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SAFETY ASSURANCE SYSTEM SUMMARY (SASS) MANUAL FOR APPRAISAL

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THE SAFETY ASSURANCE SYSTEM SUMMARY (SASS) MANUAL FOR APPRAISAL

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I. INTRODUCTION

Appraisal is an awesome responsibility because it must be predictive in identification of accident causal factors. When a comprehensive appraisal has been completed, there should be no major accident potentials unrevealed in the areas examined; and there should be no surprises when accidents occur during subsequent operations, if they remain unchanged.

Appraisal constitutes a knowledgeable judgement of the quality of system performance and, consequently, identifies both system strengths and system weaknesses. It is based upon a systematic, critical analysis of monitoring, audit, and other information gathering and processing practices; and application of appropriate criteria for evaluation of system effectiveness and program implementation, in accordance with applicable orders and directives.

Appraisal requires the utmost in professionalism. It must integrate experience and knowledge with systematic quantitative measures. Yet, there is ample room for the inexperienced beginner to participate. Properly guided by his experienced mentor on the job in field appraisal, in preanalysis of the areas of inquiry, and in formulation of lines of inquiry (which this manual provides), the beginner participates in a learning experience of great value, and simultaneously provides useful input to the appraisal report to appraisee management. Appraisers should never hesitate to ask for information from technical experts, for there are too many technologies for any person to understand fully. Use of the guidelines to good appraisal practices in Appendix A will be helpful to both beginning and experienced appraisers.

The appraiser must always keep in mind that some of the specific conditions which produce major accidents are unlikely to be noticeably present when he observes in the field. However, the appraiser should look for systemic deficiencies that allow specific accident-prone conditions to develop and loss producing events to occur. Accurate and meaningful

appraisal is best achieved if the organization being appraised has auditable measurements of program performance. Lack of such information is often a strong indication of program inadequacy.

Systemic weaknesses and defects revealed through use of the Safety Assurance Systm Summary (SASS) must be evaluated by the appraiser in terms of potential Environmental, Safety, and Health (ES&H) impact. The appraiser will find that these effects may range from trivial to unacceptable risk levels, depending upon the nature of both the system and the detected problem. The appraiser must make the initial judgment as to whether to:

(1) Identify the detected defect as trivial,
(2) Specify findings and recommendations based on the available information, or
(3) Pursue additional risk studies, as necessary, to establish the true risk level.

The SASS is an evaluative tool to assist the appraiser in performing the appraisal task. It is useful in systematizing program appraisals, audits, and assessments. It can be used singly as the basic appraisal evaluative method; or can be employed as a generic checklist in meeting appraisal objectives dictated by specific appraisal orders or directives. One such application is use of SASS in conjunction with twelve (12) appraisal factors to be considered in performing DOE appraisals. Appendix B correlates SASS generic evaluative elements with the 12 appraisal factors of the order. SASS can be applied in similar manner to any appraisal directive. The broad applicability of SASS results from its being specifically structured for appraisals; and its capability for providing a high degree of confidence in objectively and comprehensively evaluating system performance and developing factually based and valid recommendations or statements of need.

II. SAFETY ASSURANCE SYSTEM SUMMARY (SASS)

A. CONCEPTS

The simple, nine-element SASS (Figure 1) describes the entire gamut of necessary and sufficient safety system ingredients for a well functioning safety or loss control program. Use of SASS is congruent with good management practices and will contribute to enhanced credibility and effectiveness in ES&H efforts.

SASS is useful in appraisal because observations of specific system strengths and weaknesses can be systematically assembled to aid in forming a final judgement of the effectiveness of an organization's safety assurance systems. The nine elements of the SASS are basic ES&H appraisal factors. Eight of those factors are branched into eleven major program elements. The ninth appraisal factor, Documentation, is a fundamental consideration in each of the other eight, as well as in the overall appraisal process.

There are some desirable safety redundancies in complementary appraisal factors. At successive stages of decision and review it is generally better to ask a question twice in different contexts, than to fail to ask the question at all. There may be differences of opinion on specific definitions and subordinate program elements, but if there is agreement on the nine appraisal factors, differences of opinion at lower levels of detail can be easily handled and reconcilable on a case by case basis.

The SASS may be used as an aid in performing appraisals at any level: from evaluation of managerial effectiveness in establishing and implementing ES&H program plans (management appraisal), to field level appraisal of an ES&H speciality discipline (functional appraisal), to similar appraisal activities at the operating level performed by in-house personnel (internal audits), to ES&H evaluations by program/project offices (assessments).

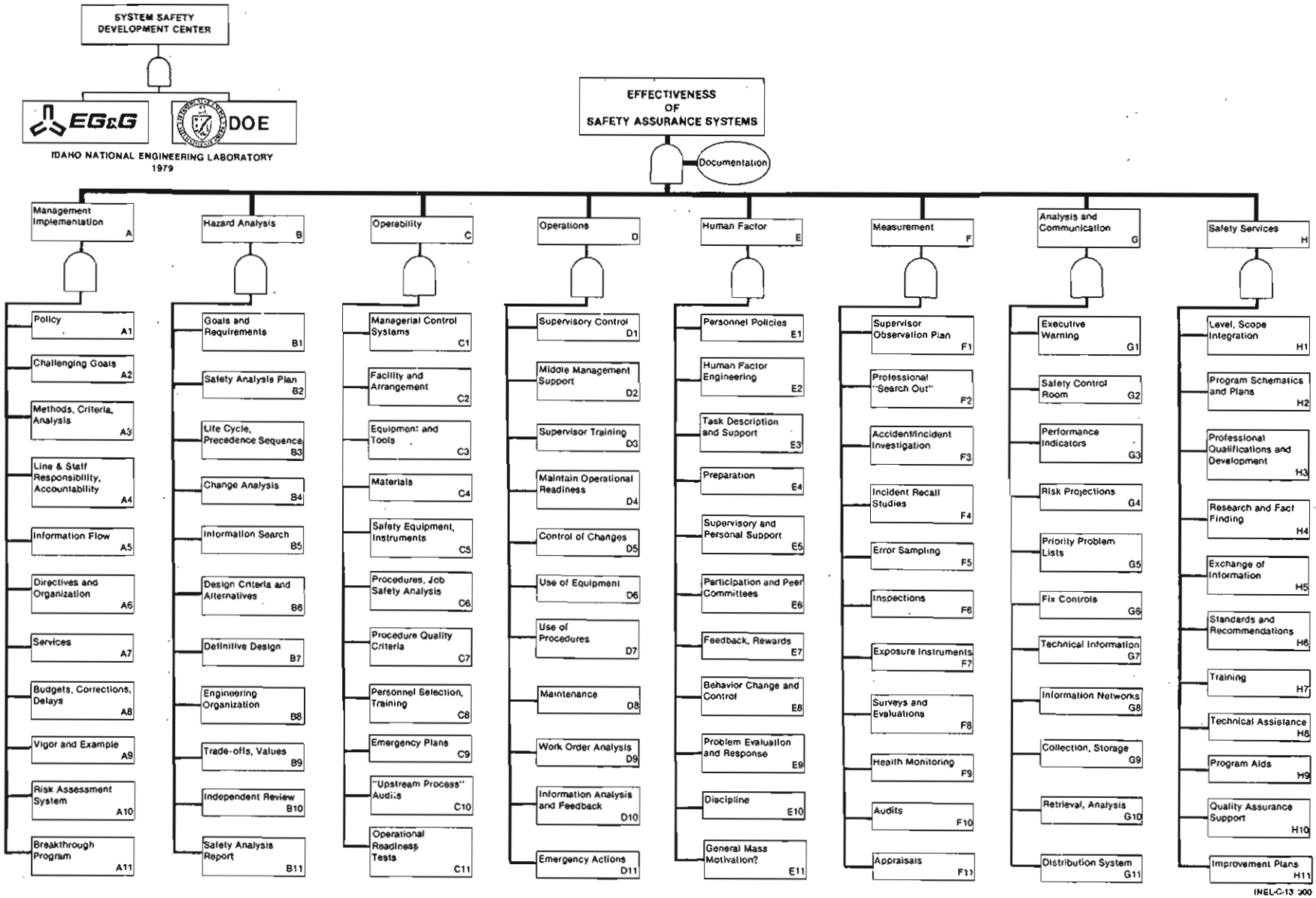


Fig. 1 SASS tree.

In performing management appraisal, the appraiser uses this SASS Appraisal Manual to prevent oversights by evaluating organizational defects which could lead to accidents/incidents at field operational level.

In performing field level functional appraisals, the appraiser uses the manual in determining the system defects which have led to observed safety deficiencies within their specialized ES&H discipline areas.

Internal audits and program assessments may have either a topdown management appraisal orientation or a bottom up functional appraisal focus.

B. SASS ANALYTICAL TREE

The Safety Assurance System Summary, as shown in Figure 1, is a simple diagram which arranges safety appraisal factors in an orderly and logical manner. It presents a schematic representation of a dynamic safety model using analytical tree format.

Criteria for each of the program elements in the SASS tree are amplified through questions in Section III. The questions should stimulate additional, more specific lines of inquiry related to the ES&H system or program being appraised, and may be the springboard for developing more detailed, discipline-specific appraisal aids for functional appraisers.

C. WORKING WITH THE SASS TREE

Repeated practice and experience in use of the SASS tree will develop skill and competence in its application. In using SASS, the appraiser will find that each program element may not apply to every organization being appraised, and should be marked as "not applicable" when it is appropriate to do so. It should be kept in mind, however, that most of the elements in each appraisal will usually be applicable and should be used in rating the effectiveness of the appraisee's safety assurance system. Further, the appraiser should not be surprised in discovering that many program elements should have been in place, but have simply been overlooked by management in designing and implementing its ES&H program.

D. USE OF SASS IN APPRAISAL

1. Introduction

SASS serves two functions in appraisal:

(1) It reduces the probability of oversights in the appraisal process by setting down the ES&H appraisal considerations in a logical manner. It should be noted that the objective of SASS is to describe a complete ES&H program, whether or not the particular elements and functions are covered by specific orders, directives, codes, or standards.

(2) It provides a standardized procedure for combining appraisal findings into an overall system evaluation.

This section describes the mechanics of using the SASS diagram to accomplish these two functions.

2. Oversight Prevention

a. General Considerations

Use of the SASS diagram with this Manual will enable ES&H appraisers, internal auditors, and program assessors to systematically evaluate program performance strengths and weaknesses, with consistency and without oversights. As appraisers use the systematic methods and appraisal aids herein described, they will also be able to meet four basic appraisal objectives.

(1) Determine that ES&H policies and requirements are appropriately interpreted and implemented.

(2) Evaluate the effectiveness of their implementation.

(3) Provide management with:

(a) Accurate information on ES&H performance and

(b) Recommendations for performance improvement.

(4) Determine adequacy of ES&H requirements in meeting DOE policy and goals.

Use of a standardized and widely accepted appraisal method will further permit objective comparison of appraisals performed by different appraisers from different organizational levels at different facilities and organizations.

The actual ES&H performance evaluation is accomplished by comparing the elements of the appraisee's program or system with the "checklisted" elements and functions of SASS to determine actual program status in the areas being appraised.

A simple "adequate/less than adequate" status designation (as used in MORT analysis) does not give sufficient discrimination among the program elements being appraised, so a more detailed, 5-category rating system has been devised (Table 1). Use of this rating system is not required within DOE, but it is suggested as a representative method for grading the quality of safety programs and their constituent elements.

Likewise, the same evaluative procedure for grading ES&H program elements should be used whether the appraisal being performed is a management appraisal or a functional appraisal. They differ only in scope, focus, and depth of evaluation. All aspects of the ES&H program are broadly considered in the management appraisal; while in the functional appraisal, emphasis is placed on in-depth evaluation of specific processes and functions within a designated ES&H discipline. Additionally, more detailed

TABLE 1. SASS RATING SYSTEM

Rating	Criteria for Judgement
"1"	indicates that performance is POOR (no effort has been made in this area).
"2"	indicates that performance is SUBSTANDARD (some efforts have been made in this area, however, performance is inadequate) and requires some immediate corrective acion. Areas of adequate or better performance are offset significantly by poor performance in other areas.
"3"	indicates that performance is SATISFACTORY (applicable elements of this program have been developed, documented and effectively implemented). Areas requiring improvement are approximately offset by better performance in other areas.
"4"	indicates that performance is GOOO (more than minimal efforts have been made in this area and this area has desirable qualities with only a few minor areas requiring improvement).
"5"	indicates that performance in OUTSTANDING. There are no significant areas of poor performance and there are factors indicating creativity, ingenuity and initiative and/or excellent performance.

specialized appraisal checklists, in analytical tree or outline form, may be developed to supplement this Manual in specialized functional areas.

b. Procedure

(1) Proceed through the SASS safety program elements, item by item, utilizing the SASS tree and worksheets,the appropriate questions from Section III, and the rating system in Table 1, to evaluate each function shown in Figure 1.

(2) Mark the rating for each element on the bottom of the box as indicated in Figure 2.

(3) Make note of system differences or inhomogenieties in the following areas:

(a) Differences in opinion among members of the appraisal team.

(b) Differences in opinion between the appraiser(s) and appraisees.

(c) Differences between functional discipline appraisers, e.g., fire protection, industrial safety, industrial hygiene, etc.

(d) Differences in geographic and organizational units, e.g., plant-to-plant, process-to-process, "new" processes vs "old" processes, etc.

These differences are normally handled in one of two ways:

(a) Combining individual ratings into a consensus or composite rating by using some measure of central tendency, i.e., average or median rating, or

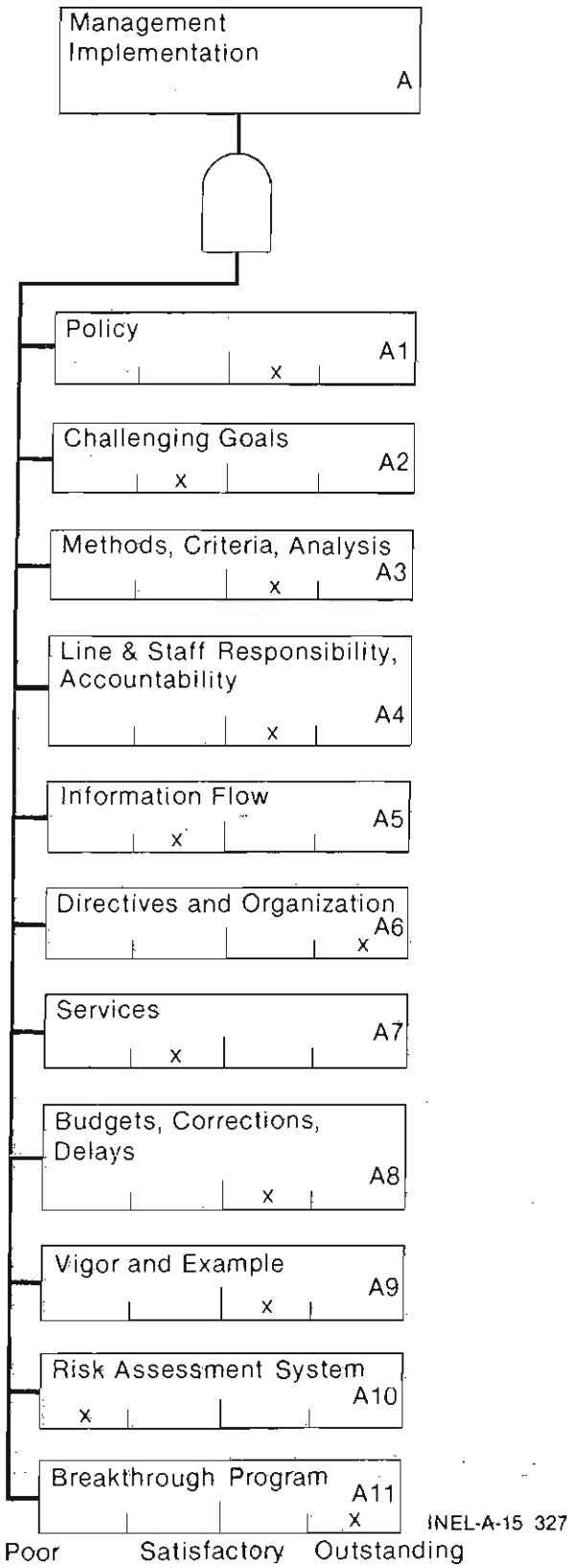


Fig. 2 Example of major function rating sheet

(b) Recognizing the unique factors involved and indicating the differences explicitly.

