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DOE HANDBOOK

GUIDE TO GOOD PRACTICES FOR TEAMWORK TRAINING AND DIAGNOSTIC SKILLS DEVELOPMENT



**U.S. Department of Energy
Washington, D.C. 20585**

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FOREWORD

1. This Department of Energy (DOE) Handbook is approved for use by all DOE Components and their contractors. The Handbook incorporates editorial changes to [DOE-STD-1007-92](#), *Guide to Good Practices for Teamwork Training and Diagnostic Skills Development*, and supersedes DOE-STD-1007-92. Technical content of this Handbook has not changed from the original technical standard. Changes are primarily editorial improvements, redesignation of the standard to a Handbook, and format changes to conform with current Technical Standards Program procedures.
2. This technical standard provides guidance to DOE staff and contractors that can be used to modify existing programs or to develop new programs. DOE contractors should not feel obligated to adopt all parts of this guide. Rather, they can use the information in this guide to develop programs that apply to their facility. This guide can be used as an aid in developing a program for initial and continuing training. The training on teamwork and diagnostic skills, as outlined in the guide, can be applied to any working group whose success is dependent on the interaction of the individuals.
3. Beneficial comments (recommendations, additions, deletions) and any pertinent data that may improve this document should be sent to the Office of Nuclear Safety Policy and Standards (EH-31), U.S. Department of Energy, Washington, DC 20585, by letter or by using the self-addressed Document Improvement Proposal (DOE F 1300.3) appearing at the end of this document.
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 - (1) they are explicitly stated to be requirements in a DOE requirements document; or
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1. INTRODUCTION

1.1 Purpose

This guide provides assistance in the development, implementation, and improvement of training on teamwork and diagnostics.

1.2 Background

DOE and contractor representatives identified the need for teamwork and diagnostics training guidance. This need was based on the increasing emphasis of properly applying knowledge and skills to complete assigned tasks. Teamwork and diagnostic skills have become a focal point because of the impact they have on effective facility operation and safety.

1.3 Application

DOE 5480.20A, "Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities" requires that qualification programs include training on teamwork skills. The Order requires that personnel are trained as a team to stress team communications and interaction where job functions require team solutions and activities. Diagnostic skills are integral in the development of teams and should be a part of the team training concept.

The content of this guide is applicable to all DOE reactor and nonreactor nuclear facilities. Portions of the programs outlined may not be applicable to all facilities because organizations, disciplines, titles, and responsibilities vary among DOE reactor and nonreactor nuclear facilities. Facility training personnel can improve existing training programs by adapting this guide to their specific facility and individual operational disciplines.

Discussion

The groups that would benefit from team building need to be clearly identified. Training on teamwork and diagnostic skills should be included in a training program for groups that are interested in improving the way they currently operate, are functionally interdependent, and in

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which each member has a stake in solving the problems or challenges facing the group. Little will be gained unless team members have a clear motivation to proceed.

Each facility should analyze its training needs to develop a facility-specific, performance-based training program. Analysis results should be used to establish training program learning objectives, test items, instructional methods, and instructional settings. Team building should be preceded by a thorough assessment of need. A clear picture is needed concerning what problems may be occurring, or opportunities lost, due to the lack of teamwork.

The teamwork skills that may be developed for effective teams include, but are not limited to, those listed below:

- Communications
- Stress-management
- Leadership
- Team building
- Conflict resolution

The diagnostic skills that may be developed include the following:

- Monitoring
- Interpreting
- Intervening

Full implementation of quality team and diagnostic training requires a long-term commitment. Training activities should be carefully managed to produce effective results. Training plans should be developed, organizations should be staffed with qualified instructors, and sufficient controls should be applied to ensure delivery of an effective training program.

Training programs for teamwork and diagnostic skills development should be evaluated on a regular basis to determine the extent to which established learning objectives are being accomplished. Evaluation results should be used to improve training plans, facilities,

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programs, materials, and procedures. In addition, a systematic method to update training program content as a result of facility modifications, operating experiences, procedure changes, and changes in job requirements should be implemented.

