QUALITY AND RELIABILITY ASSURANCE

HANDBOOK 4155.12-H

AD A950061

A GUIDE TO ZERO DEFECTS

1 NOVEMBER 1965

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
(INSTALLATIONS AND LOGISTICS)
WASHINGTON 25, D. C.

PHOTOGRAPH THIS SHEET

AD A950061

DTIC ACCESSION NUMBER

LEVEL

INVENTORY

Assistant Secretary of Defense (Installations and Logistics) Wash, DC

"A Guide to Zero Defects"

DOCUMENT IDENTIFICATION

Date: 1 November '65

Quality and Reliability Assurance Handbook 4155.12-H

DISTRIBUTION STATEMENT A

Approved for public release; Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR		
NTIS	GRA&I	☒
DTIC	TAB	☐
UNANNOUNCED		☐
JUSTIFICATION		
BY (1 November 1965)		
DISTRIBUTION /		
AVAILABILITY CODES		
DIST	AVAIL AND/OR SPECIAL	
A		

DISTRIBUTION STAMP

Released

DTIC ELECTE NOV 3 1980 S D

D

DATE ACCESSIONED

UNANNOUNCED

80 10 23 040

DATE RECEIVED IN DTIC

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-DDA-2

DTIC FORM OCT 79 70A

DOCUMENT PROCESSING SHEET

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

INSTALLATIONS AND LOGISTICS

November 1, 1965

A Guide to Zero Defects

4155.12-H

Quality and Reliability Assurance Handbook 4155.12-H is approved for printing and distribution. This handbook provides guidance for planning, implementing, and sustaining a Zero Defects-type program designed to motivate all persons directly or indirectly involved in the national defense effort to do their jobs right the first time, every time.

The Department of Defense (DoD) accords its full support and encouragement to both industrial and governmental activities that adopt and practice Zero Defects concepts. To be effective, a Zero Defects program must be a voluntary effort in every respect. For this reason, the DoD does not intend to reference this handbook in contracts, specifications, or any other documents which would make the establishment of a Zero Defects program a contractual requirement.

This handbook is a preliminary effort. It will be reviewed periodically and improved. Users are encouraged, therefore, to recommend suggested changes to the Commanding General, U.S.Army Materiel Command, Attn: AMCQA, Washington, D.C. 20315.

George E. Fouch
GEORGE E. FOUCH
Deputy Assistant Secretary of Defense
(Equipment Maintenance and Readiness)

CONTENTS

	Page
SCOPE AND USE OF THIS HANDBOOK	3
CONCEPTS AND BACKGROUND	3
What Zero Defects Is	3
What Zero Defects Is Not	3
Background	3
Role of Top Management	3
Achievements	3
Basic Philosophy	4
PLANNING	4
ORGANIZING A ZERO DEFECTS PROGRAM	5
Management Support	5
Organization	5
Outlining the Program	5
FORMULATING OBJECTIVES	5
Identifying Targets	5
ESTABLISHING NUMERICAL GOALS	6
FORMULATING SCOREKEEPING AND REPORTING PROCEDURES	7
DESIGNING ERROR-CAUSE-REMOVAL (ECR)	7
SCHEDULING AND BUDGETING	9
PRE-KICKOFF ACTIVITIES	9
Preparation of Promotional Material	9
Buildup Phase	9
Personnel Briefings	9
KICKOFF ACTIVITIES	10
Communication Media	10
Kickoff Meetings	10
SUSTAINING ACTIVITIES	11
Continuing Promotion	11
Exchanges of Information	11
Briefing of New Employees	11
Management-Employee Liaison	11
ACTIVATION OF ERROR-CAUSE-REMOVAL (ECR)	12
RECOGNITION AND REWARDS	15
GENERAL REVIEW	16

SCOPE AND USE OF THIS HANDBOOK

This handbook is a guide for Department of Defense activities and defense contractors in establishing and implementing Zero Defects. Its primary purpose is to provide a review of the basic philosophy and principles of Zero Defects, with particular emphasis on planning, management support, error cause removal, recognition and measurement of achievement, and ways and means to sustain the program. The application of Zero Defects is expanding rapidly, with beneficial innovations being introduced constantly. Accordingly, this handbook should be considered as only a first step in the treatment of this subject.

CONCEPTS AND BACKGROUND

What Zero Defects Is

Zero Defects is a motivational approach to the elimination of defects attributable to human error. It is a voluntary program aimed at improving the quality and reducing the cost of producing and maintaining defense materiel. It is an organized effort to inspire personnel at all levels in an organization to do their jobs right the first time, every time. Zero Defects is dedicated to preventing defects by detecting and removing the causes of their generation. It is an attempt to reverse the unquestioning acceptance of human error as a normal byproduct of personal effort. Zero Defects is an appeal to the individual's pride of workmanship and self-interest. It is a program that can be applied to all activities participating in the defense effort and to all personnel at every organizational level in these activities.

What Zero Defects Is Not

Zero Defects is not a speedup program.

Zero Defects is not an employee evaluation technique.

Zero Defects is not a technique for censuring error.

Zero Defects is not a substitute for quality control.

Zero Defects is not a substitute for employee suggestion programs.

Zero Defects is not a Department of Defense contractual requirement.