Generally, small differences in ratings of program effectiveness can be reconciled through averaging processes. This would include minor grading disagreements between several individuals on an appraisal team.

On the other hand, definite polarization reflecting differences in risk level from one activity to another should be dealt with individually. This would include significant differences between "old" processes and "new" ones, differences in effectiveness from one ES&H disciplinary area to another, differences in ES&H emphasis from one organizational unit to another, etc.

(4) Rollup the eleven individual program element ratings to appraisal factor level, as illustrated in Figure 3, to establish appraisal factor ratings.

(5) Transfer the appraisal factor ratings to the overall program evaluation matrix, Figure 4, and/or rollup the appraisal factor ratings to the Effectiveness of Safety Assurance Systems level, Figure 5, to establish the overall program performance rating.

Consensus or composite ratings at both of these levels are facilitated by appropriate use of averaging, median, or other measure of central tendency. The considerations for reconciliation of differences discussed previously are also applicable here

c. Weighting

Present state-of-the-art does not provide adequate information or guidance on the relative significance of each of the 12 appraisal

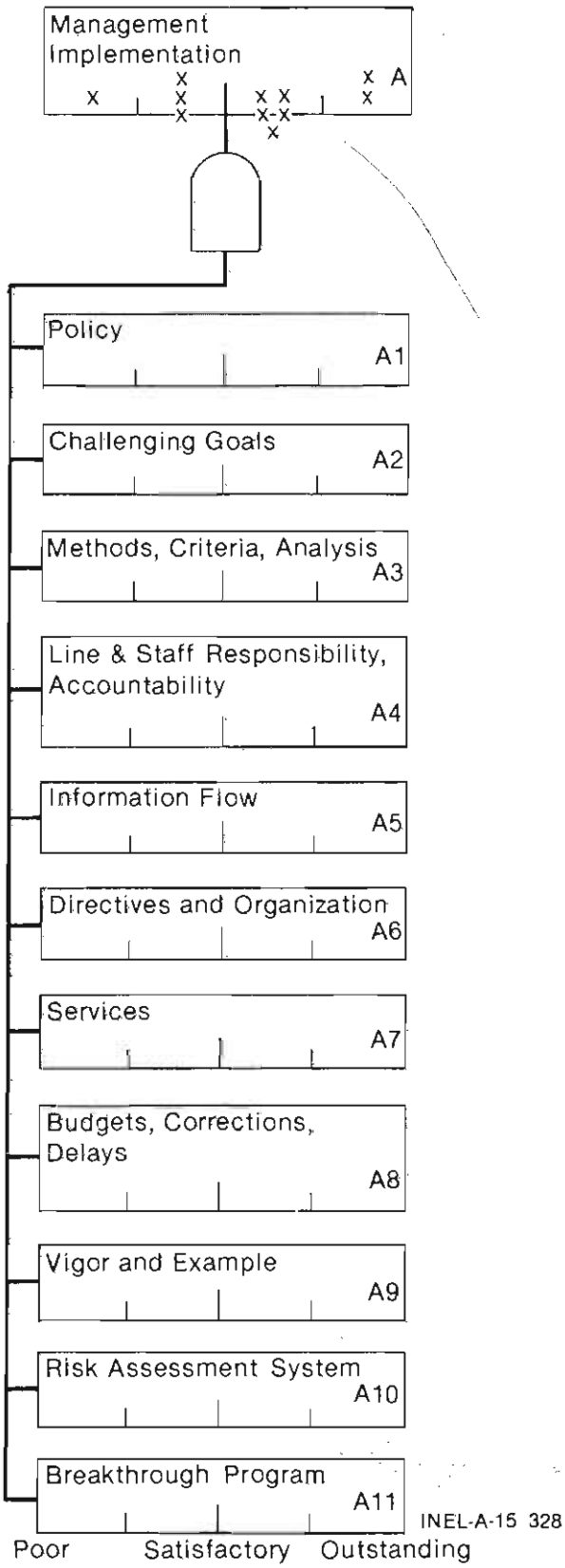
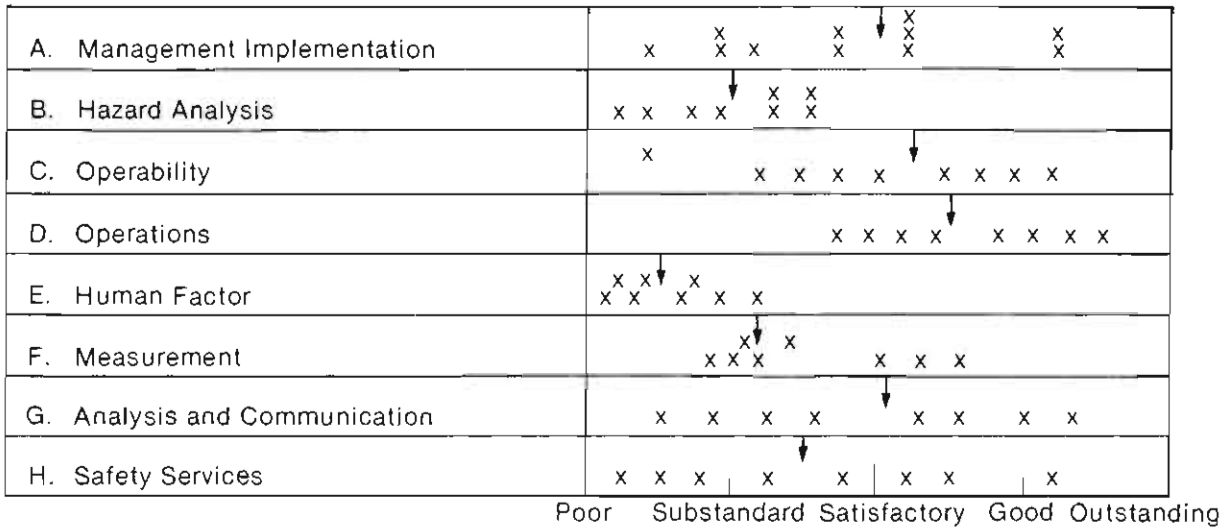
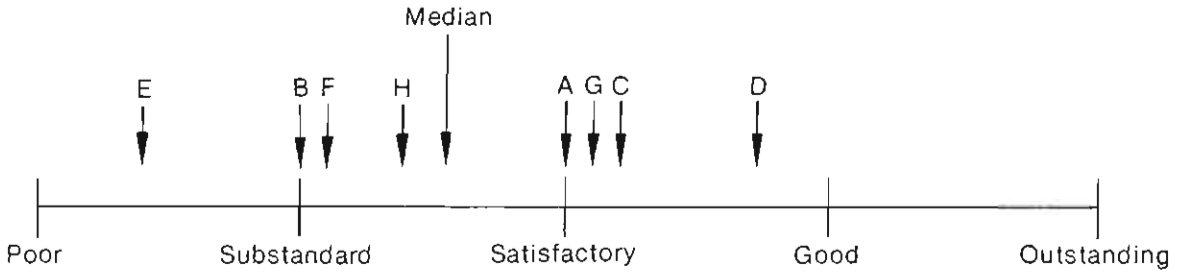


Fig. 3 Example of basic process roll-up rating



(a)



(b)

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Fig. 4 Example of overall SASS roll-up rating

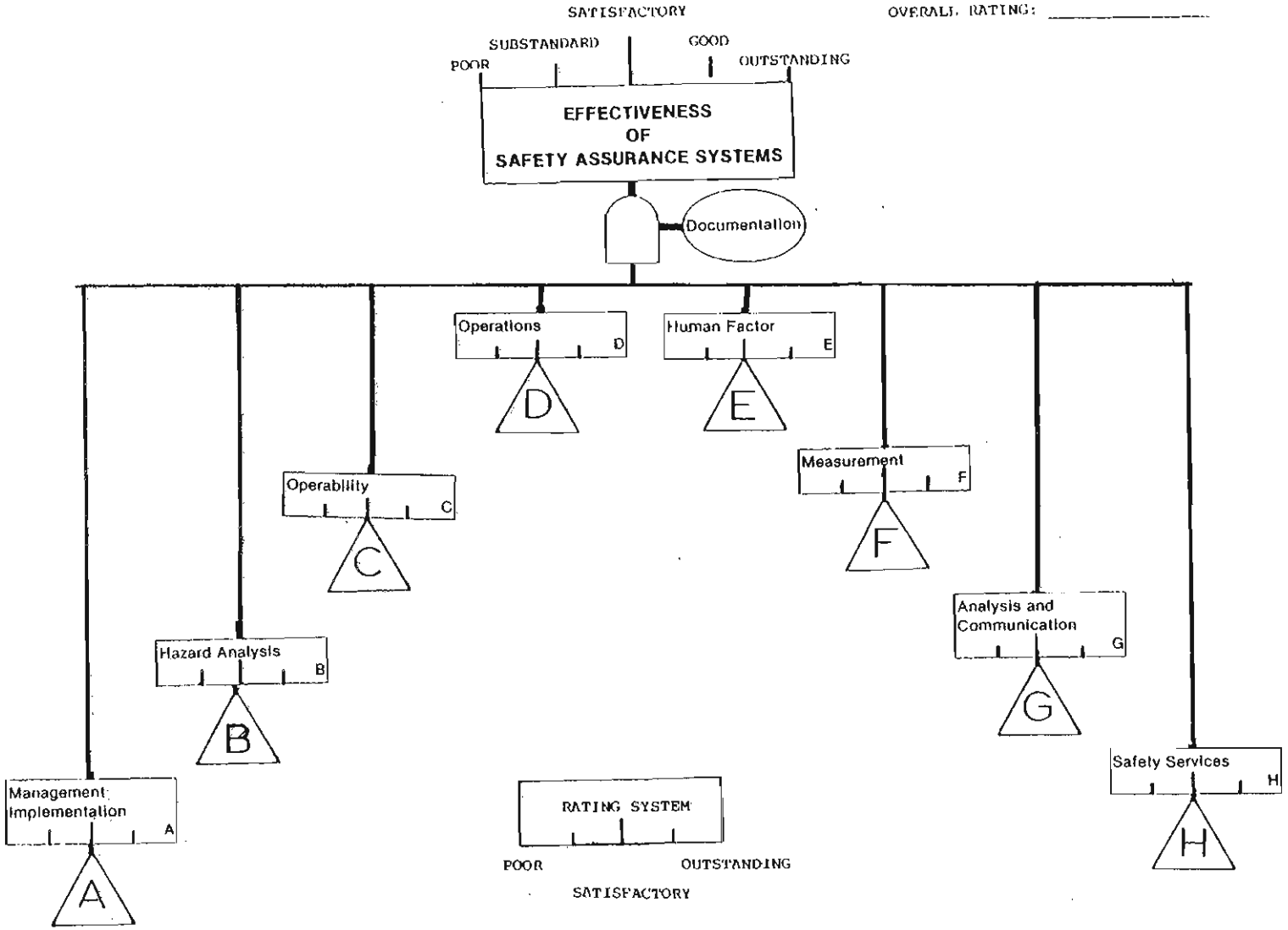

Figure 5 - Effectiveness of Safety Assurance Systems Rating Form

factors in preventing accidents and controlling losses. The appraiser or appraisal team, therefore, is normally confronted with a choice of two ways of dealing with appraisal factor weighting considerations:

(1) Weight all appraisal factors equally, i.e., do no weighting, or

(2) Subjectively weight, prioritize, or highlight specific appraisal factors on a case-by-case basis, as dictated by the perceived needs of the appraisee organization.

In either case, care must be taken to assure that accident provocative deficiencies at the program element/subelement levels are not lost or diluted as ratings are "rolled up" to provide factor and program ratings. In particular, all "poor" and "substandard" items should be dealt with on an individual basis, regardless of the total program rating.

E. Use of Appended Information

Appendix A, "Guideline to Good Practices," presents considerations, techniques, and advice on conducting ES&H field appraisals.

Additional guidance and specific training concerning steps of the total appraisal process (i.e., selection, notification, agenda preparation, inbriefing, fact finding, analysis of facts, findings, outbriefing, report preparation, appraisal protocol, corrective action commitment, follow-up, etc.) are provided at five-day DOE Appraisal Workshops.

Appendix B, "Using SASS to Comply with DOE Order 5482.1A," presents a matrix and outline which correlates SASS elements with the 12 Appraisal Factors of the Order.

Appendix C, "Guidance for Gathering Information," identifies several appraisal aids which have proven useful in various applications and suggests their consideration by safety program appraisers who may find them useful in their appraisals and audits.

III. QUESTIONS FOR THE APPRAISER

In applying SASS to ES&H performance appraisal, the SASS appraisal factors and program elements are evaluated and rated. Then those ratings are rolled up to establish the total performance rating for the appraisee safety program or safety assurance system. Appropriately selected questions can lead the appraiser to collect that information which is needed to make knowledgeable, factual, accurate judgments of the quality and effectiveness of the program elements that shape overall system performance.

Following are suggested questions to be used with the SASS tree and worksheets to evaluate safety assurance system program elements and appraisal factors.

The nine SASS appraisal factors are:

A. Management Implementation

B. Hazard Analysis

C. Operability

D. Operations

E. Human Factor

F. Measurement

G. Analysis and Communication

H. Safety Services

I. Documentation

Each of the first eight appraisal factors is divided into eleven program elements. The ninth factor, Documentation, has no set of program elements. Instead, Documentation is considered for each program element under the other appraisal factors to determine the auditability of its status. The basic question that needs to be answered is: Is there adequate documentation to confirm the adequacy and effectiveness of this program element?