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2. DEVELOPING AND IMPLEMENTING TEAMWORK FUNDAMENTALS TRAINING**2.1 Discussion**

The skills and knowledge developed and improved during the training described in this section should enhance the ability of facility personnel to function effectively in teams. For any group to function effectively, its members must possess both technical and teamwork skills. In situations where resources are limited or when actions must be taken promptly, teamwork becomes increasingly important. Team deficiencies considered insignificant during normal situations may become major obstacles in the decision-making and action-initiation process during abnormal conditions. Examples of obstacles and potential effects include the following:

- Actions are not performed or are performed incorrectly due to improper communications
- Actions are not verified due to misunderstandings of roles or responsibilities
- Blindly following incorrectly worded procedures can misguide task performance
- Individual performance is inhibited due to stress
- Desired actions are not conducted due to coordination problems
- Important paperwork is improperly filled out or routed due to improper communications
- Results of expensive experiments and projects are ruined due to poor initial communications or direction.

Any of these obstacles resulting from poor teamwork could disrupt operations, experiments, projects, or paperwork flow and possibly cause a safety risk or environmental hazard to occur.

To develop the particular skills that a group of personnel need in their environment, additional training should be provided to enable them to operate as an effective team. The skills that are critical to successful team performance should be identified using the systematic approach to training (SAT) processes found in DOE *Training Program Handbook: A Systematic Approach to Training* and in DOE Handbook *Alternative Systematic*

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Approaches to Training. Consideration needs to be given not only to technical systems, but managerial and organizational ones as well. Systematic consideration of problems related to goals, procedures, roles, and interpersonal relations is necessary to establish the need for change, and the strategy by which improvement might be best achieved. Shortages in qualified personnel or adequate resources also need to be considered. Initial training on teamwork fundamentals should enhance the ability of personnel to:

- Demonstrate and promote effective communications, using both verbal and nonverbal methods
- Interact effectively with team members of different personality types
- Provide leadership to team members to achieve team goals
- Resolve conflicts constructively within the team and with interfacing organizations
- Recognize and reduce individual stress.

These fundamental skills should be developed progressively, using both classroom and practical exercise training. The teamwork skills should be integrated into situations where technical knowledge and skills and team skills are necessary. On-the-job and simulator training can provide useful environments for achieving team proficiency in team skills. Role-playing in a classroom or laboratory setting can help with initial skill development.

Teamwork and diagnostic skills training should also be a part of the continuing training program. The objective of continuing training in teamwork skills is to establish, maintain, and enhance the performance of the individual and the team. Continuing training on teamwork should be conducted using the same training settings and methods used in the initial training portion of teamwork training. Continuing training should:

- Identify and correct performance deficiencies related to teamwork on the job in normal and abnormal situations
- Emphasize industry events where poor teamwork was a factor
- Resolve team conflicts through role-plays, simulations, etc.
- Reinforce teamwork fundamentals during technical training.

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There is no one best way to do team building. One approach is to deal with actual problems in the work setting. This approach may focus more on group facilitation than on individual skills training. From the beginning, the group learns to reflect on how it has previously approached its work and to make plans for how to do it better. Upon completion of a task, the group reflects again on what went well and what did not, and why. When a group is able to productively reflect on its experience and to formulate and test out potential means of improvement, they are showing the results of substantial team development. The learning process is an ongoing one. Learning about themselves as a team and finding ways to improve that learning process over time becomes a regular part of how they function.

Another approach (the one in this guide) is to begin team training with a focus on individual skills, and then progress to focusing on the performance of the team as a whole. Efforts to deal with the team as a whole may begin with role-playing and simulations before being moved into the actual work setting.

Training in teamwork fundamentals should be presented to enable trainees to develop and demonstrate basic skills before progressing to more advanced skills. Information from supervisor training may be used as a building block to provide fundamental training in team skills. The DOE *Guide to Good Practices for Developing and Conducting Case Studies* and the DOE *Handbook: Implementing U.S. Department of Energy Lessons Learned Program* can be used as references when developing case studies and role-play exercises for the teamwork and diagnostic training. Teamwork fundamentals training should enable the trainee to:

- Demonstrate ability to make his/her own thinking explicit and open to inquiry from others. The trainee should support a position while inviting others to question the assumptions upon which their position is based
- Demonstrate effective skills in verbal and nonverbal communications, including listening
- Interact effectively with different personality types
- Delegate tasks effectively
- Coordinate successful completion of tasks
- Deal successfully with abnormal behavior
- Demonstrate techniques for praising and reprimanding personnel

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- Provide on-the-job coaching of subordinates
- Establish feedback mechanisms that monitor the effectiveness of decisions
- Develop strategies that accomplish tasks efficiently and effectively.