Background

Zero Defects was originated in 1962 by a major defense contractor who developed this new approach to the problem of preventing errors in engineering and production. This contractor established goals for each department to reduce to zero those defects attributable to human error—hence—"Zero Defects." The program was first applied to an Army weapon system and proved to be highly successful. Subsequently, in mid-1963 it was adopted for implementation by the Army Missile Command. This action by the Army Missile Command and widespread sensitivity to the need for precision workmanship in defense and space programs accelerated development and implementation of the Zero Defects concept. Early in 1964 the Assistant Secretary of Defense (Installations and Logistics) invited the attention of the Military Departments and the Defense Supply Agency to the potential of Zero Defects. This gave the program substantial impetus. Since that time Zero Defects has been adopted by numerous industrial and Department of Defense activities.

Role of Top Management

The President of the United States and the Secretary of Defense have repeatedly expressed their determination to reduce the high cost of defense by the elimination of waste. Zero Defects helps to achieve this goal because it is directed at reducing human error that is a major cause of waste.

The Zero Defects concept recognizes that even though a person is dedicated, well trained, and uses the finest tools, he does not necessarily do defect-free work. He needs something more—a reminder that his contribution to the quality of a product is important and is recognized by management. He can be expected to sustain a positive attitude only if his efforts are acknowledged by persons in the higher echelons of his organization. Hence, strong commitment, direction and support by top management are essential prerequisites to the success of a Zero Defects program.

Achievements

Comprehensive data are not yet available to measure the effect of Zero Defects throughout the Defense-Industry complex. Nevertheless, the success of Zero Defects has been impressive and substantial. Contractors have reported reductions as

PRECEDING PAGE BLANK-NOT FILMED

high as 70 percent in overall defect rates. Equally important, Zero Defects has proven to be an effective mechanism for integrating all echelons of an organization into a spirited, coordinated, and hard-hitting team for combatting defectiveness and reducing costs.

Basic Philosophy

People are conditioned to accept mistakes as inevitable—"to err is human!" Zero Defects attacks this long-accepted tolerance of error. It asks each individual to accept voluntarily a challenge to do an errorless job. Those who are proud of their handiwork are likely to do error-free work. Accordingly, the Zero Defects concept must be presented as a challenge to the individual's pride.

Pride in workmanship is motivated by knowing that one's work is meaningful. It is, therefore, important that each individual be properly informed of the direct effect of his work on end results—e.g., major end products.

PLANNING

Apart from management direction and support, the single most decisive factor in establishing a Zero Defects program is proper planning. Ordinarily, this planning is the responsibility of the Administrator of the program. The first and most important element of a plan is the formulation of objectives. As applied to Zero Defects, these objectives pertain to—(1) identification of prime targets; and (2) establishment of numerical goals. Both of these topics warrant extensive and thorough consideration by the Zero Defects Administrator in cooperation with his advisors. It is important to remember that while Zero Defects appropriately applies to the total organization, not all areas within that organization are likely to derive equal benefit from the program. Therefore, it is highly advisable that at the very beginning of the program the Administrator pinpoint the departments, shops, processes, products, and services that are likely to yield significant rewards. Thus, while an appeal is made to all employees to support Zero Defects, the Administrator should establish a priority for focusing major effort and resources. The identification of these prime targets is made primarily on the basis of surveys to determine current rates of defectiveness and related costs.

There are obviously a variety of approaches and techniques by which the Administrator can assess likely opportunities for Zero Defects. Having pinpointed the targets, it follows that the Administrator must formulate goals in numerical terms. For example, if a defect and scrap rate in a particular shop is 5 percent during a typical week of production, a goal of 4 percent might be established for the first Zero Defects reporting period. On the other hand, it may be desirable to establish goals in financial terms, utilizing data regarding cost of rework which are often maintained by industrial organizations. In any event, failure of the Administrator to carefully think out the objectives of the program both in terms of targets and of quantitative results can result in the establishment of a program characterized more by preachment than by solid achievement.

Having established targets and goals, it is incumbent on the Administrator to develop procedures for keeping score of actual achievement and for reporting progress from the various elements of the organization to management—and from management back to the employees. Unless the reporting program is a two-way communication system, the Zero Defects program very likely will not be effective. This follows largely from the fact that the program depends on management support and direction. Unless progress is made, such support will not be forthcoming. At the same time, unless the employees who have pledged their support to the program are informed of the results of their efforts, good will or continuing support cannot be anticipated.

Finally, before initiating the program, the Administrator should have delineated in detail the methods by which the causes of errors will be probed, reported to the proper authorities, and removed. It is emphasized that the design of Error-Cause-Removal procedures must be accomplished before the program is initiated.

In summation, it can be said that intensive planning and preparation are an absolutely necessary prelude to the kickoff of the program. Unless this "homework" is accomplished, it would be inadvisable to proceed further in the implementation of a Zero Defects program. Accordingly, each of the aforementioned elements related to planning and preparation for implementation of Zero Defects is discussed in the following paragraphs.

ORGANIZING A ZERO DEFECTS PROGRAM

Management Support

Without the direction and support of top management, a Zero Defects program has little chance of success. Management's endorsement is required not only at the start of the program but throughout its subsequent stages. Prior to instituting a Zero Defects program, it is incumbent on management to make an organization-wide assessment of opportunities for eliminating errors and defects. There is no point in instituting a Zero Defects program unless management has information identifying significant targets for elimination of error and related cost reduction. Possibly the most rewarding aspect of management's involvement in Zero Defects will stem from this assessment. In itself this assessment can be both enlightening and rewarding.