Correlation with Department of Energy (DOE) Order 5482.1A appraisal factors is indicated throughout this section by the use of asterisks. An asterisk indicates that the designated question is taken directly from DOE Order 5482.1A guidelines.

A. MANAGEMENT IMPLEMENTATION

Management has the responsibility for risk assessment and reduction, and for vigorous implementation of ES&H policies and controls throughout the organization.

Are all the factors of the management system necessary, sufficient, and organized in such a manner as to assure that the overall program will be as advertised? Does the overall program represent the intended fulfillment of the policy statement? If there are problems encountered in carrying out the policy, are these fed back to the policy makers? *What are the significant aspects of the ES&H program performance, taking into consideration management support of the program and the exercise of sound technical and professional judgment in implementing the program? Is implementation a continuous, balanced effort designed to correct systemic failures? Is it generally pre-active rather than re-active? *To what extent are contract safety clauses, ES&H program plans, codes, regulations, and directives complied with? The appraised organization should convince the appraiser that the safety program is effective.

A1. Policy

ES&H safety policy should be written, comprehensive, applicable to all organizational functions, consistent with current DOE policy and standards, made known to all employees, and effectively implemented throughout the organization.

*How adequately are DOE and ES&H policies and standards written, published, transmitted, kept current, and carried out? Is there a written, up-to-date policy with a broad enough scope to address all major problems likely to be encountered? Is it sufficiently comprehensive to include major ES&H motivations (e.g., humane, cost, efficiency, legal compliance)? Is it implemented without conflict? How well is the policy implemented? How is safety policy communicated to middle management, supervisors, employees, and technical staff? *How effective is the implementation of federal, state, and local requirements?

A2. Challenging Goals

The articulation of ES&H goals is reflected in three ways:

1. Broad statements

2. Quantitative risk goals for rates or projected risks

3. Negotiated program goals for a coming year.

Are management goals limited to legal compliance? Are investments in safety going well beyond the minima of codes, standards, and regulations commonly authorized? Are there high goals for policy and implementation criteria, as well as specific goals for projects? Are the goals nonconflicting, sufficiently challenging, and consistent with policy and the goals? Are goals quantified as much as practicable. Are goals realistic?

A3. Methods, Criteria, Analysis

Management must describe and analyze the methods and criteria used to:

1. Attain the general mission without compromise of ES&H goals

2. Plan, organize, and measure ES&H performance

3. Resolve ES&H problems and issues.

Managerial excellence in implementation of ES&H policies and goals is dependent upon the quality and completeness of criteria used in problem solving, accident prevention and loss control. Proper analyses and selection and implementation of control methods based upon these criteria is fundamental to achieving successful and effective ES&H assurance systems.

Are selective methods used for management implementation of ES&H policy and for reduction of human error? Is a comprehensive set of criteria used for assessing the short-term and long-term impact of the methods on ES&H performance? Are schematics and flow charts used to help define criteria as appropriate? Does management demand that adequate analyses be performed and applicable ES&H-related countermeasures examined? Has management taken appropriate action to ensure that ES&H policies and goals are given adequate consideration in trade-off studies?

A4. Line and Staff Responsibility, Accountability

Responsibility for implementation of the ES&H program at each level and activity in the organization rests upon the cognizant line manager. Each line manager should be held accountable for the ES&H performance of his organization.

*What is the assignment of line and staff ES&H responsibilities to the various organizational components? Is there a clear written statement of ES&H responsibility and accountability? Is this statement distributed and understood throughout the organization? Is it implemented? Are there

provisions for assigning and implementing specific ES&H functions to staff departments in support of line management? Is line management held accountable for ES&H functions under their jurisdiction? What are the methods for measuring line management performance? Have line managers in various control chains been systematically measured by ES&H and higher line management to (a) evaluate their knowledge of their ES&H responsibilities and accountabilities, and (b) determine the support services they need to fulfill those responsibilities? Is responsibility, authority, and accountability clearly delineated in combined operations with others? Is ES&H performance known to have been an appropriate factor in the selection and performance appraisal of managers?

A5. Information Flow

Lack of feedback may allow hazards to go uncorrected, and may inhibit managerial and supervisory attainment of safety goals. The development of a well structured information flow and feedback system is essential to effective management of the ES&H program. Cognizant managers at all levels in the organization require information sensing and display systems which indicate the status of ES&H program functioning.

Has management specified the types of information it needs? Has it established efficient methods by which such information is to be transmitted through the organization? Has upper management provided the information needed by lower managerial and supervisory levels? Are there sufficient levels of redundancy or parallel information channels from independent agencies? *How effective is the system used to keep management informed? Does management verify information received? How does management provide liaison, coordination and communication between various organizational levels with regard to ES&H program continuity? *To what extent is information flow, on ES&H matters up, down, and horizontally in the organization to the decision level, made auditable?

A6. Directives and Organization

It is common to find that organization manuals and directives are poorly written and poorly understood. Observation suggests that directives frequently are strong on control of specific hazards and weak on preplanning, operational readiness, independent review, system performance measurement, etc. Also, directives tend to be overreactive to past events and underactive in identifying and controlling future potentials. Sometimes, a basic and serious weakness in operating organizations is the lack of a clear and meaningful ES&H program description.

The managerial structure of an organization is obviously relevant to the achievement of its mission. Normally, ES&H goals and policies must be carried out within the framework of an existing managerial system, whatever its structure, and whether good or bad. Defective systems should be identified and repaired, as required, within reasonable bounds of time, pace, cost and impact.

*What is the structure of the organization and how effective is it in achieving its mission? Has the ES&H program been adequately described? Is ES&H policy properly implemented by directives which emphasize methods, functions, practices, as well as rules for control of specific hazards? Are directives clear, understandable, and implementable without interface gaps? How effective is the organizational structure in achievement of ES&H goals and implementation of ES&H policies. Do management system deficiencies exist as a result of the organizational structure? Can these deficiencies be fixed without undue or unreasonable impact on ongoing operations or mission achievement?

A7. Services

ES&H performance deficiencies at one level is often mirrored by related service deficiencies at a higher level. When managers or supervisors fail to understand and carry out their responsibility for

effective implementation of the ES&H program, they frequently have not been adequately trained, supervised, measured and evaluated, held accountable or provided with needed tools (or aids) and support by their management.

Has management provided the type of supportive services needed at the lower organization levels? Is there a formal training program for all managerial and supervisory personnel which addresses: (a) general programs in management and supervision, (b) specific technologies, (c) human relations and communications, and (d) ES&H? Are needed service improvements initiated after accidents, audits, and appraisals? Is there an ongoing program to identify and meet service and support needs at all levels of management?

A8. Budgets, Corrections, Delays

Early and continuing involvement in budget processes is necessary if necessary modifications and corrections are to be made, adequate ES&H are to be built into operations, processes, and facilities, and necessary studies funded. The level of budget support might be tested by identifying both recent major authorizations for ES&H improvements, and those other ES&H projects not authorized or delayed significantly. Delays and non-authorizations become assumed risks as management knows and accepts such decisions.

*How extensive is ES&H input to the budget formulation and review process? *Is the budget adequate not only for the ES&H group, but also for related ES&H program aspects for which other groups in the organization have responsibility? Are ES&H program elements implemented in early life cycle phases of projects? Are decisions to delay ES&H projects or correction of existing hazards accepted by line management at the proper level? Do budget constraints lead to cancellation or delay of ES&H projects, or inadequate retrofits or correction of hazards? Is there a budget planning document which prioritizes ES&H projects and deficiency corrections.

A9. Vigor and Example

Management vigor and example, though often difficult to measure, are essential to successful managing of ES&H programs. They are usually reflected in the ES&H awareness and commitment of subordinates and the attitudes and priorities which workers exhibit in performing their work tasks.

Have top managers demonstrated their interest in ES&H through personal involvement? Is top management's concern for safety known, respected, and reflected at all levels? Are instances of management vigor and example systematically recorded by the Safety organization? How much visibility do safety policies and goals receive? *To what degree does management show interest, initiative, and participation in development, implementation, and enforcement of ES&H policy? *To what degree is management active in ES&H aspects of ongoing operations?

A10. Risk Assessment System

The primary objectives of a risk assessment system are to provide a manager with the information he needs to (a) assess the ES&H risks, (b) determine which can be eliminated or controlled, (c) evaluate the residual risks, (d) identify the residual risks which are acceptable, and (e) take appropriate action on those residual risks he finds unacceptable. Secondary objectives of risk assessment are to (a) provide comparative evaluation of two or more units or alternatives and (b) provide development and evaluation of methods supporting the hazard analysis process.

Is a risk assessment system implemented? Is it responsive to the needs of management? *To what degree is management active in making risks decisions? Does the risk assessment system receive adequate support from technical information systems? What are the accepted risks of the organization? Are risks accepted by people who have management-delegated authority for risk acceptance? Are their risk acceptance decisions within

the scope of their authority? Has the organization utilized the SSDC Risk Management Guide[5] or similar aids in setting up a risk assessment system and making risk acceptance decisions?

A11. Breakthrough Program

Breakthrough is a change in attitude; a change from "that's the way we've always done it," to a significant reduction in risk. The approach to breakthrough should be organized so that it can be systematically measured. The system approach clearly implies that short and long range goals have been established for safety.

*To what extent do long range organizational plans include ES&H goals? What ES&H performance improvement goals have been set and met within the last five years? Are resources spent in areas where greatest risk has been assessed? *How adequate are expenditures of available funding provided to meet ES&H needs? *How well does the organization compare with similar operations in overall experience of ES&H areas?

B. HAZARD ANALYSIS

Hazard analysis is the process for identification and evaluation of system hazards and proposed or existing controls to keep them within acceptable limits. The earlier in the life cycle it is applied, the greater the assurance of adequate hazards control.

Is a hazard analysis process properly conceptualized, defined, and executed? *To what extent and how adequate are measures established to ensure that applicable requirements are correctly translated into specifications, drawings, procedures, and instructions?

B1. Goals and Requirements

The importance of introducing ES&H in the initial stages of concept and definition of requirements cannot be overemphasized. Too often selected processes are not adequately analyzed for hazards and alternative,

safe processes are not considered. Further, safety review only of completed plans occurs too late in the design process to effectively influence the design direction, without significant retrofit, if ES&H problems are found.

Have goals and tolerable risks been defined for both ES&H and functional performance and any conflicts between the two resolved? Do ES&H goals state the degree of ES&H excellence to be attained and when is should be accomplished? Have goals been set for performance efficiency and productivity? Is an appropriate level of hazard analysis required for every activity in the organization?

B2. Safety Analysis Plan

The safety analysis plan is essentially "who does what and when" in analysis, study, and development. A detailed listing of the specific safety tasks to be performed and the scheduled milestones to measure performance are provided. Specifically, there is provision for ES&H assessment in every program review.

Have the necessary criteria been specified and elements defined to adequately support safety analysis? Has a safety analysis plan been developed which describes "who does what and when" in analysis, study, and development? At what point in the project is the amount and kind of safety analysis to be done negotiated between contractor and government representatives?

B3. Life Cycle, Precedence Sequence

Life cycle analysis (LCS) is an early time consideration of the hazards that may exist during any and all phases of system lifetime. It must include not only operational hazards and problems but also pre-operational and post-operational ones, as well. The Safety Precedence Sequence is a prioritization of acceptable ES&H control methods.

Is the precedence for ES&H solutions prioritized as (a) design for minimum hazard, (b) utilize safety devices, (c) utilize warning devices, (d) control through procedures, and (e) accept residual risks at proper management levels? Is there adequate safety analysis and review which starts with planning and continues through design, purchasing, fabrication, construction, testing, operation, maintenance, decommissioning and disposal? Does the scope of analysis include not only process or operational equipment, but test equipment and procedures for its operation; selection and training of personnel; training equipment and procedures; maintenance facilities, equipment and procedures; and support equipment? Is LCA scoped to include analysis of environmental impact and eventual site restoration?

B4. Change Analysis

Unwanted and unplanned change can generate accidents. Even desirable and planned changes can cause serious problems and accidents if not properly coordinated and controlled. Therefore, analysis of changes and modifications in system elements or system functioning is an essential part of safety analysis. Often a change in "form, fit, or function" of a part has signaled the need for review of components and subsystems upward in the design review channel until no change is demonstrated. Use of change analysis methods offers a very perceptive potential for improving detection and correction of sources of troubles. A review of the change factor in configuration control systems also identifies sources of trouble.[6]

How are changes identified and controlled? How are change-based analytical methods applied? Are changes in all parts of the system considered for impact? Are all changes in people, plant and hardware, procedures and management controls, or interfaces evaluated and controlled? What level of management is authorized to institute changes in field operations, processes or facilities? Do changes require new risk assessment analysis by the organization? Who is trained in change recognition and what criteria are provided for their guidance? Are

periodic reviews conducted to assess the effects of cumulative changes? Have needed ES&H-related counterchanges been instituted to prevent changes from degrading the ES&H level.

B5. Information Search

An information search of related prior experience in-house and at other organizaions and facilities can establish a firm base for analysis, and can reveal problem areas requiring specific attention.

Is an adequate information search required? Does the nature of the search include incident files; codes, standards and regulations; change and counterchange data; related previous analyses; and quantification of selected variables? Is the search scoped in a manner that would reveal information on problems from conceptual design, through construction and use, to final disposal? Does the search include others' experience, as well as this organization's?

B6. Design Criteria and Alternatives

ES&H design criteria should be provided to all engineers and designers involved in designing facilities and systems. This criteria should include accepted good practices; specific organizational and system requirements, constraints and guidelines; and ES&H factors to be considered in tradeoff studies for selection of design alternatives.

Have engineers and designers been provided with adequate ES&H design criteria? Do they use it? Are commonly recognized good engineering practices (including safety, reliability, and quality engineering practices), adequately incorporated into both the hazard analysis process and the design process. Do both processes require development and review of alternative approaches and solutions?

B7. Definitive Design

The conceptual design phase provides major safety inputs (analysis plan and methods, requirements and information) which are used in design and development of the selected system alternatives.

Does the system design and development incorporate the goals and requirements generated during concept definition? Is the design a true representation of the developed criteria, definitions, specifications, and requirements?

B8. Engineering Organization

An effective engineering organization should establish a general design process which includes:

1. Upfront efforts to achieve intrinsic safety in system design

2. Use of Safety Precedence Sequence

3. Requirements for independent ES&H reviews

4. Specification of appropriate ES&H codes, standards, and regulations.

Are there written procedures to assure compliance with applicable engineering and design codes? Where codes, standards, and regulations cannot furnish required design data, are engineering studies conducted to obtain the needed information? Is there adequate testing during development of a new design to demonstrate that it will serve its intended function? Are adequate safety, reliability, and quality assurance programs integrated into the general design process?

B9. Trade-Offs, Values

Management decisions often involve trade-offs between the conflicting demands of budgets, schedules, production, quality, safety, and legal and social pressures or values. Hazard analysis is an essential consideration in trade-off studies and evaluations, and management decisions.