Performance areas that impact teamwork are communication, stress management, leadership, team building, and conflict resolution.

2.2 Communication

The skill that serves as a cornerstone for teamwork is communication. Without precise and accurate communication, the effectiveness of the team is reduced. Communication becomes critical especially during abnormal and emergency conditions. Communication practices impact the effectiveness of a team by affecting the flow of information among team members.

Training should be implemented that provides the team member with the ability to communicate effectively. This training should enable the trainee to:

- Deliver clear and concise messages
- Apply the fundamentals of group communication such as methods used to communicate, the impact of environmental conditions, and the medium used to send the message
- Identify and overcome communication inhibitors such as lack of standardized words/phrases, lack of procedural guidelines, inability to say or understand "what you mean," noise in the workplace, and deficient or defective communications equipment
- Establish and maintain effective communication during abnormal situations
- Establish and promote feedback mechanisms in the communication process. Focus on what is right rather than who is right, the value of the feedback to the other communicator, the amount of usable information, proper timing, and paraphrasing or direct repeat back of messages
- Exchange information in an efficient and effective manner
- Influence team decisions by effective questioning and assertiveness
- Use facility procedures for communication practices.

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2.3 Stress Management

Boredom and actual or anticipated abnormal conditions can make the work environment a center of stress. Stress causing events could be when the only copy machine available breaks in the middle of an important job or the client you've been trying to reach for the last week calls as you leave to go to the boss's meeting. Stress can reduce a person's ability to think clearly and can cause poor communications, degradation of teamwork, and faulty decision making. Although stress cannot be eliminated from a work area, personnel should be able to recognize and restrain its effects. To achieve this goal, training on stress management fundamentals should be conducted. This training should enable the trainee to:

- Describe the relationship between performance and stress
- Identify conditions that cause stress both internal and external to the work place such as physical, chemical, and emotional factors
- Identify variables that determine conditions or events that contribute to individual stress
- Explain why thought processes suffer under stress
- Explain why a work team's performance is affected by the response of individuals under stress
- Identify symptoms of stress-induced behavior such as rapid or shallow breathing, dizziness, anger, loss of patience, and "drawer slamming"
- Apply methods that control the effects of stress on individual performance during normal and abnormal conditions such as following procedures, communicating effectively, applying breathing exercises, and relaxing. Note: Procedures that are not written properly will also cause stress.

Stress management skills developed during initial training should be maintained and enhanced during continuing training. Performance evaluations conducted on the job and during simulator training should be used to identify areas where continuing training is needed.

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2.4 Leadership

Many work teams have a supervisor designated by the formal organization structure and many do not, but in either case, each team member exercises some aspects of leadership in his/her involvement with other team members and with outside groups. Team members exercise leadership skills while coordinating tasks during day-to-day activities. To contribute to the success of the team, every member of the team should understand the leadership function.

Training in leadership for all work group personnel should enable them to:

- Define leadership and the leadership role in your facility
- Identify the aspects of an effective and non-effective leader
- Identify those factors that adversely impact the leadership role, and develop methods to minimize the impact of these factors on team functions
- Identify and respond to the needs of individuals using different motivational techniques
- Identify those characteristics of the team (i.e., group objectives and individual and collective abilities) that impact on a person's leadership strategy and control their effect on team output
- Fulfill leadership functions as needs arise within the team.

Practical exercises, role-plays, and classroom training with table-top drills should be used to develop and enhance the ability of personnel to act effectively as a team.

2.5 Team Building

Training individual team members in teamwork skills is best seen as part of a larger, more comprehensive program aimed at improving teamwork in larger organizational units. Team building refers to a comprehensive program conducted at all levels to bring about better team performance. It can be led by individual managers, supervisors, or specially skilled trainers, facilitators, or consultants. Elements of a team building program include individual skill training for technicians, operators, supervisors, and managers.

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Teamwork training should be conducted to support the tasks identified in the job analysis. Since most teamwork skills may not be identified by traditional methods of analysis, this guide, the team itself, and references on team building also can be used to determine what knowledge and skills are necessary. This training should enable individuals to:

- Function effectively within a group of people who possess varying technical, communication, and interpersonal skills
- Identify deficiencies and initiate corrective action for performance problems resulting from lack of teamwork
- Describe the organizational roles and responsibilities assigned to work team members
- Describe and apply criteria used to measure team effectiveness
- Describe characteristics common to effective teams and determine which are present in their own team
- Identify and promote factors essential to internal group support and cohesiveness
- Describe disadvantages of teams and improve the individual's ability to counteract these disadvantages
- Describe team member roles assigned only during abnormal or emergency operations
- Determine how organizational and individual perceptions of assigned roles and responsibilities influence individual performance
- Promote individual concepts and positions during interfaces with other people
- Define team values, attitudes, and beliefs, and identify those adopted by the work team(s)
- Perform a self-assessment to identify and compensate for personality traits that detract from effective teamwork
- Describe how team values, attitudes, and beliefs affect team interaction.