Once top management decides that the potential benefits of Zero Defects justify its adoption, implementing instructions should be prepared reflecting management's complete commitment.

Organization

The institution of a Zero Defects program begins with the assignment of responsibility for its administration to a person at an appropriate staff level. The Zero Defects Administrator must be selected and positioned in the organization with careful forethought in order to give the program [illegible] organizational stature commensurate with the importance management attaches to it.

[illegible] for administering Zero Defects must [illegible] the needs of the organization. In a large organization this might include a full-time Zero Defects Administrator and Zero Defects Representatives for the various functional groups. A Zero Defects Advisory Committee may also be useful in planning, initiating, sustaining, and evaluating the program. In a small organization a part-time Zero Defects Administrator might be sufficient.

Outlining the Program

The basic plan and schedule for implementing Zero Defects must be precisely and comprehensively prepared at the outset. This plan serves two important purposes—(1) it provides management with a clear picture of the events scheduled and costs budgeted to implement and support the Zero Defects program; and (2) it gives the program administrator a set of guidelines to follow.

Figure 1 illustrates the activities of a typical Zero Defects program and figure 2, the essential elements of a Zero Defects plan.

FORMULATING OBJECTIVES

Identifying Targets

The initial step in identifying the primary targets for Zero Defects action is to survey the performance of each functional area of the organization. Quantitative rates of defectiveness as well as the related costs involved in scrap and rework should be determined. The focus of attention should be on all available quantitative sources of data applicable to the functional area, such as inspection reports, cost accounting summaries of scrap and rework costs, and customer complaints.

Cost-reduction potential is a principal criterion in selecting prime targets for Zero Defects. In addition, however, consideration must be given to the relative importance of a component or an assembly to the satisfactory functioning of the ultimate product. The more important the component or assembly, the more serious may be the consequences of defects.

Care must be taken in the identification of primary targets for Zero Defects to assure that no departments, shops, processes or products are exempted from Zero Defects responsibility. The main objective of identifying these targets is to establish priorities. This forces a preponderance of effort on the potentially high payoff areas.

I. Preliminary Management Study (Assessment of Opportunities)
II. Top Management Go-ahead
III. Selection of Zero Defects Administrator
IV. Establishment of Zero Defects Committee
V. Preparation of Program Plan (See fig. 2)
VI. Management Review of Plan
VII. Management Approval of Plan
VIII. Implementation of Plan
  A. Pre-kickoff Activities
    1. Preparation of promotional material
    2. Buildup phase
    3. Briefing (management, supervisors, employee associations, community)
  B. Kickoff Activities
  C. Activation and Implementation of Error-Cause-Removal
  D. Sustaining Activities
    1. Continuing promotion
    2. Reporting of results
  E. Recognition and Rewards

Figure 1. Activities of a typical Zero Defects program.

I. Establishing targets and goals
  A. Identification of prime targets (e.g., departments, shops, processes, products)
  B. Establishment of numerical goals (e.g., defect rates, scrap and rework costs)
II. Formulation of scorekeeping and progress reporting procedures (e.g., measurement of achievement and reporting from departments and shops to management, and vice versa)
III. Design of Error-Cause-Removal (ECR) procedures
IV. Scheduling and budgeting

Figure 2. Elements of a Zero Defects program plan.

ESTABLISHING NUMERICAL GOALS

Having selected the targets for Zero Defects, the goals of the activity in each target area must be expressed in quantitative terms to permit the achievements in these areas to be measured and rewarded. Successful Zero Defects programs are characterized by a continuing, systematic effort to define, evaluate and reward achievement on the basis of clearly identified and realistic quantitative goals. If these goals are attainable and are expressed in terms that employees can understand and accept, the typical employee can be expected to make a serious and sustained Zero Defects effort.

To establish numerical goals, the Zero Defects Administrator, in conjunction with his advisors and management, begins by examining specific data pertinent to each primary target. He then sets goals for each of the specific functional elements whose efforts contribute to the attainment of the target. When a target is a product, the numerical goals might initially be set for the total production effort. For example, if a certain expensive assembly was selected as a primary target because approximately 20 percent of the assemblies were found to be defective after manufacturing, the initial numerical goal might be set at 16 percent (i.e., a reduction of 20 percent in the defect rate). When a target is a shop or process the numerical goals might apply to major processes of the shop or to the shop as a whole. For example, if analysis of the plating department in a shop leads to its selection as a primary target because its scrap and rework costs are currently running about $22,000 per month, a numerical

goal might be established of reducing this cost by $4,000 for the first reporting period. The overall primary numerical goals set by the Zero Defects Administrator should then be further broken down by the managers and supervisors involved and allocated to specific groups, functions and individuals. Once primary targets have been identified and expressed in terms of numerical goals, the Zero Defects Administrator must devote some time and effort toward establishing numerical goals for other areas and products of the organization where opportunities for defect reduction are significant even though not of the greatest potential.