Does the hazard analysis process offer a broad and comprehensive view of safety and its relationship to other aspects of system performance? Does it provide an ordered, visible method of analysis and decision making which will (a) improve communications, (b) facilitate agreement on potentials for loss, (c) establish a firm foundation for evaluation of trade-offs among alternatives, and (d) aid in planning and execution of sequential tasks in the evaluation, trade-off, selection, and decision process?

B10. Independent Review

Independent safety review improves identification, analysis and control of hazards in two basic ways: (1) it provides a secondary assurance that adequate safety analysis has been performed at preestablished points in the life cycle process, (2) it enhances the quality of initial safety efforts by personnel who know their work will be critically reviewed by someone else.

Is provision made for thorough and independent safety review at pre-established points in the life cycle process? Are the risk reduction trade-offs documented? Is the technical competence of reviewers properly related to the level and type of technology involved? Are well defined criteria in review established? Is the review system convenient to use? Has the independent review system been audited?

B11. Safety Analysis Report

A safety analysis report documents the identification and evaluation of system hazards and the controls necessary to reduce the risks arising from those hazards to an acceptable level.

Safety analysis reports can range from a simple, single page operational safety assessment to a formal, multi-volume SAR for a complex facility operation.

Are safety analysis reports structured in compliance with all applicable codes, standards, and regulations? Is attention given to the entire frequency-severity spectrum of potential accidents and incidents? Is sufficient information provided to permit management to make knowledgeable judgments regarding (1) adherence to safety goals and objectives and (2) acceptability of risk? Are field controls established to assure that systems are maintained and operated in accordance with the safety analysis report? How adequate are reviews of safety analysis reports? Does the organization utilize the SSDC document Applications of MORT to Review of Safety Analyses, SSDC-17, or similar aids?[8]

C. OPERABILITY

Operability refers to the capability of operating a system, facility, or process effectively, through proper utilization and coordination of (1) personnel, (2) plant, environment and hardware, and (3) procedures and management controls. Operational readiness reviews evaluate operability of proposed activities to assure smooth, efficient, and safe startup and operation, and to minimize hazardous conditions and expensive retrofits.

*How effective is the identification and evaluation of risks in current and planned facilities? Is the conduct of an operational readiness review required? Does the organization use the SSDC document, Occupancy Use Readiness Manual - Safety Considerations, SSDC-1, or similar aids?[9]

C1. Managerial Control Systems

There are eight basic control systems involved in operational readiness review. They are:

1. Test and qualification
2. Supervision
3. Procedure criteria
4. Personnel selection
5. Personnel training and qualification
6. Personnel motivation
7. Measurement
8. Emergency plans

How well qualified are the personnel who make decisions on occupancy-use readiness? Does a procedure for determining occupancy-use readiness exist? How well is it followed? Is the follow up of action items adequately resolved prior to startup? Is there an adequate verification process? How well is it working?

C2. Facility and Arrangement

Deficiencies in the arrangement of controls and displays leads to high human error probabilities and results from inadequate human factors engineering. Human factors and safety professionals should verify that designers have properly considered layouts, space, ease of operation, proximity, crowding, convenience, freedom from interruption, enclosures, work flow, storage, etc. Configurations in the facility should match drawings and specifications.

*How effective is the organization at reducing known risks to acceptably low levels in current facilities? Are the actual physical arrangements or configurations identical with those required by latest drawings, specifications, and procedures? Have they been designed for minimal human error probabilities? Is the configuration and documentation of modifications to the facility or process adequately engineered and controlled? Is the general design process adequate to assure functional operability? Does the organization use the SSDC document Human Factors in Design, SSDC-2, or similar aids?[10]

C3. Equipment and Tools

The safest and most efficient layout and use of equipment must be determined. Availability of proper tools must be assured. Equipment, tools, and hardware systems must be evaluated, tested, and accepted prior to operational use.

Have the equipment and tools to be used been properly selected, designed, integrated, reviewed, tested, and accepted prior to use? Have retrofit and "make-do" situations been properly evaluated, engineered, reviewed, tested, and accepted by the proper authority prior to operational application? Are the needed equipment, hardware, and tools available to do the job efficiently and safely?

C4. Materials

Sufficient quantities of needed material must be available and ready to use for any productive activity. After operation has begun, a system of replenishment must keep the material stocked.

Are enough materials of the right kind available to begin operations? Is there an adequate system of restocking needed materials? Is there an adequate control system to assure materials are what they should be? What means of hazardous material evaluation and control are employed?

C5. Safety Equipment, Instruments

Often work processes will require that the operator and others be protected from the hazards of the job. Safety barriers and devices are needed to separate workers, equipment, and materials from sources of energy that can cause injury or damage.

Prior to the start of operations, are safety barriers and devices in-place and ready for use? Are there documented policies and procedures to inform the worker of the need for and usage of safety equipment, and that require compliance? Are safety barriers and devices properly tested and inspected? Are safety instruments that warn workers of hazardous situations in-place, funcioning properly, and periodically checked and calibrated?

C6. Procedures, Job Safety Analysis

Procedures must fit the work situation and the workers who will use them, whether they originate with the workers themselves or come from management or engineering. A detailed operating procedure should always be preceded by an adequate Job Safety Analysis (JSA). The four basic steps in making a JSA are: (a) select the job to be analyzed, (b) break the job down into successive steps, (c) identify the hazards and potential accidents, and (d) develop ways to control the hazards and prevent potential accidents.

Does the organization have a policy that all jobs should be subjected to appropriate levels of job safety analyses? To what degree is this policy implemented? Are the analyses and resulting job procedures reviewed at the working level before issuance? Are they updated as changes occur? How many are past due for update? What criteria does Safety use when reviewing procedures? Does the organization utilize the SSDC document, Job Safety Analyses, SSDC-19, or similar aids?

C7. Procedure Quality, Criteria

Appropriate criteria must be established and followed to assure that procedures at all levels fit the people who will use them, and the work situation in which they are used.

Have appropriate procedures criteria been established to assure high procedural quality? Do users have input into criteria definition review and approval? Do developed procedures meet established criteria?

C8. Personnel Selection, Training

Proper selection and training of personnel is essential to safe and effective operation of plant equipment and processes. Workers must possess the requisite skills and knowledge to carry out their assignments in system or process functioning.

Are the methods of personnel selection adequate? Are the safety-related job criteria adequately defined and fed into the selection process to assure selection of individuals with desired characteristics? Is the training of personnel adequate? Is it properly directed to assure high performance? Is there adequate verification of training adequacy, timelines, relevance, and application to operational performance?

C9. Emergency Plans

Response to emergencies, like other management functions, must be planned in advance. Only in this way can potential harm to people and property be minimized. Before an organization initiates an emergency plan it needs to evaluate the hazards that might be encountered during its execution.

Has an emergency action plan been written, published and endorsed by management? Has safety review been accomplished? Has the plan been

updated to prepare for any newly identified hazards? Are practice drills conducted to prepare for an actual emergency? Are employees properly trained in emergency response prior to being placed on the job?

C10. "Upstream Process" Audits

In a dynamic safety system the work flow processes are divided into: (a) the worksite operations and (b) the upstream processes (such as design, construction, selection, and training, etc.) which create and organize the worksite hardware, procedures, people, and interfaces.

Are the "upstream processes" adequately audited? Are each of the three basic work ingredients--hardware, procedures, and people properly considered? Are interfaces properly evaluated? Do upstream processes generate significant problems or hazards that impact safe system operability?

C11. Operational Readiness Tests and Reviews

Once a facility or process is prepared for operation, there should be a final verification that all readiness activities have been adequately performed. Operations should not begin until an operational readiness review has been performed to assure safe and effective operability.

Is verification of the facility, operation, or process readiness adequate? Is the conduct of an operational readiness review specified? Are the criteria used for determining readiness adequate? Are the criteria followed? Are the personnel who made the decision on readiness adequately skilled and experienced? Is the follow up of action items from the readiness review adequate? Are outstanding items resolved prior to start of the work process?

D. OPERATIONS

Management objectives that must be met to assure safe and efficient operations include: (a) maintain an acceptable state of operational

readiness, (b) maintain reasonable control over operational changes, and (c) assist supervisors in carrying out their operational safety responsibilities.

Are middle management services to the supervisor adequate for safe operations? Are maintenance and change controls adequate to ensure continuing operational readiness?

D1. Supervisory Control

First line supervision has the most direct management control over worksite activities. Being closest to the action, he becomes the center of worksite control. He directs worker performance and is strongly affective in his own performance by higher management direction, suggestions and supportive services.

Is worksite supervision adequate? Are the necessary supportive services in place and functioning? Does the supervisor have adequate authority to control worksite activities? Is his responsibility and accountability well defined and monitored? Is his performance and effectiveness measured and fed back to him?

D2. Middle Management Support

If the supervisor is to properly fulfill his responsibilities, he must receive active top and middle management direction, support, and assistance.

Do mid-managers measure supervisor safety performance? Does the supervisor receive feedback on how his operation is functioning? Do supervisors receive data in usable form? Is the help and assistance given to supervisors adequate to enable them to fulfill their operational safety roles? Have supervisory responsibilities and accountabilities been clearly defined and communicated? Does supervision have uniform guidance and support for safety program enforcement?

D3. Supervisor Training

Training of supervisors in their safety/loss control roles is vital to consistent interpretation and application of safety requirements at the worksite. The training must be kept up-to-date and monitored for adequacy and effectiveness.

What training has the supervisor been given in general supervision? What training has the supervisor been given in safety? Has the supervisory training program been properly evaluated for adequacy and updated as necessary? Has each supervisor's training been documented?

D4. Maintain Opertaional Readiness

It is the responsibility of supervision to maintain operational readiness of the work site, work processes, and work activities they supervise. Work site inspection and work activity observation and monitoring are essential to determination of operational status and detection, correction and control of work hazards.

Have supervisor's efforts been adequate in the detection and correction of hazards? When did the supervisor last inspect the work site? Does the supervisor show vigor in acting on safety suggestions? Are checklists used for inspection and work observation complete, clear, and up-to-date? Are change controls identified and adequate to assure continuing operational readiness?

D5. Control of Changes

Sensitivity to change is a key ingredient in the work of supervisors in maintaining worksite operational readiness and safety. If they are to properly control change and its effects, they must be sensitive to both the need for change in improperly functioning systems, and the need for safety-related counterchange in systems undergoing change or modification.

What guidance and training is given to supervisors on change detection and control? What kind of hazard review is required for known changes? What counterchanges are made for known changes? Are there periodic reviews to detect changes and control their effects?

D6. Use of Equipment

New, changed, or restarted equipment should be inspected routinely for hazard detection and correction, and use of the equipment should be monitored for proper operation. When a hazard is found by a supervisor or is reported to him, he should make concerted effort to eliminate it or control it.

What guidance is provided to supervision for detection and correction of equipment hazards? Is the guidance used? Is point-of-operation posting of warnings, emergency procedures, etc., provided for in a general hazard detection plan? Is it in place at the worksite? Are corrections to equipment hazards initiated as soon as they are detected? Is equipment operator performance monitored for compliance with safe operational practices?

D7. Use of Procedures

Procedures may vary from highly formalized, rigorously reviewed documents to brief outlines of pre-job analyses. They may originate with management or engineering or at the worksite. In either case, they must be appropriately reviewed and validated to assure that they really apply to the tasks at hand and to the people who will use them.

Are appropriate procedures written for safe operations and maintenance? Do they match the people, equipment and activities for which they are intended? Do they follow the policy and guidelines governing proper review before approval? What criteria are established for the review of procedures? Have they been validated by the users? What methods

are in place for correcting deficient procedures? Is procedural use monitored to detect and correct substandard performance and procedural inadequacies.

D8. Maintenance

Requirements should emanate from the development stage of the hazard analysis process. Otherwise, plans should be produced in operations as rapidly as possible. Logs, labels, color coding and displays at the point of operation should show maintenance status.

Is there a maintenance plan? Is it followed? Is there a requirement to analyze all failures for cause? Are point of operation logs or other displays of equipment status maintained at the job site? What are the criteria for lock-out and tag-out procedures during maintenance? How is restoration to service handled? Has the organization utilized the self-study course developed by SSDC or similar aids.[12]

D9. Work Order Analysis

Work order analysis should be scaled to fit the magnitude of the hazards in the work task. The safety analysis effort applied to work processes having high energy or high hazard potential is usually highly formalized.

When are work order analyses required? What are the criteria for work order analyses? Are they properly scaled for the task under consideration? How are the major functions of the basic Hazard Analysis processes applied at the work level? Does work order analysis include protective equipment and clothing for specific jobs? Does work order analysis include special sensing and monitoring equipment? Are technical constraints from the hazard analyses adequately communicated to the field (limiting temperatures, pressures, etc.)? Has the organization utilized the self-study guide developed by SSDC or similar aids?[13]

D10. Information Analysis and Feedback

Proper collection, evaluation and feedback of work related information is necessary for safety assurance and loss control at the work site. Consequently, proper monitoring of worksite activities and an active system to assess information collected and put it in proper form for feedback must be in place. The supervisor should be fully aware of the functioning, uses and outputs of the information system.

How is technical information collected, analyzed and transmitted to users before a work task proceeds? While it is underway? How adequate is the interface between technical operations and maintenance personnel? How adequate are the feedback systems to the work site supervisor and the people doing the work? Do they know their roles in the system functioning? Do they receive the information necessary to perform their jobs safely?

D11. Emergency Actions

Reactions during and immediately after an accident should limit the consequences of what has occurred and reduce the severity of those consequences. Development of an emergency action plan and periodic practice exercises in its execution are needed to assure full preparedness.

How adequate is the emergency action plan? What are the criteria used for its development and review? What is the supervisor's role in emergency action? Will an emergency drill verify proper execution by all concerned parties? When was the last drill held? How well have the fire and medical services responded to planned drills and actual emergencies? What plans have been made for reporting to officials, employees and the public?

E. HUMAN FACTORS

Human factors considerations in building high performance enhances operability and maintainability of planned and operating systems. By consideration of the effect of the human element in the system, the plant

environment, equipment, materials, displays, controls and procedures can be better planned, developed and integrated to minimize errors, incidents and accidents and to enhance high performance, safety assurance and loss control.

What are the human factors skills in the organization? Where is the responsibility for human factors engineering established with the organization? Has the organization utilized the self-study course produced by the SSDC or similar aids?[10]

E1. Personnel Policies

Written, up-to-date policies that assign responsibilities and establish controls to prevent unacceptable deterioration of employee performance is the first step of the human factors process.

What considerations must be given in policies, designs, plans, and procedures to human performance as it relates and interfaces with machine, material and environmental characteristics? How adequate are written policies on human factors engineering? Are policies understood by those responsible for human factors review? Are the policy makers well informed or well advised on the characteristics and consequences of the psychophysiological factors that influence human performance?

E2. Human Factor Engineering

The human factors process overlaps (1) operability (Section III.C), which considers such functions as procedures, personnel selection, and training, and (2) operations (Section III.D), which deals with such functions as supervisory control, use of equipment and procedures, and control of changes. It is the need for safe, reliable, effective, and efficient system operation that requires human factors to be engineered into system design, operation and maintenance.

