in the organization how his department functioned and that there would be no interference from other groups or departments. This allowed the silo master to keep control of his territory. This also assured that the other department managers did not fully understand the requirements for positive interaction between groups or departments within the organizational structure.

Here's a classic example of how silos can thwart satisfying customer requirements. The marketing group receives an order from a customer and tells the design group what the customer wants. The design group gives their interpretation of the customer's needs to the manufacturing engineering group. Manufacturing engineering tells manufacturing what process to use to create the product that will satisfy the needs of the customer. Manufacturing does their very best to manufacture the part according to criteria supplied by manufacturing engineering. The quality department inspects the final product and decides it is manufactured incorrectly. Rework is performed and the part is shipped to the cus-

tomer. The customer rejects the part because it does not meet his requirements! (See Fig. 1-1.)

Management needs to break down silos in their organizations because they create waste, redundancy, and poor quality. We are getting better today at breaking down silos and allowing interaction through cross-functional team management. Management should evaluate themselves to determine if their management style is autocratic or team oriented.

### Autocratic Management

I remember when I first started working. I was told that in order to succeed and to keep my job, I had to remember two rules. Rule 1: The boss is always right. Rule 2: When the boss is wrong, remember Rule 1. Those were the days when systems were more important than people. Employee involvement consisted of doing only what the boss told you to do, whether it made sense or not. Management felt that empowering the worker took control away from management.

Switching to a management style that encourages employee involvement and empowerment is a tough transition for many. Unless special training is provided for middle and first-line management, the transition may never take place. And, unless upper management invests and participates in this training, the organization is bound to fail. It will be overtaken by other organizations who have invested in their most valuable resource, their employees, and are cashing in on that investment. Employees of an enlightened organization contribute every day to improved operations and systems.

Once management has committed itself to breaking down silos, it must embrace the concept of *Team Management*.

### Team Management

Gone are the days when managers are expected to be proficient in only one discipline. Today managers must be part of a management team, and they must have a working knowledge of their peers' responsibilities. For example, the quality manager needs to understand how design engineering, manufacturing engineering, purchasing, sales, production control, customer service, and every other department functions. And every other manager should know the roles of the others.

This is not to say that they need to be as well trained in the other disciplines as their peers, but they must understand how the entire organization functions. We want to break down silos so we can move freely throughout the or-
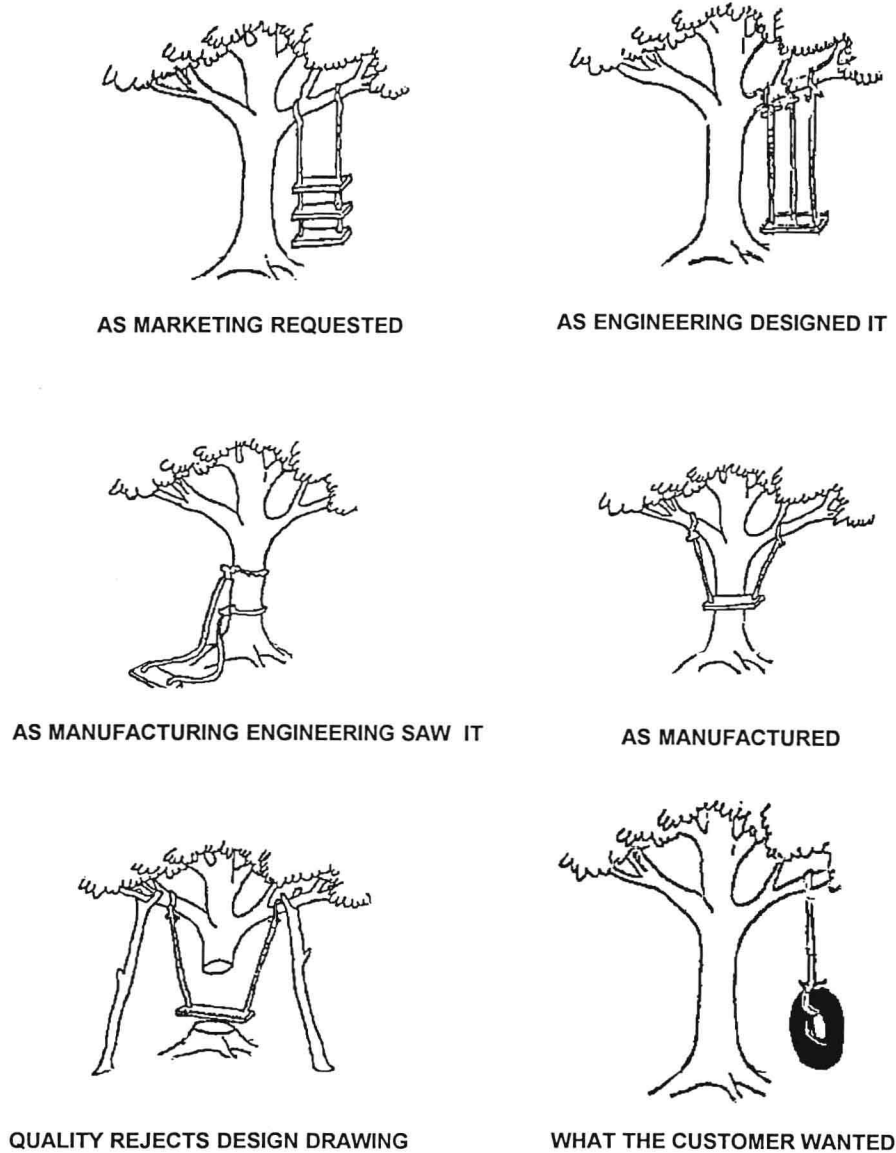
**AS MARKETING REQUESTED**