Effective team performance not only means successful completion of the technical task at hand, but doing so in a way that increases the team's ability to do future work and satisfy the needs of individual team members. While classroom learning has proven its utility for addressing technical problems, it may not be the preferred approach to team development. The team skills developed through classroom training and practice exercises may be

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reinforced during on-the-job and simulator training. The proper mix and sequence of approaches should be considered. Obtaining detailed knowledge of results over time can help the individual organization learn which approaches will best meet its particular needs.

Team building goes beyond traditional skills training. The purpose is to get work done better, and not simply to learn abstract concepts about groups or interpersonal dynamics. Even when individuals possess strong team skills, they do not necessarily work well together as a group. For this reason, intact work teams should go through the process together. They develop and improve as a team by addressing actual issues of current importance to the team.

Effective teams share several common characteristics.

- They operate with well defined goals, objectives, and expectations
- Members function interdependently with personal freedom to accomplish assigned tasks
- Decisions on complex situations are made on the basis of team member input rather than on an individual basis
- Information is shared freely
- High standards are set and maintained.

Once established, an effective team requires constant maintenance. Previously developed competencies can assist with learning new skills and with adaptation to changing circumstances and unique situations. To maintain effective work teams, an environment should be established to promote these characteristics. Teamwork should be established through training on roles, relationships, and procedures and by using realistic scenarios when conducting role-plays and exercises that require the team to define each member's role in any situation and to identify the individual responsibilities towards the team.

To obtain a better functioning team, team building needs to take place on multiple levels. At the individual level, individuals must have some level of teamwork skills. In addition, managers, supervisors, trainers, and others in key leadership positions must learn and consistently demonstrate effective teamwork skills. At the group level, teams learn to

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develop the ability to work together effectively. At the organizational level, larger organizational units learn better ways to interact.

The interaction between teams is also an appropriate focus of team building. This interaction, and the quality of communication within the larger organizational units as a whole, are important dimensions of team performance. It is important that this broader context not be neglected in the teamwork training. Individual teams need to understand the impact their performance has on other teams and the organization as a whole.

Developing effective teamwork needs support from the larger organization of which the particular group is a part. Patterns of work used by larger organizational units will have a significant impact on their component parts. For example, if the larger unit fails to consider options before selecting a given alternative, it may be more difficult for a subordinate team to adapt that as their own work practice.

2.6 Conflict Resolution

When not handled properly, conflict can severely hamper the ability of the team to complete assigned tasks successfully, especially during stressful emergency situations. The ability of team members to resolve conflict situations during both normal and abnormal conditions should be developed and maintained to enable team personnel to:

- Identify common misconceptions about conflict and describe how these misconceptions such as "personality difficulties" or challenging leadership decisions inhibit conflict resolution
- Describe how controversies, conflicts of interest, and conflicts related to stress affect the work team
- Achieve constructive conflict by applying techniques such as communicating information accurately, having a supportive climate, sharing a common set of values, and establishing and adhering to a common set of rules about conflict
- Assess situations that may result in destructive conflict such as physical conflicts and conflict related to drugs or alcohol, and take actions necessary to eliminate the adverse consequences

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- Identify and respond to different styles of conflict resolution (i.e., compromise, avoidance, accommodation, competition, and collaboration)
- Determine when the inability to resolve conflicts within the team should be reported to higher supervision or management.

The conflict resolution skills developed in classroom training and through practical exercises can be reinforced during on-the-job and simulator training and role-play exercises. An understanding of the causes and benefits of constructive conflict helps the team members recognize early signs of conflict and prepares them to handle or avoid highly emotional issues. The resolution of conflict in a professional and timely manner will reduce stress during situations when the team must focus its energies on controlling a situation.