What attempts are made to predict the ways and frequencies with which human errors may occur, and thereby determine corrective action to reduce

the human error rates? Are checklists of stereotypes used in design? Is available knowledge about potential users defined and incorporated in design? Is human reliability included in system reliability studies and evaluations? How can human factors engineering be improved or effectively implemented in the organization?

E3. Task Description and Support

Application of such task descriptive tools as human factors task analysis can define the elements of the tasks to be performed and supports needed to accomplish them.

What methods are in place for defining essential work tasks? What criteria is used for task description and support definition? Does each task description identify the elements of the task, the hazards involved, the error provocative system deficiencies and reasonable approaches to their solution? Does management support task safety through active involvement in solution of problems identified in task analysis or other pre-job or operational work job analyses?

E4. Preparation

High quality personnel performance requires acquisition of people with the needed knowledge and skills to perform specified jobs. A proper balance of selection and training can prepare an employee to reach the desired level of performance.

What criteria exist to guide in selection of personnel with the needed job characteristics? How effective is the new employee training/indoctrination program? What special training and/or certification is required for various skills and jobs? What jobs require specific safety-related selection criteria? Do individuals meet standards established for special tasks? How well prepared are workers to perform all assigned tasks?

E5. Supervisory and Personal Support

When appropriate selection and training are coupled with on the job direction, monitoring and feedback on job performance by the supervisor and other knowledgeable and responsible personnel, the employee has the best opportunity for safe and successful performance of a well-defined job.

Does the supervisor provide needed job performance direction, monitoring and feedback? Does he have appropriate criteria and guidelines for performing these functions? How adequate is supervisor training in areas of personal problem recognition and counselling? When problems beyond supervisory capabilities occur, does the supervisor recognize them and is professional help available for prompt and effective response?

E6. Participation and Peer Committee

The more involvement and participation an employee has in shaping and controling his work environment and work activities, the more he will be committed to work goals and objectives and high quality work performance.

In what ways do the workers participate in planning, analysis, training, validation, review and monitoring? Do workers know and support high performance goals? Are safety professionals and their line and support counterparts utilized as members of peer group reviews and audit committees? Are special purpose and on-going committees used to improve safety understanding and attitudes within scientific and engineering groups? Are employee committees, quality circles, safety circles, etc., established and functioning in meaningful ways?

E7. Feedback and Rewards

Feedback on ongoing work performance lets the employee know how well he is performing his job and where he needs to improve present performance. Effective feedback should involve both recognition for good performance and suggestions for improved performance.

Have methods been set up for measurement of performance and feedback of findings? Is management kept informed of subordinate performance levels? Do they feedback their observations to subordinates? Are workers rewarded for good performance? Are they informed of areas needing improvement?

E8. Behavior Change and Control

If an organization has maximized its contribution in the areas of management concern, safeguarded environment, good job safety procedures, good job training, sound human reations, etc., an individual's job performance is maximized. Deficiencies traceable to people are often not solved by changing people, but by changing conditions that are obstacles to good performance.

Are supervisors trained to be alert to individuals that exhibit deviant or unacceptable behavior? Are individuals re-examined to the standards established for their task? When an individual is asked to perform a task, are the following criteria utilized: (a) physical characteristics, (b) skill, (c) reliability, (d) knowledge, and (e) motivation? Has the organization utilized the self-study course developed by SSDC or similar aids?[14]

E9. Problem Evaluation and Response

Often a task would get done more efficiently if conditions were changed. If poor performance is not due to lack of skill or motivation, it may be due to an obstacle that prevents acceptable performance.

Is a change-based analytical technique used to find underlying problems of performance troubles? How are task schedule pressures held to an acceptable level? Do employees find the consequence of doing some tasks incorrectly more favorable than doing them as directed? How are obstacles that might prevent satisfactory task performance reduced to an acceptable level? Is refresher training conducted for highly technical tasks?

E10. Discipline

Although discipline entails both good and bad behavior or performance, it is most often related to punishment for misbehavior or substandard performance. Within that context then, guidance should exist on appropriate measures to be taken in response to unacceptable performance or behavior.

If a supervisor observes workers taking shortcuts or otherwise circumventing safe methods, does he correct them at once? Are penalties verbal or written? Are reprimands or time off without pay assessed for serious violations? Are violators of safe practices treated fairly? If a penalty is assessed, is it for violation of safety rules or standards and not for having had an accident?

E11. General Mass Motivation

Mass motivation is somewhat of a misnomer because it implies that motivation can be externally imposed, when, in reality, motivation is internally generated and is manifest in a worker's quality of effort in doing a job. What is commonly meant by mass motivation is increased safety awareness through the use of various media.

Is management's concern for safety displayed by direct, vigorous, and personal action? Are regular safety meetings conducted and well structured? What evaluation methods are used to monitor safety meeting effectiveness? Are slogans, posters, leaflets, and contests a highly visible part of the safety awareness program? Is the safety program participative rather than dictatorial?

F. MEASUREMENT

Measurements tell a manager how well his safety/loss control program is functioning. To be effective, meaningful, objective, and reproducible, measurements must be based upon well defined standards or criteria. When

the measurement system reveals a disparity between actual performance and the standard, management must decide whether the performance is deficient or the standard is deficient.

What are the measurements needed in the organization? Are the right measurements being made to determine system performance? Are they based upon well-defined standards or criteria? Are they validated and confirmed by other methods when necessary? Are they being made at the right organizational level? Are they being done by the best qualified people with the right tools? Is all the information analyzed and given to management for decision making? Is properly analyzed information fed back in appropriate form to appropriate organizational levels?

F1. Supervisor Observation Plan

The supervisor is in the best position to observe, measure and evaluate the quality of ongoing work activities and worker job performance. He can be most effective if he works from a well defined observation plan that is kept active and up to date.

Does management give guidance and assistance to supervisors in development and execution of their observation plans? Do they have definite standards or criteria to which they observe and measure? Are they updated as needed? Are observation findings evaluated as a basis for improved performance? Are the results fed back to those who need them to correct substandard performance?

F2. Professional "Search Out"

Field safety professionals "search out" and measure meaningful indicators of safety performance. Their observations measure the effectiveness of supervision in carrying out its safety program. Their findings, consequently, must be communicated to supervision and management for appropriate action on both good and substandard performance.

Is the amount of time spent in technical assistance and "search out" by safety professionals sufficient to keep management and supervision informed of the level of their safety performance? Are they using the most appropriate "search out" methods? How does the safety professional feed findings and evaluations of performance in the work areas to the line supervisor and manager? What criteria are available to the field safety professionals to make independent "search-out" of hazards and controls?

F3. Accident/Incident Investigation

Accident/incident investigations are primary after-the-fact indicators of safety program failures in an organization. If well done, investigation reports can be used to prevent future accidents, improve system functioning, increase performance quality, and raise the level of safety consciousness.

*What is the extent and adequacy of the system established to implement the requirements for reporting accidents and incidents? How are accident/incident investigation reports disseminated among appropriate and cognizant management? How effective is followup action on system deficiencies identified in the reports? How responsive is line management to reported judgments of need? What improvements in the safety assurance systems have resulted from good accident/incident investigation reports? What needed improvements have yet to be done? Has the organization utilized the self-study course produced by SSDC or similar aids?[15]

F4. Incident Recall Studies

Incident recall is an information gathering technique which uses employee-participants to describe situations they have personally witnessed involving good and bad practices and safe and unsafe conditions. This information is used to identify worksite hazards and facilitate their elimination in both current and future operations and designs.

Is there a planned incident recall program? Is it operative? When was the last study performed? What was done with the information? Has the organization utilized the self-study course produced by SSDC or similar aids?[16]

F5. Error Sampling

Error sampling is a specific management plan whereby line or staff personnel systematically sample for operating errors, using prepared checklists based on identified priority safety and operational problems. Effective sampling requires updating of the checklists as problem priorities change.

Is there an error sampling plan? Is it keyed to present priority safety problems? What criteria are used by the error samplers? How effectively is error sampling being conducted? When was the last error sampling performed?

F6. Inspections

Inspections are a routine method of hazard detection and a basic information gathering process. They must be planned to be truly effective. The type and nature of prescribed inspections constitutes a major facet of a supervisor's safety program. Too often, inspectors and reviewers fail to analyze inspection reports for direct causes of identified inadequacies, and stop gap item fixes are done when systemic fixes are needed.

What is the basic inspection plan used in all areas in the organization? How is it modified for specific needs or circumstances? How comprehensive are inspection checklists? Are primary safety inspections being conducted by supervisors and line managers? How adequate are the field safety professional's audit inspections in identifying supervisor/manager safety performance?

F7. Exposure Instruments

Measuring work environmental exposures requires teamwork by several professional disciplines. Proper equipment must be used, readings must be interpreted and right actions must be taken to identify exposure levels, mitigate their effects and limit future exposures to acceptable levels.

What types of exposure do employees experience? What is done when exposures occur? What reporting is required? Who maintains the exposure data for the organization? How reliable are the exposure measurements? What is the schedule of calibration for exposure instruments? How do the exposure data compare to national and local standards?

F8. Surveys and Evaluations

Safety should use procedural surveys to spot-check high energy and other hazardous operations. After information is gathered it needs to be analyzed and interpreted. Both the survey and the evaluation of data must fit into a comprehensive plan for internal program measurement and review.

When were the last spot-check surveys conducted? What did they deal with? Were they part of a comprehensive plan for safety performance measurement and review? Were they done as planned and scheduled? How adequately was the survey data analyzed and interpreted and presented to management? How and by whom are surveys and evaluation process reviewed and validated?

F9. Health Monitoring

Maintenance of a safe and healthful work environment is mandated for all DOE and contractor organizations. Humanitarian considerations reinforce the desirability of keeping workers as free from injury and health problems as can reasonably be done. Monitoring the health aspects of the work environment therefore becomes very important to conscientious organizations. Proper monitoring should warn of health hazard existence, trigger action to limit exposures, provide means of exposure level

determination, evaluate effects of cummulative exposures, provide proper treatment and inform employees of their exposure levels, accumulations and limits.

How adequate is the health monitoring of the work force personnel? Do employees know and understand their exposure levels and accumulations, as well as the limitations affecting their health in particular work tasks? Do methods exist for relating medical-dispensary findings to field work?

F10. Audits

Audits are periodic, methodical, and in-depth examinations of a safety/loss control program function or suborganization to verify and assure its adequacy. Internal audit programs are a key factor in maintaining and improving the quality of organizational safety performance.

Is there a defined internal audit program? What types of internal audits have been conducted in the past three years? How many audits have been conducted? Were the report recommendations appropriate? Was there sufficient follow-up to obtain effective implementation? What recommendations have not yet been implemented? Does the audit system need to be improved? How can it be done?

F11. Appraisals

The purpose of an appraisal program is to develop overall judgments of the quality of safety programs and safety assurance systems and to identify safety management improvement needs. Appraisals draw on monitoring, audit, accident investigation and special reports or studies to evaluate program strengths and weaknesses.

*How frequently are appraisals conducted? When were the last appraisals conducted? What kinds were they? By whom were they conducted? What were the findings and recommendations? What improvements were

implemented by management? *How adequately are records kept of formal appraisals? How does performance compare between organizations conducting similar activities? *How effective and timely is the follow-up system?

G. ANALYSIS AND COMMUNICATION

Safety information must be in usable form. Raw data needs to be reduced and analyzed before it is communicated to management. The criteria for analysis should be defined and the lines of communication open to all users.

Do all user suborganizations know what technical information is available? Are there definitive criteria for analyzing raw data? What lines of communication are open to users of safety information? *To what extent is Department of Energy (DOE) experience and accumulated knowledge in preventive techniques disseminated? To what extent is DOE or this organization providing information to the public?

G1. Executive Warning

Essential information for management should provide warnings that are predictive of increased risk, reduced effectiveness of information systems and administrative controls, and impending major accidents and losses.

What type of executive warning system is utilized by management? Is it in use, up-to-date, and adequate?

G2. Safety Control Room

At least one location should be established where safety and loss control information is displayed to give management an overview and assessment of safety program status.

Does the safety organization provide management with a display of current problems, analyses, trends, and recommendations? Is it in a form

that is meaningful to management? Is it located at a single location or at several appropriate locations at the worksite? How much does management use the information provided?

G3. Performance Indicators

The predictive value of statistical data helps managers assess safety. Rates, trends, and comparative data must be meaningful to management if they are to provide a basis for revisions and improvement of safety assurance systems.

Does management have sufficient performance indications to know what has happened, is now happening and is likely to happen in their organizations? How comprehensive and perceptive is the evaluation of information presented to management? How is it compiled? Who performs the evaluations? Are the indicators of performance expressed in an understandable and meaningful form to management? Does management use the performance indicators to make decisions on system changes and improvements?

G4. Risk Projections

Simple and straight forward risk projection methods enable managers and safety professionals to assess operational safety risks and make judgments and decisions based upon those projections.

Are analyses and projections of safety risks being done in this organization? *How adequate are these risk analyses and projections? Does the manager know what his assumed risks are? What action has been taken to identify and reduce risks? What additional measures to reduce risk have been considered and rejected? Are the residual risks identified and acceptable? Has the organization utilized the self-study guide developed by SSDC or similar aids?[5]

G5. Priority Problem Lists

Priority Problem Lists (PPLs) inform management of its most serious problems, so they can direct major efforts toward solution of those problems. PPLs also serve to correct two strong and adverse tendencies in many organizations: (a) bad news tends not to be communicated upward for managerial action and (b) the "vital few" problems are often not adequately distinguished from the "trivial many" for proper allocation of resources.[17]

Does the organization have a master PPL? Have PPLs been compiled by and for major division or department managers? Have safety professionals participated in PPL formulation? How effective is the PPL in getting needed action on safety and loss control concerns by upper management? Do PPLs reflect the need for improved services from higher echelons of the organization or DOE?

G6. Fix Controls

Many methods are employed to identify the need for safety corrections or fixes: i.e., performance indicators, priority problem lists, audits, appraisals, accident/incident recommendations, etc. Once identified, needed fixes must be accomplished in an organized and traceable manner. Management will then be able to identify the status of system fixes and track them to completion.

Are the fix controls defined and auditable? How acceptable are the rates at which fixes are accomplished? How many fixes are pending? Is the organization experiencing recurrence of the same or similar problems? When did management last receive a report which showed fix control results? How frequently is a reminder list of pending fixes provided to field office organizations and contractors?

G7. Technical Information

Technical information includes codes, standards, regulations, manuals, professional literature, special analyses, in-depth studies, computerized national safety libraries, etc. The better that technical information systems are organized, the more efficient and effective they tend to be. Additionally, fewer problems are experienced because inefficient, uncoordinated modes and expensive duplications are eliminated.

Is technical information from internal and external sources readily available and adequate? Is it getting to users in a timely manner? How can the system be improved? Is safety information known and available to those who need it?

G8. Information Networks

A basic information network requires (a) input, (b) processing, and (c) distribution. The value of the output for the decision-making process is paramount, so inputs and processing must be appropriately organized to give the most meaningful and useful decision bases.