**AS ENGINEERING DESIGNED IT**

**AS MANUFACTURING ENGINEERING SAW IT**

**AS MANUFACTURED**

**QUALITY REJECTS DESIGN DRAWING**

**WHAT THE CUSTOMER WANTED**

**Figure 1-1—Customer requirements.**

ganization. This creates another dilemma because now we need to allow managers who are outside our responsibility to be permitted, even welcomed, to handle situations that structurally may belong to us.

It's time for the goose story. We as managers should take a lesson from the goose. I'm sure you have observed geese in flight. They fly in a pattern that forms a horizontal V. There is a good reason why geese fly in a V pattern. The lead goose breaks the air current and creates an uplift behind him that the other geese can take advantage of. The second tier of geese likewise does the same for the third tier and so on and so forth for the entire flock.

The lead goose eventually tires of butting his head against the wind, so he drops back in the formation. Here's when something interesting takes place. Another goose from the flock moves to the front to assume the lead. This goose does

so until he tires. Then he drops back and another goose moves in to lead. Geese in a flock are willing to follow the lead of whoever is leading at the time because they all have a common goal.

We can learn a lot from the goose! Geese have learned how to work as a team. All in the flock are willing and able to lead when necessary. The leader who drops back is not intimidated by another taking his place. He understands that for now it is best that someone else assumes leadership.

## CUSTOMER FOCUS

Management must develop an attitude that puts the customer in every decision made. The customer is the reason we are in business. Without customers there would be no

job to perform, no requirements to be met, and no reason anyone would wish to purchase your company's stock.

As explained in the Introduction, there are two kinds of customers: *internal* and *external*. External customers provide income for the organization through purchasing goods or services. Internal customers (employees) satisfy the requirements of the external customers and the requirements of others in their own organization. Both are important and need to be understood for an organization to succeed and prosper.

## External Customers

The expression "The customer is always right" is not always true; however, one right of the customer is always true: "The customer has the right to purchase from whomever he wants." With this in mind, we should make every attempt to make sure the customer wants to buy from us.

To assess the needs of your customers, utilize input from all customer contact personnel. In an organization that follows TQM principles, input can come from the sales representative, your marketing group, the quality department, manufacturing, customer service, and engineering. The method in which the input is provided can be *reactive* or *proactive*. Both sources should be looked upon as opportunities for satisfying your customers' needs.