Goals must be attainable and realistic. They must neither be set so low that meeting them is too easy, nor so high that their realization is impossible. Moreover, goals are not fixed or final. They are steps in the direction of the ultimate goal of Zero Defects.

Criteria for measuring Zero Defects achievements are practical only if they can be readily applied by the supervisor in his normal daily relationship with the employees under his supervision. Accordingly, each supervisor should participate in the development of these criteria. An individual's achievement in a Zero Defects program can be measured by comparing it with the work of other persons in a group performing the same or a similar task at an equal skill level. To assure a meaningful comparison, this often will require the establishment of different criteria for measuring Zero Defects achievement within each of several functional areas.

FORMULATING SCOREKEEPING AND REPORTING PROCEDURES

Once targets and goals are established, the Zero Defects Administrator is responsible for assuring that they are effectively and clearly communicated to the individuals, groups and departments to which they apply. A corollary responsibility is to assure that timely, accurate and complete data are gathered on the progress made toward achievement of these goals. These data must then be analyzed and presented to management and all other persons in the organization, so that achievements are clearly and readily apparent.

In planning for the scorekeeping and reporting functions, major emphasis must be placed on making maximum use of already available data gathering and reporting systems. Frequently, the types and sources of data previously employed in identifying primary targets and setting numerical goals can be used with suitable modification. Ordinarily, Zero Defects should not create needs for data beyond what is normally necessary for effective management of the organization. For example, inspection reports, cost accounting summaries, and customer complaint reports are invaluable existing sources of data for use in Zero Defects programs.

Ingenuity and imagination are necessary in devising effective methods for graphically portraying Zero Defects goals and the progress made toward their attainment. A wide variety of techniques exist for showing trends, including various kinds of charts described in textbooks on quality control. Such trend charts should be of simple design, readily understandable, and appropriate to the personnel to whom they are addressed.

It is essential to keep in mind that charts intended for public display should be limited to information showing group rather than individual performance. Charts that publicize individual performance may result in adverse reactions. This is particularly true of charts that indicate unsatisfactory or mediocre personal achievement.

DESIGNING ERROR-CAUSE-REMOVAL (ECR)

Error-Cause-Removal (ECR) is a procedure whereby—(1) individuals are encouraged to identify existing environmental causes of defects on Error Cause Identification forms; (2) the supervisor, with the help of the Zero Defects Administrator and other management personnel, promptly investigates the identified problem; (3) management corrects the environmental cause of error if the problem is substantial; and (4) the employee is advised of the corrective action to be taken or the reasons why such action is not possible.

Experience with Zero Defects programs has shown that the most impressive and lasting achievements have come from ECR activities. In planning procedures for ECR, therefore, the Zero Defects Administrator should devise procedures which will stimulate active interest and participation in ECR by production workers, super-

790-195 O - 66 - 2

visors and management personnel. Zero Defects programs frequently reveal that many defects have their source in causes other than human error. ECR helps to identify these environmental causes of defects.

To be effective, an ECR procedure must—(1) give the employee an opportunity to identify those environmental conditions which he believes are causing him to make errors; and (2) provide for prompt action to remove environmental causes of error in order to demonstrate to employees that management stands squarely behind this element of the Zero Defects effort. So long as errors attributable to environmental conditions are not eliminated it is impossible to achieve Zero Defects.

Appreciating and understanding the causes of errors are essential for the development of effective ECR procedures. Errors are caused either by persons or by deficiencies in the tools, procedures and facilities with which the person does his work. The human error may be diminished or eliminated as pride of workmanship develops from the motivation of a Zero Defects program, but errors stemming from the environment cannot be eliminated by the individual, however dedicated he may be. This is management's responsibility.

In the early stages of a Zero Defects program the individual is inclined to be skeptical that he is the real cause of faulty workmanship; but, as the program develops more and more employees can be expected to examine errors objectively. They want to make certain that errors caused by environmental conditions are not attributed to them. The experience of many organizations indicates that the typical employee does not try to cover up or minimize his own mistakes. However, motivated by a Zero Defects program, he is less inclined to accept defects as inevitable. He will be motivated to investigate further every error that may be caused by something other than his own lack of care.

An ECR procedure may pose some management problems, particularly where the action needed to correct an environmental condition is either more costly than the defects involved or cannot be taken as promptly as might be desired. Any apparent lack of action may be interpreted as an indication that management is not only indifferent to ECR, but is also unwilling to acknowledge its own errors. Thus, management's vital role in the Zero Defects program is nowhere more apparent than in the operation of the ECR element of a Zero Defects program. Management must respond rapidly and constructively to ECR recommendations and be prepared to present the factual basis for decisions to turn down a recommendation.

To a major degree, the effectiveness of procedures for removing environmental causes of error depends heavily on the first-line supervisor. Experience has shown that—

(a) Ninety percent of unsatisfactory environmental conditions can usually be corrected by the supervisor.

(b) Almost ten percent of ECR actions involve changes in procedures, or minor facility alterations, both of which can be accomplished by such groups as plant engineering or the maintenance department.

(c) The remaining fractional percentage of ECR actions may require costly modifications in facilities or procedures.

Since the supervisor is the link between management and the employees under his supervision, his handling of environmental causes of error is particularly important. When a supervisor corrects an environmental condition, he is in effect correcting a management error since it is management that provides and controls the tools, facilities and procedures that resulted in the unsatisfactory environmental condition. Accordingly, the supervisor must handle suggestions for removing environmental causes of error with courage, tact and understanding, and be willing to present suggestions to higher authority when correction is beyond his authority to accomplish.