Is there a defined and functioning information network? How adequate is the information input, processing, and distribution? Does the information network provide the information needed for management decision? Is it in meaningful and useable form? Does the organization utilize the self-study guide produced by SSDC or similar aids?[18]

G9. Collection, Storage

Large amounts of safety data may be collected through the safety information systems. The stored information should be necessary and sufficient for the needs of the organization. Computerization is often the best form of storing collected data for easy retrieval in a variety of forms and applications.

What safety and loss control related information is collected and stored? How is it collected? How is it stored? Are the collection and storage methods appropriate for this organization? Do they satisfy the organizational needs for usable information?

G10. Retrieval, Analysis

Rapid retrieval of technical safety and loss control information is necessary for timely evaluation and projection of system and operational risks. Key word coding of computerized data has proven to be a very satisfactory retrieval method. It is used effectively by many organizations with significant amounts of data is storage. Other organizations with limited quantities of generated and stored data have found manual methods to be adequate for their data processing and retrieval needs.

What retrieval method is used? Does this organization have an adequate data retrieval and analysis system? What analyses and data reduction are performed? Is the key word coding adequate? Can data be retrieved and analysed in a timely manner when it is needed? What practical improvements can be made in the system?

G11. Distribution System

Distribution usually results from either of two processes: (a) user requests or (b) selected distributions. In both cases, the information must be put into the form that is both meaningful and usable to the intended recipients. It may have to be tailored for specific recipients.

How is information distribution initiated and carried out? Is it timely? Is information in useful form? Is it tailored for specific recipients?

H. SAFETY SERVICES

Safety services are provided by the safety/loss control organization to line managers and their organizations to assist in carrying out management's safety assurance programs. Additionally, managers provide services and support to the safety programs of their subordinates, both directly and through safety/loss control professionals. Effective safety services assist managers and supervisors in safety management, loss control, accident prevention, performance improvement, hazards control, emergency response and accident investigation and control.

What safety services are provided to line organizations and operations? How are safety services funded and staffed? Have the services been appraised or audited? How recently? What were the findings? What program improvements have resulted from safety services?

H1. Level, Scope, Integration

The level and scope of safety services must be appropriate to the needs of the recipient managers. Proper staffing, funding and resources must be provided to meet those needs. An integrated safety services program provides best utilization of the staffing and resource commitments.

What is the management policy towards safety services? Is the level of support appropriate for the organizational needs? Are safety services applied to intensive investigations of major accidents? How efficiently is the safety unit organized to economically produce services at points of need? Is the staff support for safety integrated for maximum flexibility and support? Does the safety services program scope address all forms of hazards, including anticipated hazards associated with advanced technological development and research? Have proper resources been allotted to meet the safety service needs?

H2. Program Schematics and Plans

The safety services program can be specified and defined through appropriate schematics and program plans. Users or recipients of these services can identify present capabilities and determine available services by reference to these documents.

Have all primary safety services been documented in schematics and program plans? Are they available to present and potential users of the services? Do they explicitly identify available services and capabilities?

H3. Professional Qualifications and Development

The education, experience, qualifications, and organizational status of the safety professionals who provide safety services enhances the effectiveness of the ES&H services program.

Do safety service personnel rate well by both safety and management criteria? Do safety professionals have proper organizational status? Are their qualifications, education and experience appropriate for the organization's needs? What short courses and on-the-job training and development has been completed by safety professionals in the last three years? Is the quality and quantity of professional staff adequate? *When principal changes in organizational programs are anticipated, are safety staffing changes made to meet the anticipated needs?

H4. Research and Fact Finding

Research and fact finding includes such activities as survey of needs, incident recall studies, literature searches, inspections and audits, and development, testing and evaluation of methods and equipment. Early initiation of research and fact finding is the hallmark of effective anticipation and response to needs.

What relevant research and fact finding has been conducted or is in process in the safety unit? Is the safety unit organized, structured,

staffed and funded to provide such research and factfinding services? Is this capability known to potential users? Is there a well defined and well understood method for requesting and receiving these services? Is response to needs and requests timely and effective? Does the safety unit initiate needed research and factfinding or only respond to requests for such services?

H5. Exchange of Information

Exchange of information includes directives, bulletins, fact sheets, memorandum, notices, newsletters, meetings, etc. It includes all methods which enable line management and safety professionals to share and benefit from safety and loss control related knowledge.

What exchange of information methods are used in this organization? Are appropriate means established, known, and in use for sharing needed safety/loss control information? Can these means be rapidly activated when the need arises? Is the exchange of information program documented and auditable?

H6. Standards and Recommendations

Standards and recommendations include formal orders, regulations and codes; safety, loss control, standard practices and guideline manuals; and organizational and consensus recommendations. Their intent is to provide meaningful guidance and direction on safety and loss control matters. There is frequently a sequential process flow from research through exchange of information to a sound consensus. Standards and recommendations without these foundations may be inadequate, misdirected, misleading, even unsafe to implement.

Are applicable standards and recommendations identified, available, known and implemented within the organization? In cases where organizational and external sources of codes, standards, and regulations do not cover a particular situation, does management develop (or have

developed) adequate standards and issue appropriate directives? Are relevant codes, standards, and regulations (CSRs) known to designers, planners, operational personnel, and all present and potential users? Are safety services provided for interpretation and implementation of standards and recommendations? Are those services sought for and used? Are they provided in a timely and responsive manner? Are they provided even when they are not requested?

H7. Training

Training in the nature, availability, and use of safety services provides users with the knowledge, skills and tools to do their safety jobs effectively.

What relevant safety training has been given to designers, operators, management, ES&H staff and others within the organization? Is general safety training provided to all employees? Is specialized safety training provided when needed? How complete and auditable are training records? *What is the extent and adequacy of training, education, and promotion in the areas of ES&H for both the professional staff and operating personnel?

H8. Technical Assistance

People have difficulty using new methods without a source of help, guidance and reinforcement. Field assistance, meetings and discussions, written guidance and consultive phone calls can provide needed technical assistance.

Is there a list of experts to contact for technical assistance? Is there adequate internal and external communication for technical assistance? *How adequate is the technical skill and numbers of staff assigned to carry out the ES&H program? Are they responsive to requests for assistance? Do they seek out need and offer technical assistance where needed?

H9. Program Aids

Program aids include mass produced or locally generated aids of any kind for use in safety program management and implementation - forms, analyses charts, MORT charts, training literature, descriptive booklets, etc.

How effective is staff safety support in supplying and using program aids? Are applicable external aids acquired, made available and used? Are special program aids developed to meet local needs?

H10. Quality Assurance Support

Safety and quality assurance have many common methodologies. Their programs complement one another. Improved safety assurance can result from well planned and effective quality assurance programs.

How well is the quality assurance (QA) program integrated into the general design process? Does safety and QA mutually benefit from nonduplicative cooperation in design review, procedural control, construction/installation, operation/maintenance, and test for critical equipment? Are common methodologies and technologies shared and integrated for mutual benefit and program quality enhancement? Are teamwork and common goals evident?

H11. Improvement Plans

Safety improvement must keep up with social and technological change if degradation of safety program effectiveness is to be prevented. Safety Program Improvement Projects (SPIP) are a very effective means available to organizations in accomplishing needed improvements, and in making the transition to higher levels of program effectiveness necessitated by technological breakthroughs.

Is there a well defined program for safety program improvement? Has there been a steady improvement in organizational safety/loss control performance? How much have accident losses dropped in the last 3-5 years? Are safety program improvement projects currently underway? What is the status of these projects? What projects are planned for implementation? How are projects planned, implemented and documented?

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APPENDIX A

GUIDELINE TO GOOD PRACTICES

APPENDIX A

GUIDELINE TO GOOD PRACTICES

I. INTRODUCTION

The following pages present suggested techniques and advice on conducting field appraisals. These suggestions come from discussions with experienced safety appraisal personnel, from the listed references, and from methods and techniques used in DOE Accident Investigation. Adopt those suggestions you feel will assist you as you conduct appraisals, follow proper document flow, schedule interviews, and validate report findings. Wherever the terms "manager" or "management" are used, they refer to the manager or the management of the appraisee organization.

II. COMMUNICATION

First impressions are important. A special effort should be made to establish a good working rapport at the first meeting with management.

A. Questioning[1]

1. Avoid an air of dogmatism for it tends to elicit a defensive response from the appraisee. When the appraiser is telling, not asking, he is perceived as an outsider subverting management's control. Be open-minded and willing to hear out the appraisee's views. The purpose of questioning is to learn, not to air preconceived opinions.

2. The discussion should be viewed as a partnership between equals. Any expression of superiority by the appraiser can result in resentment and competition rather than communication.

3. The question "Why did you do that?" projects the impression that the appraiser is sitting in judgment. A better

approach that shows the appraiser is genuinely requesting information is to ask "How is this done?", "How does it help you to do it this way?", or "What would happen if it were done another way?"

4. Instead of hammering away with the same question until you are satisfied with the response, be willing to rephrase and clarify what you are seeking.

5. Communication is more than words. A cold, detached tone of voice evokes a similar response. An attitude of empathy will also be reflected in the tone of voice.

B. Listening - "Most people speak at a rate of about 125 words a minute - but our minds work at a far greater rate. As a result, unless we discipline ourselves, our minds will wander. To counteract this tendency, the listener should try these techniques:"[1]

1. "The listener should not only hear the spoken words but also think ahead of the speaker, trying to anticipate what he's leading to and what will be the conclusion that can be drawn. This keeps the listener's mind on track and makes the listening more interesting."

2. "The listener should seek the evidence the speaker has or has not adduced to support his comments or buttress the points he is trying to make. This will form the basis for intelligent and relevant questions which will expand on the speaker's thoughts and make them easier to recall."

3. "The listener should mentally summarize what has gone before. If there appears to be any gaps in his recollection of what has been said, he may ask for a reprise which will aid in the absorption of the information."

4. "The listener should look directly at the speaker, observe his facial expressions, gestures, tone, and posture so as to focus on the nonverbal communications, which are sometimes more important than the verbal ones. This also tends to keep the mind tethered to the subject and to improve recall."

5. Don't meet hostility with more hostility; you are rendering a service, not being a disciplinarian.

III. PREPARATION

A. Prepare an appraisal plan to fix in your mind how you are going to proceed. Your plan may be requested as input to files for the benefit of future appraisers who evaluate similar organizations.

B. Lay the groundwork for the appraisal personally - a preliminary meeting with line management. Make face-to-face contact and establish who will be management's primary liaison for the appraisal.

C. Try to accommodate management with respect to the details of scheduling in order to minimize disruption of operations.

D. Ask management what are the perceived priority and problem areas not noted in the appraisal scope that you should evaluate.

E. Assure management that they will be able to discuss the appraisal findings and comment informally prior to their publication.

F. Establish what working facilities (i.e., desk, phone, etc.) are available for your use during the appraisal.

G. Learn the job of the appraised organization:

1. Objective and goals

2. Where it fits in the organizational structure

3. Present and near future projects.

H. Learn the climate at the appraised organizations.

1. Schedule, funding and staffing pressures

2. Security pressures

3. Attitudes toward company safety policy, rules and procedures.

I. Review applicable control documents which provide performance standards.

J. Locate sources for logs, training records, etc.

K. Be sure you understand what are the objectives of the system that you will be evaluating.

L. Read previous appraisal reports and learn the general background, findings and actions taken on previous appraisals.

M. Identify the changes that have occurred since the last appraisal.

N. Contact the field safety branch to ask for pertinent background material.

IV. INVESTIGATIONS: Field Work and Analysis

A. Appraisals are not limited to finding wrongs and inadequacies; they are a determination of the status - good and bad - of the system.

B. "The objective is not to parade errors, but to identify matters which prevent the orderly functioning of the activity and create barriers to effective accomplishment of established goals."[1]

C. In organizing your efforts consider investigating an organizational/administrative grouping or following the flow of a work process.

D. Some general guidelines to breakdown broad safety topics are given in SSDC-1, "Occupancy-use Readiness Manual - Safety Considerations."[2]

E. Evidence[1]

1. "Primary evidence affords the greatest certainty of the fact. An original signed contract, for example, is the best evidence of its existence and its content."

2. "Secondary evidence is inferior to primary evidence and cannot be given the same reliance. Secondary evidence may include a copy of a contract or oral evidence of its contents. Secondary evidence may be considered acceptable if the primary evidence is destroyed or lost and if it can be shown that secondary evidence is a proper representation of the primary evidence."

3. "Direct evidence proves a fact without interference or presumption. It tends to show a fact or matter at issue without the intervention of proof of any other fact. Evidence is direct when the facts at issue are asserted by those who have actual knowledge of them by having personally witnessed them"

4. "Circumstantial evidence tends to establish one fact by proving another collateral fact. Even though true, circumstantial evidence does not conclusively establish the

fact. It is founded on experience and observed facts and coincidences, establishing a connection between the known and proven facts and the facts sought to be proved."

5. "Corroborative evidence is additional evidence of a different character, to the same point. An oral statement, for example, may corroborate that a purported copy of a document is a true copy."

F. In striving for the facts beware of unverified statements of opinion and heresay. Evaluate the source.

G. The proper attitude is that appraisals are a joint effort of the appraiser and line management.

H. Recognize that the operational management does know more about how things are actually done in the particular organizations; ask questions.

I. You may be a stranger to some of the operating personnel. Don't hesitate to identify yourself.

J. A useful conceptual model for identification of hazards is that of unwanted energy flow, specifically the channels for, the barriers to and the potential recipients of this flow.

K. Keep your notes and other working papers in order and so written that another individual can take over for you should you be called away from the appraisal.

L. One method of taking notes is to photocopy a control document and make notes in the margin. If more space is needed than is available in the margin you can (a) code documents and notations for cross-reference or (b) cut and paste a section of the document at the top of a blank sheet and write below it.

M. Take notes on the spot. The disadvantages of loss of eye contact and interruption of communication are compensated by increased retention of information.

N. Keep working papers a uniform size; small scraps get lost. A smaller paragraph or photo can be pasted on a standard size sheet of paper.

O. Your working papers represent many long hours of effort and are potentially very sensitive; especially if taken out of context. This information is privileged; keep it secure.

P. Summarize often - either mentally or on paper - in order to:

1. Get an overview

2. Insure you are keeping within the appraisal scope and satisfying the appraisal purpose

3. Keep findings in perspective and focus on the facts.

Q. Retention of these working papers will be determined on a case by case basis. Perhaps they would be valuable to future appraisers and should be retained in files.

R. A helpful model for analysis of field work findings is the comparison of the present situation with what is desired.

S. Controls naturally become more formal and more restrictive where hazard potential and loss/injury potential are higher. Some guidelines to assess procedural requirements and risk acceptance by line management are given in SSDC-11, "Risk Management Guide."[3]

T. Aids to retrieving information such as reference standards, case histories, etc., are explained in SSDC-9, "Safety Information System Guide."[4]

U. For areas where no formal standard exists, you will need to evaluate the situation in light of <u>your</u> professional experience and interpretation of concepts, such as "good engineering practice" and "reasonable risk."