*Reactive input* is in the form of customer complaints or from interpreting customer purchase orders or sales inquiries. When customer complaints are received, either as written complaints or in the form of returned goods, most organizations react as fire fighters and focus on the hot spot. We sometimes ignore the system that created the problem in the first place. When a purchase order or sales inquiry is received, most organizations interpret their customer's requirements through the mirror of their own paradigms.

*Proactive input* is solicited through visits to the customer's place of business, visits to your facility by your customer, customer satisfaction surveys, and by cross-functional teams consisting of employees from customer and supplier facilities. All these activities should be part of management's strategic business plan. The strategic business plan will be discussed further in Chapter 3.

## Internal Customers

In a TQM environment, the attention paid to employees is as important as, if not more important than, attention paid to the customer. The employee is the internal customer of the organization, the individual who can make things happen. His or her understanding of the organization's goals and commitment to the customer must be complete. This can be assured by following a three-step process that includes (1) an employee survey, (2) an employee training program, and (3) regular communication sessions to continually reinforce the organization's goals.

### Employee Survey

The employee survey should be designed to provide an assessment of how the employee feels about the company and how he perceives his role to the customer. An example of a survey I used successfully is provided in Fig. 1-2.

The TQM steering committee (discussed in Chapter 3) should review and analyze employee survey results and determine the training program required to bring employees up to speed on company goals. Training can be conducted by inside experts or by using outside resources. There are advantages and disadvantages to both approaches.

The advantages to using inside experts are cash flow containment and assuring that the training is tailored to existing company paradigms. The disadvantages of using in-house experts are having to overcome existing negative perceptions of the expert, if there are any, and removing the expert from his duties to provide preparation and training.

The advantages of using outside sources for training are many. Among them is the natural perception that an outside consultant knows more about a subject than inside people. This advantage can create a more receptive learning environment for the employee. Another advantage is that no time is taken from anyone's schedule for preparation of lesson plans. Two major disadvantages are expense and the fact that the outside resource is not familiar with your company culture.

Both options of training must be evaluated by the TQM steering committee, and selection of training resources should be made on the best fit analysis. The key is to assure that whatever training source is utilized that the source emulates the goals of the organization.

Activities concerning customers need to be communicated to everyone in the organization in a timely manner. Most information can be distributed on a monthly basis, but special news should be disseminated as required. An ideal method of sharing news is through a company newsletter that contains information on employees, customers, and continuous improvement activities.

## TRAINING

Continuous improvement cannot occur within an organization unless training is part of management's agenda. Leaders in respective departments should take the initiative to conduct an analysis of each employee's ability to perform his or her job. This is often referred to as a *needs assessment analysis*.

The needs assessment analysis should be performed on the job function, not the individual performing the job. For example, suppose the job is to prepare an accurate product certification document. A flow diagram on completing a product certification is shown in Fig. 1-3.

The focus should be on preparing an accurate product certification, not on the skills of the final product auditor, the material handler, or the typist. Study each step in the flow diagram for the job and determine exactly what is required for that step to be successful. For example, let's look at the step: Inspect All Critical Characteristics Per Sample Plan.

To be successful at this step, every step preceding must have been performed correctly and accurately. All critical characteristics must be identified on the inspection plan or engineering drawing. The sample plan should be available and germane to the product being inspected. The test equipment and inspection equipment should be in full calibration and acceptable for the tolerances being examined. The individual conducting the task must be qualified for the task.

## IN PLANT "ASK ME" BOX

(1) How do you perceive your role in service
    for customers?
    _____ Directly Involved
    _____ Indirectly Involved
    _____ Not Involved

(2) How do feel about service you receive
    from related departments?
    _____ Satisfied
    _____ Not Satisfied
    _____ No Opinion

(3) Do you have enough authority to make
    improvements to better serve our customers?