As a key element in the success of ECR, the supervisor must be carefully and fully briefed in the operation of the ECR process. He should also be furnished written guidance to explain the procedures he is to follow in ECR and assist him in detecting and identifying environmental causes of error.

There is a relationship in certain instances between the Error-Cause-Removal procedures and the existing suggestion awards program. The ECR procedures motivate the worker to call attention to causes of error, but do not require him to propose a solution to the problem. However, if he can also suggest a practical method for eliminating the cause of error, he submits a suggestion and is eligible for an award under the suggestion program.

SCHEDULING AND BUDGETING

Prior to presenting a Zero Defects program plan to management for approval, the Zero Defects Administrator should devise a comprehensive schedule of activities and milestones for each phase of the program. The timing of events is most important in order to gain the greatest positive impact from these activities without interfering with other programs or the ordinary routine of the organization. To arrive at a satisfactory schedule, the administrator must consider the following factors as a minimum: (a) availability of key participants for specific planned events; (b) lead time required to obtain promotional and display materials; and (c) availability of space and facilities required for kickoff and sustaining activities.

A budget for a Zero Defects program must also be carefully prepared. Although experience has indicated that the dollar benefits derived from Zero Defects have outweighed the cost of the program by a large margin, it is imperative that costs be kept to a minimum. Overly elaborate promotional materials and activities and unwarranted intrusions on productive time of personnel should be resolutely avoided.

PRE-KICKOFF ACTIVITIES

Preparation of Promotional Material

Certain items necessary for the support of the Zero Defects program must be prepared at a very early stage in the program's development. These include various official documents establishing the program. For example, a management letter explaining the Zero Defects concept and philosophy, a program plan, a packaged visual presentation for indoctrinating the staff, and a handbook to help supervisors understand and carry out their assigned roles in the program should be available before the program is implemented.

The planning and preparation of promotional materials for kickoff activities must necessarily be tailored to the specific needs of the implementing organization. Promotional materials need not and should not be expensive. Posters, banners, tags, stickers, pledge cards and similar items have been used very successfully.

Buildup Phase

The buildup phase should include time for a warmup period to increase quality awareness and foster general receptiveness to the Zero Defects philosophy. The purpose of this period is to improve the employees' knowledge of the importance of the products or services they produce in order to facilitate their acceptance of the Zero Defects concept. The warmup period is characterized primarily by poster campaigns and educational programs.

It may also be effective during the last week or two of the buildup phase to initiate an awareness campaign describing some part of the Zero Defects concept each day but holding back its name until some predetermined date. As with any promotional approach, imagination and ingenuity in planning and executing the buildup phase of Zero Defects is essential to assure optimum impact.

Personnel Briefings

A major step in the pre-kickoff stage of a Zero Defects program is to explain all facets of the program to those management personnel who were not involved in the planning phase. This can be accomplished in a series of briefings by the Zero Defects Administrator. The briefings should be given first to the senior executive's staff, next to midmanagement personnel, and finally to supervisory level personnel. The briefing for the top management element of the organization should be arranged by the senior executive in order to indicate clearly that the program has his full support. All of the briefings should include a review of the complete program plan.

Midmanagement briefings should be arranged and conducted in such a manner as to reflect the support of all elements of top management. Experience has shown that mass briefing sessions for the management staff should be avoided. Small meetings convened by members of the top management staff, with the senior executive present when possible, have been found to be most effective.

Probably the most important part of this phase of the program is the briefing prepared for the first level of supervision. Acceptance of the Zero Defects challenge by this level of personnel is the key to acceptance by the individuals working under their supervision. It is important also because the supervisor, in his day-to-day contact with the in-

dividual workers, must be able to answer questions and direct activities with respect to Zero Defects.

Experience has shown that carefully prepared plans for briefing supervisors with material specially prepared for these briefings are well worthwhile. When a supervisor is furnished a handbook outlining his responsibilities and presenting suggestions for handling specific problems, he is better able to contribute to the success of Zero Defects.

It is desirable to have management staff members present at briefing sessions for supervisors. This assures that supervisors are aware of management's support of the program. It is advisable to schedule the sessions for supervisors just prior to initiation of the program to assure their peak interest at the time of the kickoff events.

Special briefings should be arranged for representatives of employee organizations, professional societies, press, and civic organizations. A briefing for representatives of labor organizations, for example, should be designed to preclude misinterpretation of Zero Defects concepts and goals. The primary purpose of this briefing should be to explain that the objectives of Zero Defects are compatible with the best interests of the employees and their organizations. It is particularly important that this briefing emphasize the voluntary aspects of Zero Defects. If employee organization leaders wish to brief their officials with respect to Zero Defects, arrangements should be made and the time allowed for such briefings.

Community briefings are also useful, particularly in situations where a community's economy is largely dependent on one organization, e.g., where a military supply depot or industrial complex is the major employer in a small city. The briefing of community leaders and community service organizations should serve to marshal strong community support for Zero Defects. Briefings should be arranged for the local press as early as possible, particularly if the program is to be initiated in an organization which is a major employer in a community.