V. When analyzing, keep the organization's objectives and goals in mind. Are they reflected in the status of the control systems as you found them?

W. Take the vantage point of management. Would the depth of your evaluation inform you of the status of the control systems if you were responsible for direct management of the organization?

1. Some questions to consider when a deficiency is found are:[1]

   a. "Is the deficiency important? What effect does it have on the functioning of the operation...?"

   b. "What is responsible for the deficiency?"

   c. "Would the matter have come to light in the normal functioning of the control system and in the absence of the appraisal."

   d. "Was the deficiency an isolated error or an indication of [system] weakness?"

   e. "Could the deficiency occur again?"

   f. "Was the deficiency a violation of established procedures?"

g. "Did the deficiency indicate the need to clarify or amplify existing instructions?"

h. "How can the deficiency be corrected?"

2. Some questions to consider when looking for the causes of a deficiency are:[1]

a. "Was the management aware of the problem?"

b. "Was the problem traceable to inadequate instruction or insufficient training of personnel?"

c. "Did the condition occur because supervisors were not adequately monitoring the on-going process?"

d. "Were improper priorities assigned?"

e. "Did the need for controls go unrecognized?"

f. "Was there a lack of coordination with interfacing organizations?."

g. "Were conditions caused by human error?"

h. "Were the defects attributable to the attitude of the employees? of the supervisors? of the managers?"

3. In preparation for writing the report a standard organization of your information is suggested:[1]

a. "A capsule comment of the finding"

b. "An identifying number for the particular finding and a reference to the supporting working papers"

c. "An indication of whether the finding was a repetition of something found in prior appraisals"

d. "A citation to the directives, procedures, or job instructions involved in the finding"

e. "A summary of the extent of the tests and the incidence of the discrepancy"

f. "The reason the discrepancy occurred"

g. "A statement of the corrective action - proposed or taken."

X. A very informal post appraisal meeting to discuss preliminary findings should be scheduled with the line manager.

V. REPORT

A. The report is an opportunity to bring to light basic system strengths, as well as deficiencies and root problems which need correction.

B. As a minimum, address each significant area mentioned in the purpose and scope sections. Again, the report is not limited to negative findings.

C. Each safety deficiency noted on an appraisal report should reference a standard or control document, or otherwise identify the basis of judgment.

D. Statements of fact must carry the assurance of personal observation or validation by the appraiser (see "evidence" definitions under Section IV). Otherwise you should mention your sources of information.

E. The accuracy of your findings and judgements will also be evaluated by the line manager for relevance and perspective. A professional analysis, not a "laundry list," is the expected product.

F. At times it is easier to use a sketch, photograph, or flow chart than a lengthy explanation.

G. Some factors to consider in making recommendations for corrective action are:[1]

1. "What course of action will most practically and economically cure the defect?"

2. "What objectives should (be kept)...in mind in recommending corrective action?"

3. "What choices are open? How do they measure up when compared with the objectives?"

4. "What tentative alternate has been selected and what injurious side effects might be expected?"

5. "Which is the best choice with the least unsatisfactory side effects?"

6. "What mechanism should be suggested to control the corrective action after it is taken? How can one make sure that the corrective action is taken...that it will be carried to conclusion...that future deviations will be referred back to someone authorized to remove impediments from the proper fulfillment of the suggested course of action?"

H. A recommendation is a recognized need for improvement and may include a method for solution, not the method.

I. The appraiser cannot insist on specific corrective action, that is a prerogative of higher line management. He should be prepared to explain how he arrived at his findings and to "sell" his recommendation.

J. To help keep the report concise, keep the central purpose of the report in mind.

K. In order to write clearly, the problem must be understood clearly.

L. Technical terminology must be translated into an easily readable form so it can be understood by those who will read the report.

M. The report draft must be timely, so it should be written expeditiously. Such action (a) fosters the ideal of service; (b) gives management prompt feedback; and (c) is relevant to present conditions.

N. The tone of the report is characterized by adjectives such as calm, objective, thoughful, and dispassionate. The report is no place to grind axes.

O. Consider the report's effect on subordinates. Be careful and selective in identifying individuals who made mistakes. Rather, key on system inadequacies and failures that led to the identified problems.

P. The objectives of the validation of the rough draft with management are:

1. "To resolve conflicts."[1]

2. "To reach agreement on the facts."[1]

3. "To prevent disputatious replys."[1]

4. "To permit the manager...to see in advance the written word - which sometimes will look different from the spoken word."[1]

5. To receive an informal commitment for action on the report recommendations.

Q. The manager is understandably defensive during the validation; use courtesy, empathy and salesmanship. Remember, too, that the manner in which the appraisal has been conducted may set the initial tone of the validation activity.

The following observations are applicable throughout the appraisal process.

R. "Have Good Manners. It is just plain bad manners to say bluntly 'I disagree with you' or 'You're wrong." It is worse manners to use such words as 'idiotic,' 'ridiculous,' or 'nonsense.' Besides, it is poor judgment. Under this kind of attack, the (appraisee)...either lashes back or withdraws. More important, communications is destroyed and the (appraiser's)...objectives cannot be met."[1]

S. "Use nonpersonal Phrases. In disagreeing, avoid starting a sentence with 'you.' That implies disagreeing with the individual rather than with the concept or idea. Use neutral phrases: 'It might be worth considering...,' 'There might be a possibility that...,' 'Perhaps it might be useful to explore...' These phrases, being impersonal, seldom arouse emotions - certainly not the emotions aroused by 'You haven't thought of...,' 'You've forgotten...,' 'You don't know about...' Never underestimate the emotional impact of words."[1]

T. "Get on common ground when an impass appears to be reached. Step back until some point can be agreed upon - even if it is just agreement that the problem is not an easy one to solve. Stand on

that ground until tempers are calmed and the (appraisee)...is comfortable enough to be willing to discuss reasonably the matters at issue."[1]

U. "Don't back anyone into a corner. Do not press the (appraisee)...for a clear statement that he has reversed himself. If he finally goes along with a point, resist the temptation. Don't say something like 'I'm glad you finally see things my way.' The (appraiser's)...objective is to get his conclusions and recommendations across. It doesn't really matter whether or not the (appraisee)...changed his mind."[1]

V. "Don't mistake airing of views with disagreement. Often all that is necessary is to let the (appraisee)...talk himself out. Perhaps he does not really disagree but merely wants a chance to justify his position or to explain the reason for the conditions that the (appraiser)...found. After he has made his point, the (appraisee)...might be perfectly willing to let the wording of the draft stand as written."[1]

W. Cross-referencing the draft report to your working papers expedites answering the manager's questions. It is far better to be able to go directly to the appropriate section of your notes than to have periods where the only sound is you shuffling through your papers. Here again you can show you are providing a professional service.

X. During the validation, impasses on certain points are probably inevitable. When they occur, keep in mind the following:

1. You cannot force an agreement; the ultimate decision will have be be made by higher authorities in safety division and line management. Refer the matter to your supervision, including the comments and position of the manager.

2. If the item cannot be reconciled before the final draft is due, the manager's comments and position should be included in the text. Let him review it again so he will not be misquoted.

3. Don't be inflexible on semantics; be willing to substitute words and phrases that do not significantly change the meaning and context.

Y. Some questions to ask oneself while writing the report are:

1. What is the management system or activity being evaluated?

2. What is the standard for evaluation?

3. What is the adequacy of the system or activity in the present status?

4. What is the adequacy of the collected and evaluated evidence and the resulting conclusions?

VI. REFERENCE

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APPENDIX B

USING SASS TO COMPLY WITH DOE ORDER 5482.1A

APPENDIX B

USING SASS TO COMPLY WITH DOE ORDER 5482.1A

I. Introduction

Department of Energy Order 5482.1A, dated August 13, 1982, entitled Environmental Protection, Safety and Health Protection Appraisal Program, requires that certain factors be considered and applied as appropriate for use in all levels of the ES&H appraisal program. This appendix will give the DOE appraiser the tools to correlate SASS and Order 5482.1A appraisal factors.

II. Comparison

As shown in matrix format in Figure B-1 and as outlined in Table B-1 the contents of the SASS are related to the appraisal factors of Order 5482.1A. A similar situation exists for other DOE orders 548X and for other appraisal schemes and logics.

Since the SASS is designed to provide a complete safety program description, it may be used to prevent oversights in evaluating a safety program in terms of any criteria, including those specified in Order 5482.1A.

SSDC 23, Safety Appraisal Guide for Use with DOE Ordre 5482.1A, contains analytical trees and an appraisal element outline which incorporates SASS elements into the 12 appraisal factors of the order. It should be used as an aid for appraisers performing appraisals based on those factors.

Safety Appraisal Manual \ DOE Order 5482.1	8a. Management Directives & Orders	8b. Policies, Standards, Permits	8c. Organization & Administration	8d. Staffing	8e. Training	8f. Communication	8g. Documentation	8h. Incident-Accident Reporting	8i. Planning, Budgeting, Spending	8j. ES&H Appraisal Programs	8k. ES&H Evaluation of Facilities & Programs	
III A. Management Implementation	A A9 A5 A10 A6 A11 A7	A1 A2 A6	A4 A9 A5 A10 A6 A11		A2 A7	A2 A5 A9 A10	A1 A4 A5 A6	A7 A10	A2 A3 A8 A11		A10	
III B Hazard Analysis	B4 B8 B11		B1 B8	B4 B10		B5	B B1 B8		B1 B10		B B8 B10	
III C Operability	C1 C6	C C5 C6		C1 C11	C7 C8	C8 C10	C2 C6 C7 C8 C11		C C3 C4 C5 C9		C C2 C11	
III D Operations	D1 D2 D10	D1	D D1 D3 D4 D10	D5	D2 D3 D5	D D2	D D7 D8 D10 D11					
III E. Human Factor	E7 E11	E1	E6	E1 E4	E4 E5 E8 E9	E2 E7	E1 E7 E10				E9	
III F. Measurements	F8				F1	F F3 F8 F10 F11	F F3 F6 F10 F11	F3		F11	F4 F8 F11	
III G. Analysis & Communication	G2 G3 G4 G5		G G7			G thru G11	G thru G11	G4 G6			G3 G4 G5	
III H. Safety Services	H1 H6	H1	H1 H3 H8 H10	H1 H3 H7 H8	H H7 H9	H2 H5 H9	H2 H6 H7	H11	H2 H11		H4 H11	

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Fig. B-1
Matrix of DOE Order 5482.1 and SASS

TABLE B-1

I. Management Orders and Directives

A. Management Implementation
A5. Information Flow
A6. Directives and Organization
A7. Services
A9. Vigor and Example
A10. Risk Assessment System
A11. Safety Analysis Report

B4. Change Analysis
B8. Engineering Organization
B11. Safety Analysis Report

C1. Managerial Control Systems
C6. Procedures, Job Safety Analysis

D1. Supervisory Control
D2. Middle Management Support
D10. Information Analysis and Feedback

E7. Feedback, Rewards
E11. General Mass Motivation?

F8. Surveys and Evaluations

G2. Safety Control Room
G3. Performance Indicators
G4. Risk Projections
G5. Priority Problem Lists

H1. Level, Scope Integration
H6. Standards and Recommendations

II. Policies-Standards-Permits

A1. Policy
A2. Challenging Goals
A6. Oirectives and Organization

C. Operability
C5. Safety Equipment, Instruments
C6. Procedures, Job Safety Analysis

D1. Supervisory Control

E1. Personnel Policies

H1. Level, Scope Integration

III. Organization and Administration

A4. Line & Staff Responsibility, Accountability
A5. Information Flow
A6. Directives and Organization
A9. Vigor and Example
A10. Risk Assessment System
A11. Breakthrough Program

B1. Goals and Requirements
B8. Engineering Organization

D. Operations
D1. Supervisory Control
D3. Supervisor Training
D4. Maintain Operational Readiness
D10. Information Analysis and Feedback

E6. Participation and Peer Committees

G. Analysis and Communication
G7. Technical Information

H1. Level, Scope, Integration
H3. Professional Qualifications and Development
H8. Technical Assistance
H10. Quality Assurance Support

IV. Staffing

B4. Change Analysis
B10. Independent Review

C1. Managerial Control Systems
C11. Operational Readiness Tests

D5. Control of Changes

E1. Personnel Policies
E4. Preparation

H1. Level, Scope Integration
H3. Professional Qualifications and Support
H7. Training
H8. Technical Assistance

V. Training

A2. Challenging Goals
A7. Services

C7. Procedure Quality Criteria
C8. Personnel Selection, Training

D2. Middle Management Support
D3. Supervisor Training
D5. Control of Changes

E4. Preparation
E5. Supervisory and Personal Support
E8. Behavior Change and Control
E9. Problem Evaluation and Response

F1. Supervisor Observation Plan

H. Safety Services
H7. Training
H9. Program Aids

VI. Communication

A2. Challenging Goals
A9. Vigor and Example
A10. Risk Assessment System

B5. Information Search

C8. Personnel Selection, Training
C10. "Upstream Process" Audits

D. Operations
D2. Middle Management Support

E2. Human Factor Engineering
E7. Feedback, Rewards

F. Measurement
F3. Accident/Incident Investigation
F8. Surveys and Evaluations
F10. Audits
F11. Appraisals

G. Analysis and Communication
G1. Executive Warning
G2. Performance Indicators
G4. Risk Projections
G5. Priority Problem Lists
G6. Fix controls
G7. Technical Information
G8. Information Networks
G9. Collection, Storage
G10. Retrieval, Analysis
G11. Distribution System

H2. Program Schematics and Plans
H5. Exchange of Information
H9. Program Aids

VII. Documentation

A1. Policy
A4. Line & Staff Responsibility, Accountability
A5. Information Flow
A6. Directives and Organization

B. Hazard Analysis
B1. Goals and Requirements
B8. Engineering and Organization

C2. Facility and Arrangement
C6. Procedures, Job Safety Analysis
C7. Procedure Quality Criteria
C8. Personnel Selection, Training
C11. Operational Readiness Tests

D. Operations
D7. Use of Procedures
D8. Maintenance
D10. Information Analysis and Feedback
D11. Emergency Actions

E1. Personnel Policies
E7. Feedback, Rewards
E10. Discipline

F. Measurement
F3. Accident/Incident Investigation
F6. Inspections
F10. Audits

G. Analysis and Communication
G1. Executive Warning
G2. Safety Control Room
G3. Performance Indicators
G4. Risk Projections
G5. Priority Problem Lists
G6. Fix Controls
G7. Technical Information
G8. Information Networks
G9. Collection, Storage
G10. Retrieval, Analysis
G11. Distribution System

H2. Program Schematics and Plans
H6. Standards and Recommendations
H7. Training.