    If No, Suggestions: _____

    _____
    _____
    _____
    _____
    _____

(4) Do you receive everything you need from
    the previous operation or department to
    do your job well?
    Yes    No         (circle one)

    If no suggestions: _____

    _____
    _____
    _____
    _____

(5) If you could make one change in
    either your department or the
    company as a whole, what would
    you change to improve service for
    our customers?

    _____
    _____
    _____
    _____
    _____

(6) If you could rate overall the products and services provided to our customers, what would that
    rating be?
    _____ Superior    _____ Good    _____ Average    _____ Poor    _____ Other

    Please explain: _____

**Figure 1-2—Employee survey.**

Any deficiency found in any of the subgroups contributing to the successful completion of the main task of *inspecting all critical characteristics per sample plan* may require training for the individual doing the inspection or correcting some upstream activities.

## EMPOWERMENT AND INVOLVEMENT

One of the more responsible acts management can perform is recognizing that their employees can make significant contributions to the success of the organization. If management provides the tools and training, a great deal can be accomplished through employee empowerment and involvement (E & I). However, the employee must be properly prepared for such responsibilities.

The first employees that should be prepared for Employee E & I are managers and supervisors. The concepts of TQM must be provided through several training sessions and should be reinforced through appropriate actions from senior management. One of the better methods of demonstrating senior management's commitment to Employee E & I is by forming management teams and allowing these teams to

evaluate and suggest how to improve current systems. It is through these management teams that lower-level employee teams are created.

The teams formed at all levels will concentrate on improving the organizations critical performance indicators (CPIs). CPIs are tracked and evaluated through measurement parameters established by management E & I teams.

## MEASUREMENT

Management should establish measurements to track progress on CPIs. The unit of measurement should fit the indicator being evaluated and should be understood by those who contribute to the improvement process for that indicator. For instance, the cost of quality CPI should be measured in dollars and compared to several key values, such as cost of sales or cost of manufacturing. Another example is on time performance. This CPI can be measured in several ways, which should all relate directly to customer requirements. For example, this CPI can track orders shipped to customer-required dates (external customer measure), or it could track design engineering input to manufacturing en-
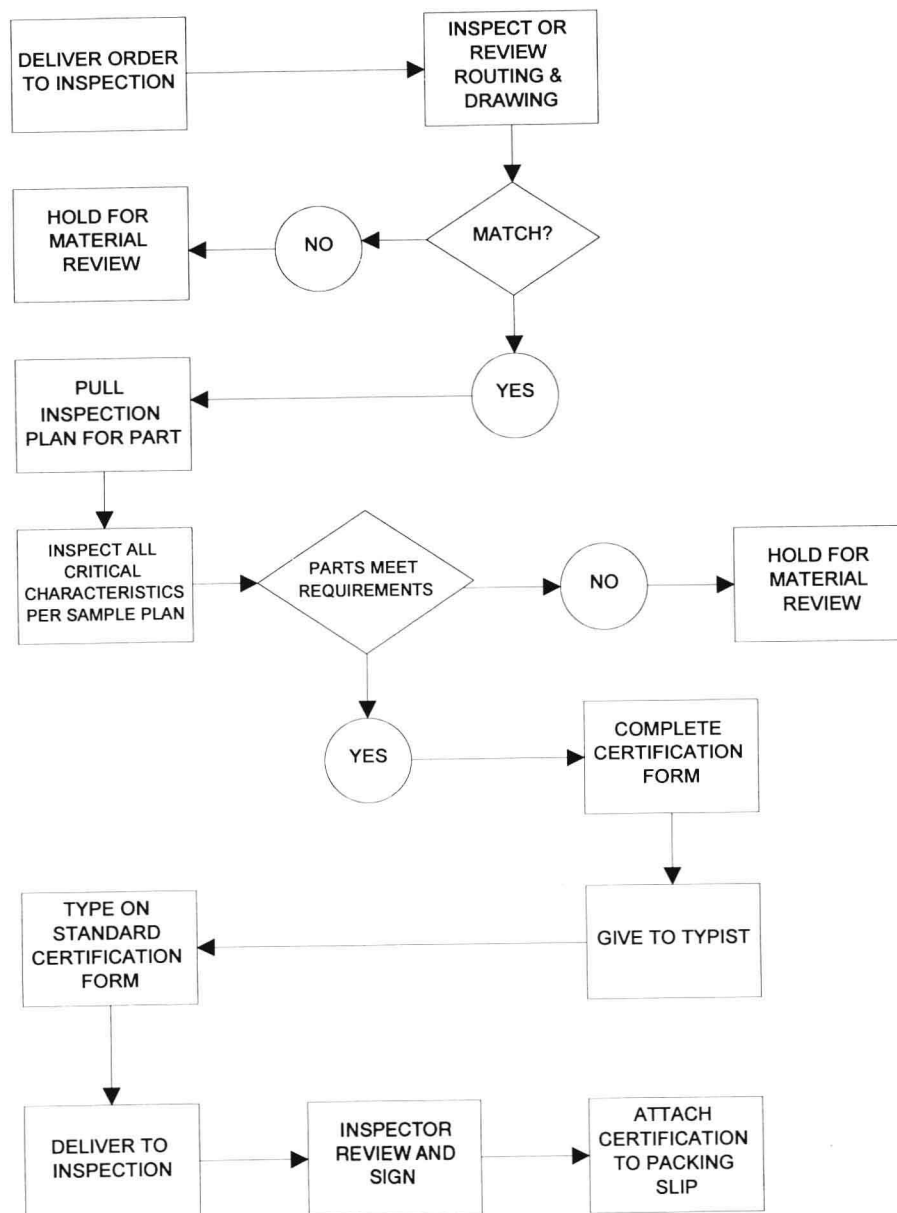
**Figure 1-3—Product certification flow chart.**