2.7 Conclusion

In teamwork training, members of the group rely on one another to support their learning. As such, establishing a higher level of cohesiveness can increase their learning and achievement. A more people-centered learning environment with a high level of trust, ease of communication, collaborative atmosphere, acceptance of personal responsibility, and clear and accepted learning goals is the proper setting for team training. In this sense, the medium is the message. The way the training is done gives much of the message about what is to be learned.

Learning exercises should be designed so that successful completion requires collaboration and constructive interaction among the team. Interdependence regarding materials, information, roles, goals, and relationships with other groups all can promote the development of cohesion in the group.

There are many resources available that can be used to develop teamwork fundamentals training. An annotated bibliography is included in this guide to help direct the research efforts of the training department.

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3. DEVELOPING AND IMPLEMENTING DIAGNOSTIC FUNDAMENTALS TRAINING**3.1 Discussion**

The skills and knowledge developed or improved during diagnostic training should enhance the ability of facility personnel to operate more effectively. A team's ability to integrate technical knowledge and skills using a systematic application of diagnostics is necessary for continued smooth operation.

An environment may exist in a work space that requires team members to make highly complex technical decisions. Along with this responsibility is the need to actively follow up and revise decisions as conditions warrant. Occasionally, limitations inherent in procedures make it necessary for personnel to apply diagnostics to handle events or conditions not addressed in procedures.

The goal of diagnostic training should be to develop basic skills in monitoring, interpreting, and intervening. If team personnel have not developed basic diagnostic skills, they may be ineffective in addressing problems. Diagnostic training should be integrated into both initial and continuing training programs.

Training on diagnostic fundamentals should enable the trainee to:

- Recognize the importance of attention to detail and recognize problems early
- Monitor data, and detect impending problems
- Differentiate between expected conditions and problem conditions
- Identify conditions requiring action
- Determine the expected response, and identify deviations in that response
- Identify potential causes of problems
- Analyze potential causes of problems to identify a most probable cause
- Prioritize problems using a systematic process
- Determine and initiate appropriate corrective actions based on a systematic prioritization
- Evaluate success of corrective action, and respond accordingly.

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Training should be sequenced to allow personnel to apply the diagnostic process from simple to complex situations. On-the-job and simulator training can be used to reinforce these fundamentals during both initial and continuing training. Continuing training should be developed to address the performance deficiencies related to diagnostics identified during on-the-job and simulator training, and to address lessons learned from industry operating experience related to the application of diagnostics. Initial and continuing training can also be enhanced by the use of case studies and role-play exercises.

3.2 Monitoring

The amount of information being processed by personnel varies significantly with interaction of team members, proximity of data, quality of data, and the ability of the individual to detect and process the data. Even though some environments have been updated to provide personnel with more accessible and usable information, the team must be able to gather and process the information. The process used to gather and analyze plant information should be developed and reinforced in classroom and simulator training and in the work place. Training should develop and improve the team's ability to:

- Understand conditions, component/system status, and performance indicators on an ongoing basis
- Identify changes in performance indicators
- Detect symptoms that might indicate degradation or failure in performance
- Anticipate consequences of jobs or tasks improperly performed by others
- Identify systems and components approaching unsafe conditions, independent of alarm function
- Identify parameters that should be trended to detect early warnings of problems
- Apply personnel and plant theory in situations to anticipate responses and identify unexpected responses
- Detect errors committed by team members, and take action to lessen their effects.

On-the-job training, simulator training, laboratory exercises and observations, and fundamentals training can be used to develop and reinforce monitoring skills.

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3.3 Interpreting

The information obtained during monitoring activities is vital to facility personnel. Once available, information must be processed and analyzed by the team to enable them to determine status and needed direction. The logical process by which a team analyzes this information relies heavily on the team's technical knowledge, experience, and interpretation skills. Technical knowledge and experience are gained and reinforced through training activities and time on the job. The development and reinforcement of interpretation skills through simulator and/or laboratory training enables personnel to use their knowledge and experience to ensure safe operation. Interpretation activities conducted by personnel identify possible causes for abnormalities and indicate the most probable cause and procedure path. This process allows them to attack the problem at its source. By using a systematic approach, team personnel can develop confidence in the selected action path.

Training to develop and improve individual and team ability to interpret information should be included in both initial and continuing training. Classroom fundamentals, laboratory exercises, simulator, and on-the-job training should be developed and implemented to enable personnel to perform the following:

- Analyze available information to differentiate among a variety of problems and situations
- Describe a problem precisely using location, severity, and trending
- Locate information resources available to assist in identifying possible causes
- Analyze possible causes to determine the most probable cause
- Integrate information on an ongoing basis to revise interpretation
- Recognize the role of team members in determining causes of events.