KICKOFF ACTIVITIES

Communication Media

The timing for the "kickoff" of a Zero Defects program should be arranged to make maximum use of available communication media. For example, the kickoff date should be selected to coincide with the publication date of the plant newspaper or house organ. Arrangements can then be made for the plant newspaper to carry a banner headline announcing the Zero Defects kickoff events and to feature messages from the company president and community and union leaders. The paper might also include articles describing Zero Defects programs implemented by other organizations to indicate that the Zero Defects concept is widely accepted.

Announcement of the kickoff should make use of all available communication media in addition to newspapers and house organs. Public address systems, banners, posters, bulletin boards, and other information media can be used to good advantage.

Kickoff Meetings

An effective way to launch Zero Defects is to hold a company-wide rally on kickoff day. Representatives of management, supervisory levels, employee organizations, suppliers, customer organizations, and prominent public figures should be given key roles in this event. Brief, motivational speeches should be made by selected individuals who hold positions of leadership in the sponsoring organization and the community. One of the featured speakers may well be a representative of an organization which uses the products of the sponsoring organization.

An alternative or addition to the company-wide rally which has proven effective is group meetings in various areas of the organization to initiate action programs to meet Zero Defects goals.

The kickoff of a Zero Defects program is also an appropriate occasion to introduce the pledge card if one is to be used. A typical pledge card states the basic Zero Defects philosophy on one side and contains a pledge to strive toward the goal of Zero Defects on the other. It permits the individual to express his personal endorsement and acceptance of the Zero Defects philosophy. Its wording should be formal and its use should emphasize the voluntary aspect of the pledge. It is also useful to give a pin to each person who accepts the Zero Defects challenge.

SUSTAINING ACTIVITIES

During the initial phase of a Zero Defects program, a primary goal is to explain the basic concepts and to obtain the widest possible acceptance of the program's challenge. Once the program is in operation, the primary objective is to help the individual achieve the goal of error-free work and to maintain his interest and dedication at the highest possible level. This latter objective can best be met through a sustaining program that—(1) identifies and eliminates the causes of error; and (2) recognizes and rewards Zero Defects achievements.

Continuing Promotion

House organs, the local press, and local radio and television stations are all media that should be used to help sustain interest by publicizing important developments in a Zero Defects program. These media are particularly valuable for publicizing significant achievements. This publicity adds measurably to the motivational impact of Zero Defects.

It is also desirable to publicize plant-wide achievement such as exceptional performance of the company's product as reported by the company's customers. Other newsworthy achievements include improved quality as evidenced by reduced scrap and rework rates, customer commendations for schedules met or exceeded, and cost reductions. All publicity releases should be designed to make each employee proud of his contribution to the well-being of the organization even if his particular task is not readily related to the production of the company's product line. This applies, for example, to administrative, clerical and service employees.

Interest can also be sustained by publicizing the achievements of Zero Defects programs of other organizations, both in Government and industry. Such an exchange of experiences can add impetus to the program by showing employees that they are not alone in their Zero Defects efforts.

Exchanges of Information

Any exchange of experience and knowledge gained in the operation of a Zero Defects program can be of mutual benefit to participants in the Zero Defects movement. Much can be learned about new developments and techniques by arranging visits to plants where Zero Defects programs are in progress. Subcontractors and vendors, particularly, can benefit from the experiences of their customers with Zero Defects. Seminars also have been used successfully for exchanging ideas among large numbers of personnel involved in Zero Defects programs. The seminar approach makes it possible for personnel with experience in different phases of the subject to help solve each other's problems. The workshop type of seminar is a particularly valuable tool for disseminating new ideas quickly and effectively to a large number of people.

Briefing of New Employees

The organization's program for briefing new workers should include a presentation on Zero Defects. This will give the new employee an opportunity to participate in the program, including an opportunity to sign a pledge card and to receive a Zero Defects pin if such promotional material is used.

Management-Employee Liaison

Effective management-employee contact is essential to the success of a Zero Defects program. Periodic visits by management to work areas are particularly useful. In those areas where significant achievement and progress have been made, such visits not only reinforce the effectiveness of the immediate supervisor, but also provide opportunities for personal approbation for the accomplishments of individuals and groups.

Similarly, the Zero Defects Administrator should maintain close liaison with first-line supervisors to offer assistance in resolving problems. A significant increase in the number of defects reported in an area, for example, is often the first indication that the supervisor needs help to identify and correct some environmental cause of error. By maintaining close liaison, the Zero Defects Administrator can often assist the supervisor not only to seek out possible environmental causes of errors, but also to stimulate action to eliminate these causes when such action is beyond the supervisor's authority.

ACTIVATION OF ERROR-CAUSE-REMOVAL (ECR)

Experience has shown that a majority of the error causes identified under ECR procedures are attributable to environmental conditions related to the tools, facilities and procedures provided and controlled by management. Most of these causes can be acted upon promptly by the supervisor, but some will require decisions by a higher management level. It is essential to the success of this effort for management to indicate an objective attitude toward ECR and to act decisively in correcting the causes of error once they are uncovered.

Whatever the final decision, the originator of an ECR suggestion must receive a report of the action taken on his suggestion. This report should be sufficiently complete to convince the originator that the evaluation of his suggestion was thorough and objective. If the suggestion is accepted, he should be given a date for its implementation and, when appropriate, an opportunity to indicate whether or not he concurs in the action taken.