gineering (internal customer measure), or it could track quote turn around from your suppliers (a measure of your needs as a customer of your supplier).

CPIs will be discussed further in Chapter 2 when methods of continuous improvement are explored.

## RECOGNITION AND REWARDS

Management has the responsibility to provide an environment for the work force that is safe and environmentally clean. This environment should also lay the foundation for supporting the employees' quality of work life. Once this foundation has been established, management must develop

a recognition and rewards program designed to improve and maintain employee job satisfaction.

A three-tiered system should be developed that includes: (1) day-to-day recognition, (2) informal recognition, and (3) formal recognition programs. The best way to get started is to create a steering committee made up of staff management. This committee can define the scope of the program and establish guidelines to be followed by employee teams established to implement the program. Employee teams should include participants from all levels of the organization.

The steering committee can set the scope of the program to include as many systems as they feel the company can support and effectively manage, but some systems should always be included because of their proven effectiveness.

The following systems, when properly structured and administered, are very cost effective and contribute directly to a company's profitability through various improvements. In no particular order, these proven systems are: *pay-for-performance, perfect attendance, service awards*, and *continuous improvement programs*. Pay-for-performance recognizes employees for their performance on the job and should include such criteria as quality of work produced, productivity, attendance, initiative, job knowledge, and safety. An attendance policy should establish rules to define when employees are to be on the job and when they are excused from their job. This may seem like a basic idea, but it is surprising how many companies do not have an established and documented policy on absence from the job. When there is no written policy, there is no consistency, and this leads to dissatisfied employees who see management as untrustworthy or at the very least prone to favoritism. A service awards policy recognizes employees for their length of service with the company and can be very rewarding in enhancing employee esteem and fostering employee loyalty.

## COMMUNICATION

This guideline is one of the more important for both management and employees. It is a two-way street, and both should strive to keep the airwaves open. Even though communication is a two-way street, it must start with management. Management should set the standard by creating an environment conducive to openness without fear of reprisal or ridicule. At all times communication must be polite and conducive to enhancing self-esteem. The best way to get started is as with all the other guidelines: establish a steering committee to set the policy and the guidelines for implementation. Then create the opportunity for employee involvement teams to get the program underway.

Some of the more common and effective programs include: company newsletters, staff and employee meetings, and an open invitation from management to allow employees at all levels to hold informal conversations or brainstorming sessions in employee lounges during breaks.