3.4 Intervention

The ability to gather, evaluate, analyze, and respond to information enables team members to function during both normal and abnormal conditions. Once the team has identified a problem and determined the most probable cause, corrective action is selected and taken. In effect, the team intervenes in the sequence of events to cause a favorable outcome. The decision on when, where, and how to intervene should be made using a logical thought

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process. The quality of the decision is dependent on the information used to make the decision and the process used to apply it. Intervening requires the highest order of cognitive skills, since an individual must predict and analyze the effects of the intervention, as well as integrate it with other actions that are taken in response to the problem. The ability to intervene is essential to the success of a team during all conditions. This ability can be developed using classroom fundamentals and simulator training and should be reinforced on the job and during continuing training. The training should enable team personnel to:

- Determine if intervention is required
- Determine the most probable success path
- Analyze resources and potential consequences of selected action to determine priority of activities
- Establish and apply success criteria for intervention activities
- Apply a diagnostic process to assess results of intervention activities
- Interact effectively with other personnel to select and implement intervention activities.

Teamwork is essential in initiating effective intervening activities. Scenarios should be developed that require input from the team members on selecting the intervening activities and determining what information is to be obtained to evaluate the effectiveness of those intervening activities. Conflict resolution management should also be exercised to achieve the best team decision. Team communications should always be stressed to ensure that the information is disseminated to the entire team.

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4. APPLYING DIAGNOSTICS TO PROCEDURE USE

Procedures are developed and implemented to guide facility operations and maintenance during both normal and abnormal conditions. Each procedure is developed using certain assumptions to address a specific set of conditions, based on available technology and the expected response.

Sometimes situations occur where a team perceives that procedures will not work for the existing conditions. At this point, the team must select an alternate path to correct the situation. The alternate path may consist of using sections of another procedure or developing a new procedure to address the situation.

The team's ability to consistently apply facility policies and a logical diagnostic process during periods of procedure deviation will improve its probability of success. Fundamentals training should be implemented that will enable the trainee to:

- Identify limitations in each type of procedure
- Describe facility policies governing procedural compliance
- List the actions to be taken when procedure problems are identified
- Apply diagnostic skills when deviating from approved procedures
- Discuss examples of situations when procedure deviation may be necessary
- Identify assumptions made in the procedure.

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5. APPLYING TEAMWORK AND DIAGNOSTIC SKILLS DURING ON-THE-JOB AND SIMULATOR TRAINING

Although some fundamental teamwork and diagnostic skills can be practiced in the classroom, team personnel might not develop the higher order cognitive skills that are necessary for good teamwork with only classroom instruction. To achieve and maintain proficiency in teamwork and diagnostic skills, the conditions established during on-the-job and simulator training provide the most efficient and effective training environment. This training should include scenarios that require the team to apply their diagnostic and teamwork skills. Evaluation of these skills, followed by constructive performance feedback, should be provided during and after drills and exercises. The results of these evaluations should be reviewed and used to modify initial and continuing training.

The goal of this training should be to maintain and improve proficiency in the following:

- Individual and team communication skills
- Individual and team stress management
- Performance of individual and team roles and responsibilities
- Conflict resolution
- Application of diagnostics during routine conditions
- Application of diagnostics during abnormal conditions.

Training should be conducted with trainees assigned to team positions dependent on their training needs. Procedures should be used to define individual team member areas of responsibility. This method of training develops the trainees' proficiency in their normal positions, provides an understanding of the roles of others on the team, and helps to develop the ability of the team to work cohesively.

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ANNOTATED BIBLIOGRAPHY

This annotated bibliography contains selected references that can be used in the development of teamwork and diagnostic training. Many additional references are provided in the review articles included in this bibliography. Potential applications are indicated for each reference listed below.

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- One approach that can be used in the classroom as a starting point for discussion of leadership behavior.

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- Sequencing of training based on task demands for teamwork and detecting team overload.

Davis, I., Gaddy, C., Turney J., *An Approach to Team Skills Training of Nuclear Power Plant Control Room Teams*. (NUREG/CR-4258) Washington, D.C., U.S.N.R.C. 1985.

- Team skills objectives and methods of instruction.

Dyer, J. L., "Team Research and Team Training: A State-of-the-Art Review," *Human Factors Review*, 285-323, 1984.