Effective implementation and control of ECR procedures requires suitable documentation of the actions taken to report, identify and eliminate error causes. Provisions should be made for a report form, such as the "Error Cause Identification Form" shown in figure 3, to help employees describe what they believe to be the causes of errors. This will also facilitate a review by the supervisor, who can often analyze and correct the problem promptly without any outside help.

Because the solution to an error-cause problem recommended by a worker may also constitute a valid suggestion under an existing suggestion program, provisions should be made to permit an employee to submit an appropriate suggestion form whenever he proposes an ECR action. This assures that a worker will be rewarded for each valid suggestion.

The Zero Defects Administrator should review all ECR proposals and keep suitable records to indicate that appropriate follow-through actions have been taken. He should also review each case to make sure that no employee considers that the action taken in response to his proposal was inappropriate.

Following are two case histories that illustrate the variety of error causes that have been encountered in current Zero Defects programs. One is a relatively simple problem; the other is quite complex. Both cases involve environmental conditions that caused defects which might normally have been attributed to human error if the Zero Defects program had not motivated management to take a second look.

CASE A:

A lamp service man whose job is to replace burned-out fluorescent tubes used a cart to carry the tubes and ladder. He always carried his ladder on the top of the cart where the tubes were stacked, and occasionally "accidentally" broke one or more tubes. He suggested that a pair of hooks be attached to the side of the cart from which he could hang the ladder. The supervisor approved the suggestion, had the hooks fabricated and installed. The suggestion reduced breakage. The employee received an award under the suggestion program.

CASE B:

A sheet metal worker reported that his machine was too close to a wall to permit him to manipulate large sheets of metal and this caused the production of defective material. The supervisor not only verified the worker's statement, but also found that it was dangerous to handle large, sharp-edged sheets without at least two additional feet of space between the wall and the machine. The supervisor could not correct the situation because the wall could not be moved without interfering with an adjoining production area.

The supervisor submitted his findings to the Zero Defects Administrator, who discussed the problem with the Plant Engineer. It was found that the production line adjacent to the wall was scheduled to be modified in three months. This would permit moving the interfering wall to provide the required clearance for the sheet metal operation. In the meantime, the fabrication of large sheets of metal was scheduled for other machines. Thus, a cause of error and a dangerous working condition were initially alleviated and ultimately corrected.

Front

ZERO DEFECTS

ERROR CAUSE IDENTIFICATION

NAME		LOCATION	MAIL POINT
OCCUPATION TITLE	DEPT.	CLOCK NO.	( ) HOURLY ( ) SALARY

IN ORDER THAT A BETTER JOB BE PERFORMED TOWARD THE GOAL OF ERROR-FREE PERFORMANCE, I AM IDENTIFYING THE FOLLOWING CAUSE OR POTENTIAL CAUSE OF ERROR:

IMPORTANT INFORMATION

IF, IN ADDITION TO IDENTIFYING ERROR CAUSE, YOU FEEL THAT YOU HAVE A WAY TO SOLVE IT, PLACE THIS SOLUTION IN THE ABOVE AREA. IF ADDITIONAL SPACE IS REQUIRED, USE A SEPARATE SHEET, ATTACH IT TO THIS FORM AND PLACE A CHECK IN THE FOLLOWING BLOCK. [ ]

THE ERROR CAUSE IDENTIFICATION PORTION OF THE ZERO DEFECTS PROGRAM IS NOT A SUBSTITUTE FOR THE SUGGESTION AWARDS PROGRAM.

IF YOUR SOLUTION IS ADOPTED, AS A COST REDUCTION TECHNIQUE, YOU MAY ALSO BE ELIGIBLE FOR A SUGGESTION AWARD. REMEMBER, YOU MUST FILL OUT AN ADDITIONAL FORM TO BE ELIGIBLE FOR THE SUGGESTION AWARDS PROGRAM.

ERROR CAUSE IDENTIFICATION IS NOT NECESSARILY RESTRICTED TO YOUR OWN WORK AREA - THE SITUATION MAY EXIST ANYWHERE IN THE PLANT.

IN ALL CASES, THE DECISION OF THE COMPANY WILL BE FINAL. ALL IDEAS SUBMITTED BECOME THE PROPERTY OF THE COMPANY.

Figure 3. Error cause identification form.

Back

SUPERVISOR'S COMMENTS

SUPERVISOR'S NAME	ROUTE FOR ACTION TO: (Name)	DATE TO BE RETURNED

ANSWER AND PLAN OF ACTION

EMPLOYEE RESPONSIBLE FOR ANSWER AND ACTION		DEPARTMENT NUMBER	CLOCK NUMBER
EMPLOYEE REVIEW		**ADMINISTRATIVE REVIEW**	
SATISFIED WITH FINDINGS: ☐ YES ☐ NO SATISFIED WITH DECISION: ☐ YES ☐ NO		ACTION BY: ☐ SUPERVISOR ☐ COMMITTEE ☐ OTHER DEPT. ☐ ADMIN.	
EMPLOYEE'S SIGNATURE	DATE	ADOPTED: ☐ YES ☐ NO	IN EFFECT: ☐ YES ☐ NO
		PROPOSED ACTION DATE	SUSPENSE FILE: ☐ YES ☐ NO

Figure 3—Continued.

RECOGNITION AND REWARDS

Official and public recognition of achievement is an important part of a Zero Defects program. Accordingly, procedures must be devised for identifying and evaluating those accomplishments which warrant such recognition. It is not necessary, however, to delay implementation of Zero Defects until all details of the procedure for measuring and recognizing achievement have been worked out. It is often possible to continue to use the existing basic tools of employee evaluation for this purpose, such as supervisory judgment supported by such data as production quality control statistics and audit reports.

Although Zero Defects is directed primarily at motivating the individual, it is also desirable to provide for the recognition of Zero Defects achievement at three organizational levels—(1) the small group; (2) the large group; and (3) the organization as a whole. Provisions for small and large group recognition are particularly important where teamwork by such groups rather than individual effort alone is of primary importance to error-free results.

The initiation of action leading to the formal recognition of Zero Defects achievement should be assigned as part of the regular duties of each supervisor. Procedures should be established for the use by supervisors of existing data and records of past performance to facilitate the evaluation of potential achievements. If the supervisor's evaluation indicates that a significant achievement has been made, the procedure should provide for the submission of a recommendation for formal recognition prepared on an appropriate form.

To assure that formal recognition is accorded only for significant achievements, all recommendations should be reviewed by a formally organized committee. The use of an achievement recognition committee has two important advantages—(1) its deliberations will be objective; and (2) its actions will not be subject to intra-organizational bias.

The most effective method of recognizing Zero Defects achievement is some form of personal approbation. Such personal action has been found to be a more potent stimulant to Zero Defects efforts than monetary or other material reward.

The procedure for recognizing achievement must also provide for suitable publicity. Well publicized recognition of a Zero Defects achievement may be used to good advantage in assuring continued interest in the program.

Group recognition provisions are valuable primarily as support elements of a Zero Defects program. Such recognition encourages team effort and engenders a competitive spirit between groups. The disadvantage inherent in group recognition is that those members of a group who have not contributed to the group's success and, in fact, who may be negative in their attitude, will be given the same recognition as those who have contributed. Conversely, an outstanding worker in a low achievement group may go unrecognized because his group's performance is inadequate. Accordingly, the procedure for recognizing group achievement must not negate or downgrade the importance of individual achievement. If it does, it may cause an adverse reaction to the Zero Defects program as a whole. Thus, group recognition procedures must be used with caution. Zero Defects is most effective when it is directed at encouraging individual achievement. Its benefits derive primarily from individual motivation and recognition. Group motivation, accordingly, must always be subordinated to motivation of the individual if the Zero Defects program is to succeed.

Among the group recognition techniques that have been used successfully in the Zero Defects chart. This technique is best applied where group achievement can be expressed in quantitative terms. Properly designed, this chart can be used to illustrate more than one aspect of a group's Zero Defects achievement. It may show, for example, that the defect rate actually achieved by the group is not only lower than the defect rate that the customer will tolerate, but is also lower than the defect rate established as a performance goal.

Almost every successful Zero Defects program has been best able to motivate the individual employee by identifying him with the product of his labor. One way to accomplish this is to arrange for employees to see their products in use. Another way is to have customers who are well satisfied with the product explain to the employees how important it is to obtain a product that is defect-free.

Of the various methods that have been used to cause employees to identify themselves with their products, one of the most effective has been to reward individuals who have shown outstanding Zero Defects achievement with a trip to the site

where the product is being used. Another method is to have a user of the product (e.g., an aircraft pilot) visit the plant to meet and talk with employees individually. Films or photographs of the product in action have also been found useful and rewarding motivational material.

GENERAL REVIEW

A Zero Defects program requires careful planning and execution if it is to accomplish its intended purpose. Such a program can be expected not only to motivate employees to perform effectively, but also to disclose environmental conditions that impede employee efforts to achieve error-free performance of their assigned tasks.

It is more difficult to sustain a Zero Defects program than to start one. This is due primarily to the normal human inclination to lose interest in something that is no longer new. Accordingly, the plan to sustain interest in a Zero Defects program must be thoughtfully and imaginatively developed before the program is adopted.

Some of the key points of the Zero Defects concept may be summarized as follows:

(a) Success of a Zero Defects program is contingent on sustained management, interest, support and direction.

(b) Participation in a Zero Defects program is voluntary.

(c) The opportunity to participate in Zero Defects should be offered to all personnel in an organization, both those whose work directly affects product quality and those whose work does not.

(d) A Zero Defects program must be designed to motivate the individual employee and should include no group recognition that detracts from this primary objective.

(e) Well-publicized recognition by management of employees' Zero Defects achievements is essential to the success of a Zero Defects program.

(f) While motivating employees to prevent human error, the Zero Defects program also motivates them to identify environmental conditions that cause defects and which are often erroneously attributed to human error.

(g) The Error-Cause-Removal (ECR) element of the Zero Defects program is a means for identifying and correcting error-causing environmental conditions such as tools, facilities and procedures that are provided and controlled by management. ECR is an essential feature of a Zero Defects program.

U.S. GOVERNMENT PRINTING OFFICE 1966 O—799-185

END

DATE
FILMED

12-80

DTIC