- Numerous training recommendations provided based on comprehensive review of literature from 1955-1980.

Dyer, W. G., *Team Building: Issues and Alternatives*, Reading, MA, Addison-Wesley, 1977.

- Team development considerations; Team Development Scale (pages 68-70) can be used as a feedback questionnaire in team training.

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Foushee, H. C., "Dyads and Triads at 35,000 Feet: Factors Affecting Group Process and Aircrew Performance," *American Psychologist*, 39, 885-893, 1984.

- Description of group process variables, such as coordination, information flow, communication style, and precision of communication that affect team performance.
- Techniques for improving group process such as altering group norms, increasing member effort and coordination, and changing group composition.

Lauber, J. K. and H. C. Foushee, "Guidelines for Line-Oriented Flight Training, "Vols. 1 and 2, *NASA Conference Publication 2184*, Moffett Field, CA, National Aeronautics and Space Administration, Scientific Technical Information Branch, 1981.

- Scenario development, conduct of simulator training, and evaluation.

Nieva, V. F., E. A. Fleishman, and A. Rieck, *Team Dimensions: Their Identity, Their Measurement and Their Relationships*, Washington, DC, Advanced Research Resources Organization, November 1978.

- Implications for team performance of group size, group cohesiveness, competition and cooperation, communication and networks, members' individual differences, power distribution, group training, and group functions.

Siegel, A. I. and P. J. Federman, "Communications Content Training as an Ingredient in Effective Team Performance," *Ergonomics*, 16, 403-416, 1973.

- Analysis of communications and impact on team performance.

Turney, J. R. and S. L. Cohen, *Defining the Nature of Team Skills in Navy Team Training and Performance*, Contract No. N0014-80-C-0811; NR 170-919, Office of Naval Research (Code 452), September 1981.

- Information transfer within teams.
- Team versus individual tasks.

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Wagner, H., N. Hibbits, R. D. Rosenblatt, and J. R. Schulz, *Team Training and Evaluation Strategies: State-of-the-Art*, HumRRO TR-771-1, Alexandria, VA, Human Resources Research Organization, February 1977.

- Individual versus team training
- Team skills
- Simulation fidelity
- Feedback
- Team structure and composition
- Established versus emergent situations
- Systems approach to training
- Evaluation techniques.

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APPENDIX
A TEAMWORK AND DIAGNOSTIC SKILLS TRAINING PROCESS

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APPENDIX

A TEAMWORK AND DIAGNOSTIC SKILLS TRAINING PROCESS**1. Introduction**

The intent of this Appendix is to provide a user-oriented description of a possible teamwork and diagnostic skills training approach that will aid trainers in implementing a similar approach to better suit specific training needs. This Appendix can be used as an example method.

2. Analysis of Team and Diagnostic Skills

During the analysis phase, the team and diagnostic skills that will become the focus of the training program are defined. The result will become the basis for the team and diagnostic skills training conducted and evaluated in the later phases.

- Obtain analysis data.
- Review fundamental team and diagnostic skills in this guide.
- Review available documentation.
- Obtain subject matter expert (SME) input.
 - SME input is invaluable in identifying team skills such as "conflict resolution," which would not show up through sources such as job analysis data, but is known to be a key team skill based on actual job experience.
- Generate a job related list of fundamental team and diagnostic skills.
- Select team tasks for training.
- Determine task training frequency.
- Evaluate team interaction complexity and criticality. Recognize that the complexity and criticality of the technical characteristics of a team task typically correlate directly to the complexity and criticality of the team interactions associated with the task.
- Consider other rationale that may also exist for including a task in the team training program (e.g., operator requalification).

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3. Design of Team and Diagnostic Skill Training

During the design phase, learning objectives are developed based on the results of the analysis phase. The objectives form the "blueprint" which guide the development of all training material, tests, and strategies.

- Write terminal learning objectives based on the information from the analysis phase.
- Write enabling learning objectives from the skills and knowledge based on the job and task.
 - Include condition, action statement, and standard in objectives.
 - Prepare objectives that will facilitate subsequent development of team and diagnostic skills evaluation criteria.
- Prepare evaluation criteria based on team and diagnostic skills objectives for each exercise and write test items for each objective.

4. Development of Team and Diagnostic Skills Training

During the development phase, the team and diagnostic skills training program is created from the results of the design phase. This program should be designed to be given to each member of a team.

- Develop training based on learning objectives.
- Use self-study, lecture, or presentation methods as appropriate for presenting materials. (Management training firms supply training kits that can be used for teamwork and diagnostic skills training. Do not re-invent the wheel.)
 - Focus on defining skills, identifying relationships between skills, understanding fundamental principles, identifying strategies for application of these skills, and providing examples of applications.

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- Develop case studies based on lessons learned from other facilities. These case studies could be video- or text-based and should include both good examples and bad examples.
- Develop an open discussion session with the team. This open discussion should concentrate on how they can improve as a team. Discussions should include lessons learned at your own facility.
- Develop practice training based on learning objectives.
 - Use combinations of on the job, simulation, seminar, and role-play methods.
 - Base exercises on actual incident situations where possible.
 - Conduct peer and instructor critiques. Video taping the role-plays and exercises can be beneficial if it is appropriate.
- Develop team task training scenarios.
 - Emphasize achieving realism in scenario design as appropriate for the training objectives of the exercise.
 - Design scenarios to exercise team and diagnostic skills.
 - Develop instructor exercise guides that include team and diagnostic skills objectives and cues to observe those skills.
 - Evaluate new scenarios and instructor exercise guides.
- Use evaluation to maintain and upgrade training.

5. Implementation of Training

During the implementation phase, teamwork and diagnostic skills training is conducted. This is where the technical skills and team skills of individuals come together in the training of tasks performed by a work team. Typically this training includes exercising a team in the performance of a variety of normal, abnormal, and emergency evolutions. This phase lends itself well to applying diagnostics training fundamentals to abnormal situations.

- Provide instructors with basic team and diagnostic skills training to increase awareness of desired skills.

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- Present fundamental teamwork and diagnostic training in an order such that each lesson provides a foundation for the next lesson.
- Conduct case studies by video or team discussion. Relate both good and bad examples.
- Conduct open discussions on lessons learned and apply the results to the team. Discuss how the team can improve.
- Conduct role-plays and exercises.
 - Use instructor exercise guides that include cues regarding team skill observation during exercises.
 - Sequence the scenarios based on considerations of task technical complexity and complexity of team interactions.
 - Apply appropriate techniques to achieve realism.
 - Use available simulator technology and video taping as appropriate.
- Conduct self-critiques and set team goals.
- Provide refresher training on fundamental team skills concepts periodically.

6. Team and Diagnostic Skills Evaluation

This phase of a teamwork and diagnostic skills training program focuses on evaluating the individual skills demonstrated during team task training. Program evaluation focuses on evaluating the overall effectiveness of the entire training program. By evaluating performance of team members during training, any common weaknesses in team and diagnostic skills can be fed back into improvements in the overall team and diagnostic skills training program. This feedback loop is critical to ensure the training is up-to-date and reflects the current job. Evaluation actually occurs throughout all phases of the SAT process.

- Conduct team and diagnostic skills evaluations concurrent with technical skills evaluation.
- Assess the performance of the entire team as well as the performance of individual team members.

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- Use critique forms that include team skills evaluation criteria.
- Conduct post-exercise critiques that emphasize team and diagnostic skills as well as technical skills and include peer critique (self-evaluation), instructor critiques, and videotape (when appropriate).
- Address critical factors of observed team coordination problems.
- Incorporate teamwork and diagnostic skills training effectiveness evaluation as an integral component of the overall training program effectiveness evaluation process.
- Conduct internal evaluations.
 - Integrate technical and team skills training evaluations where appropriate.
 - Focus on basic training of team and diagnostic skills and team task training.
 - Use testing during basic team skills training.
 - Include trainee and instructor evaluations.
 - Conduct internal training process reviews at periodic intervals.
- Conduct external evaluations.
 - Integrate team skills evaluation as part of existing technical training evaluation techniques.
 - Review on-the-job behavior to evaluate effectiveness of the training process.
 - Include team skills in supervisor evaluations of individual job performance.
 - Conduct post-training interviews.
 - Identify team coordination problems during reviews of facility operational data.
 - Review operator examination/requalification results on team skills performance.

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This approach to team and diagnostic skills training is by no means the only one that can be taken to achieve an effective teamwork and diagnostic skills training program. Each facility is unique and should build a team and diagnostic skills training program upon their current technical training program.

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CONCLUDING MATERIAL

Review Activity:

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Preparing Activity:

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Project Number:

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