VIII. Incident/Accident Reporting

A7. Services
A10. Risk Assessment System

F3. Accident/Incident Investigation

G4. Risk Projections
G6. Fix Controls

H11. Improvement Plans

IX. Planning-Budgeting-Spending

A2. Challenging Goals
A3. Methods, Criteria, Analysis
A8. Budgets, Corrections, Delay
A11. Breakthrough Program

B1. Goals and Requirements
B10. Independent Review

C. Operability
C3. Equipment and Tools
C4. Materials
C5. Safety Equipment, Instruments
C9. Emergency Plans

X. ESH Appraisal Program

F11. Appraisals

XI. ESH Evaluation of Facilities & Programs

A10. Risk Assessment System

B. Hazard Analysis
B6. Design Criteria and Alternatives
B10. Independent Review

C. Operability
C2. Facility and Arrangement
C11. Operational Readiness Tests

E9. Problem Evaluation and Response

F4. Incident Recall Studies
F8. Surveys and Evaluations
F11. Appraisals

G3. Performance Indicators
G4. Risk Projections
G5. Priority Problem Lists

H4. Research and Fact Finding
H11. Improvement Plans

APPENDIX C

GUIDANCE FOR GATHERING INFORMATION

APPENDIX C

GUIDANCE FOR GATHERING INFORMATION

This appendix has exhibits which provide the safety appraiser with guidance for collecting information. The exhibits are in order, alpha-numerically, so that they follow the SASS tree logic. Some exhibits are brief, some are lengthy, but all are to provide the safety appraiser with a proven way to gather and organize facts; so that he can draw conclusions about the organization being appraised. These exhibits are methods that have worked for others, and are suggested for your consideration. The safety appraiser is encouraged to establish his own approach for collecting additional information, using proven and established methods, modifying them as appropriate for his needs, or developing new methods that better meet his appraisal needs.

EXHIBIT 1

POLICY-A1

Prepare a brief list, such as listed in Table A-1, of the criteria expressed in various policies. For each of the criteria, complete the table's questions. Also, answer the following:

(1) Which criteria do you accept as correct?

(2) Would you rephrase any, or add any criteria?

(3) Can you provide examples of how safety policy is communicated to:

Middle Management: _____

Supervisors: _____

Employees: _____

Technical Staff: _____

TABLE C-1

Safety Policy Analysis Worksheet

Criterion (expressed in a few words)	In our Policy? Y	P	N	Our Mgt's views? Y	P	N	I agree? Y	P	N
1. a. Safety is positive									
b. Congruous with high performance									
c. Congruous with profitability									
d. Congruous with efficiency									
e. Necessary for high energy work near technological boundaries.									
2. a. Safety is a first consideration									
b. Equal to concerns for production, etc.									
3. a. Goal = As Low as Practicable									
b. "First time safe"									
c. Continuous, significant reductions									
4. a. Humane - employee protection									
b. Humane - public protection									
c. Reduce costs and wastes									
d. Protect property									
e. Protect (enhance) environment									
f. Safety of our products									
g. Pride in accomplishments									
h. "Good citizen" in community									
5. a. Line management responsibility									
b. Employee responsibility									

Y = yes, P = partially, N - no

TABLE C-1 (continued)

Criterion (expressed in a few words)	In our Policy?			Our Mgt's views?			I agree?		
	Y	P	N	Y	P	N	Y	P	N
6. Comprehensive for all injurious sources (industrial, fire, damage, radiation, nuclear, effluents, etc.)									
7. a. Safety research is needed									
b. Other safety services needed									
c. Safety staff provided									
8. a. Comply with laws and regulations									
b. Comply with contractual requirements									
c. Comply with standards									
9. Analysis & control "necessary and sufficient"									
10. a. Vigorous tone									
b. Fast pace of improvement									
c. Safety is a "Way of Life"									

If you have documents or cases which illustrate "Our Management's Views" list them on a separate sheet.

EXHIBIT 2

Challenging Goals - A2

For negotiated program goals, management's directives should suggest that criteria be simple, objective, attainable, externally established or reinforced, and having reliable, short-term feedback. If challenging goals have been set, list some projects or programs initiated in pursuit of the goal.

Project/Program	Date	Status

EXHIBIT 3

Methods, Criteria, Analysis - A3

Some organization's long-term success depends on ability, processes and arrangements. Provide illustrations as follows:

	Effective Cases	Ineffective Cases
A. Detecting/Raising Problems		
B. Solving Problems		
C. Adjusting to Change		

Become familiar with the SASS and then review the examples of sequential steps shown on the attached worksheet. Then take three or four of the most recent problem solutions and see if you can chart their sequences on a blank worksheet, just as they were carried out.

SAFETY ASSURANCE SYSTEM SUMMARY

Subject _____ Location _____ Date _____

Remarks _____

	Management Implementation	Hazard Analysis	Operability	Operations	Human Factor	Measurement	Analysis & Communication	Safety Services

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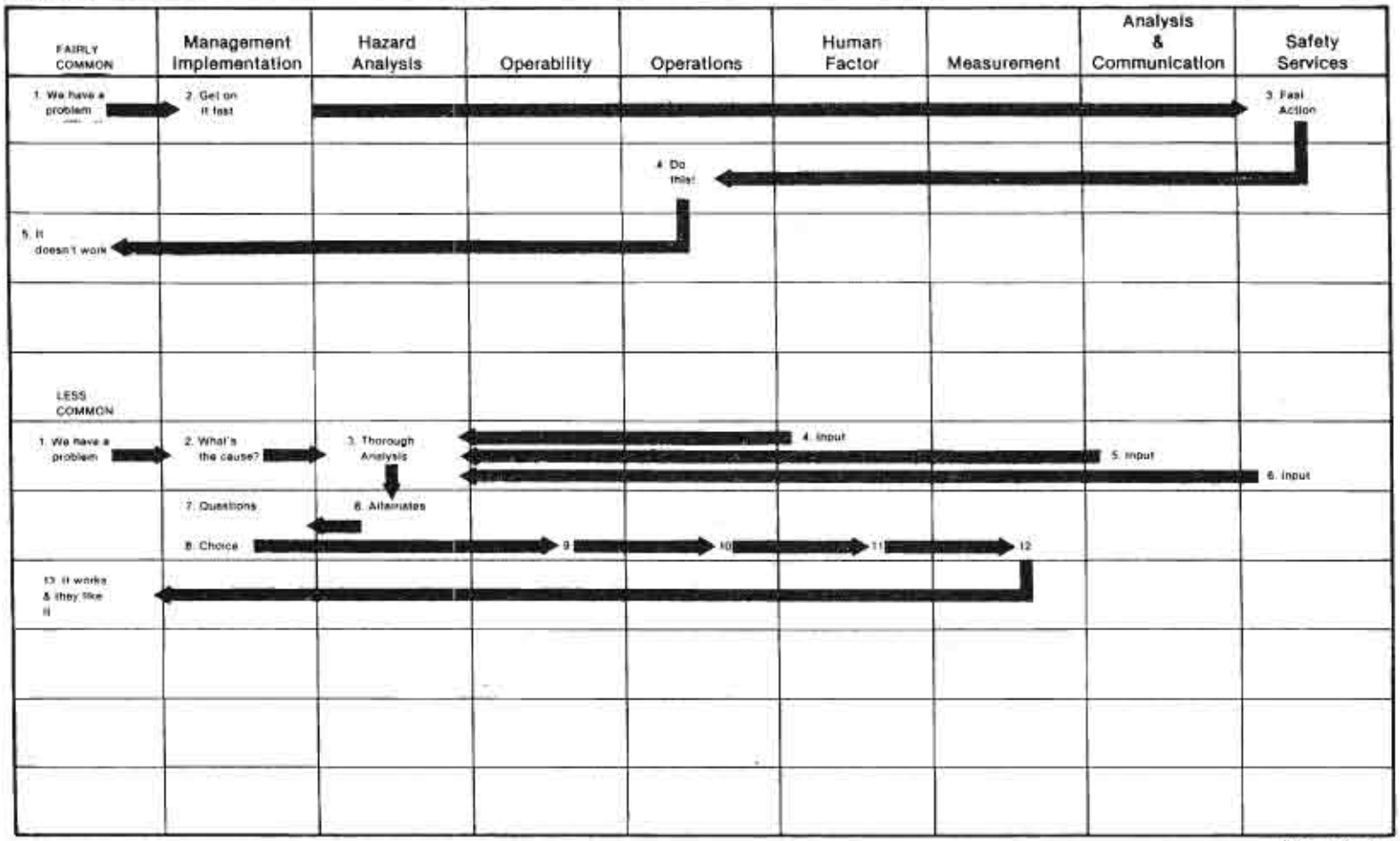
Fig. C-1
Safety Assurance System Summary

SAFETY ASSURANCE SYSTEM SUMMARY

Subject Problem-Solvers Location _____ Date _____

Remarks _____



INEL-A-14 581

Fig. C-2
SASS Example Sheet

EXHIBIT 4

Line and Staff Responsibility - A4

When safety is an advisory capacity to line managers, it is not uncommon to find a few who do not use safety consultation service. Complete the following table.

Title	Frequency of Advice, Consultation, Special Reports Requested By Him or His Staff	Volunteered By Safety

The role of middle management is frequently underplayed. If there are directives or programs which ensure their full envolvement it should be easy to list middle management's leadership in any improvement programs.

Improvement Program	Manager	Date

EXHIBIT 5

Risk Assessment System - A10

To maintain awareness of past assumption of analyzed risks, periodically review current status, and ensure that risks are known and assessed at the proper managerial level complete the following table for major assumed risks:

Risk	Study Documents		Last Review	
	Original	Update	Date	Mgr. Level

Are changing conditions (age of plant, obsolescence, obsolete standards, site or surrounding build-up) properly reflected? _____

Are changing values (e.g., environmental concerns) properly reflected? _____

EXHIBIT 6

Breakthrough Program - A11

Have the goals been documented that will lead the safety program toward becoming the ideal system? _____

Are all disciplines embraced in the DOE policy scope represented in the organization? _____

Attach a list of professional disciplines and departmental location.

Are all disciplines within a single operational safety unit? _____

If "No," how many units? _____

What is the rank of the executive who has all safety disciplines under his control? _____

How many intermediate executives will he deal with if he wants a comprehensive safety assessment? _____

Is the staff organized primarily by discipline? _____

Is Field Service (technical services to areas and departments) specially organized? _____

If "Yes," describe _____

_____

_____

_____

Is responsibility for development of information services centralized in one person? _____

If "No," are you satisifed with information services? _____

Is new program development the primary assigned function of one person? _____

If "No," are you satisifed with your innovation record of the last three years? _____

Do you use a matrix form of organization? _____

Peer Group Committees:

Title/Mission No.	Rank of Representation: Top	Middle	Sup	Empl	Ad Hoc?	Output Quality

If output quality is less than adequate, have they been given serious problems (within their capacity) to solve? _____

Ask each member of the professional safety staff to prepare a professional resume, including:

1. Education

2. Experience

3. Continuing education or training, including short courses

4. Major special assignments (task forces, investigations, reports, etc.)

5. Professional societies

   a. Membership category

   b. Offices and committees

6. Professional papers, internal and external

7. Honors

8. Community service work.

Summarize the results.

List short course on-the-job training offered to safety professionals in the last three years.

Course	Hours	No Attending

How many "young professionals" for future leadership potential are on the safety staff? _____

To what extent does management see the professional safety staff as:

Expert problem solvers? _____

Expert trouble shooters? _____

Are safety professionals often appointed to ad hoc problem solving groups? _____

Planning or "engineering" breakthrough is a difficult job. A good deal of wisdom about the job is available, but must be studied. The methods endorsed have been tested, and they work.

At the same time, appraisals indicate slow rates of program improvement and identify general weaknesses in advance planning in safety divisions.

Evaluate past progress in innovation.

a. Steady improvement in accident rates is the test of an effective program.*

Have your rates dropped 90% in the last 10 years? _____

b. Complete the table for the last ___ years.

Safety Program Improvement Projects: 19 -19

Project Description	Date	Status	Results

Safety Program Improvement Projects: 19 -19

Project Description	Date	Status	Results

*Senate Commerce Committee.

EXHIBIT 7

Safety Analysis Plan - B2

Analysis is a small fraction of project cost. Yet when projects fail: explode, burnup, breakdown, overrun budget and schedule, and fail their mission, under-analysis is a common factor. Can you get any fix on the safety analysis costs?

Project Title	Total Cost	Safety Analysis Costs		
		Engr.	Safety	Support Groups
_____	$ _____	$ _____	$ _____	$ _____
_____	$ _____	$ _____	$ _____	$ _____
_____	$ _____	$ _____	$ _____	$ _____

EXHIBIT 8

Change Analysis - B4

Improved analytic methods have been described and discussed, yet there is little evidence of the use of these methods by management. Attached are two examples that have been tested in field applications. Figures C-3 and C-4 are only intended to be indicative of worksheets needed in real world application.

CHANGE-BASED POTENTIAL PROBLEM ANALYSIS WORKSHEET

Specify Problem _____

Factors	Present?	Prior, Comparable	Differences, Distinctions	Affecting Changes	Preventive Counter Changes

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Fig. C-3
Change-based Potential Problem
Analysis Worksheet

CHANGE-BASED ACCIDENT ANALYSIS WORKSHEET

Subject _____

Factors	Present Situation?	Prior, Comparable?	Differences?	Affective Changes?
What Object(s) Energy Defects Protective Devices				
Where On the object In the Process Place				
When In Time In the Process				
Who Operator Fellow Worker Supervisor Others				
Task Goal Procedure Quality				
Working Conditions Environmental Overtime Schedule Delays				
Trigger Event				
Managerial Controls Control Chain Hazard Analysis Monitoring Risk Review				

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Fig. C-4
Change-[illegible]d Accident Analysis Worksheet

EXHIBIT 9

Independent Review - B10

Pick ten projects last put into operation. Then complete the table below, checking the earliness of the safety input and its contents.

	Time of Input					Content		
Project	Title I	Title II	Title III	When Complete	CSR	Acc. Data	Hazard Analysis	Recommen-dations

EXHIBIT 10

Procedures - C6

Procedures allow for effective control of work practices, for safety and efficiency, with proper quality and quantity.

Types of Procedural Controls	Check those used	% of tasks covered*	Accident tally** Controlled by	Violated
a. Plant rules				
b. Department rules				
c. Health and Safety Manual				
d. Safe Operating Procedures				
e. Job Safety Analysis				
f. Prejob Briefing				
g. Craft manuals/practices				
h. Equipment Mfrs. Manuals**				
i. Other				

*For a high rate department, on the next inspection, keep a tally of procedural controls in effect for each employee.

**For a sample of accidents (excluding first aid) tally the number that were controlled by any procedure, or uncontrolled and the number of violations.

***Have you verified that the men saw them? Are they used?

Laboratories

Procedural control in laboratories can be more difficult to attain or measure, but a few questions can be asked. There are differences in

control dependent on the background and experience of the supervisor or manager in control.

List some examples of high-energy experimental equipment	Supervisor is: Manager, Engineer	Supervisor is: Scientist	Are checklists, procedures, etc. in effect?	Accident Experience?

Scientists doing experiments:

a. Figure C-5 procedure developed by a scientist. Do you have any such protocol? _____

b. Do you have a permit system for unattended experiments? _____

Are the permits renewed for each type of experiment? _____

Or do they run forever? _____

Laboratory Technicians - are they controlled by step-by-step procedures? _____

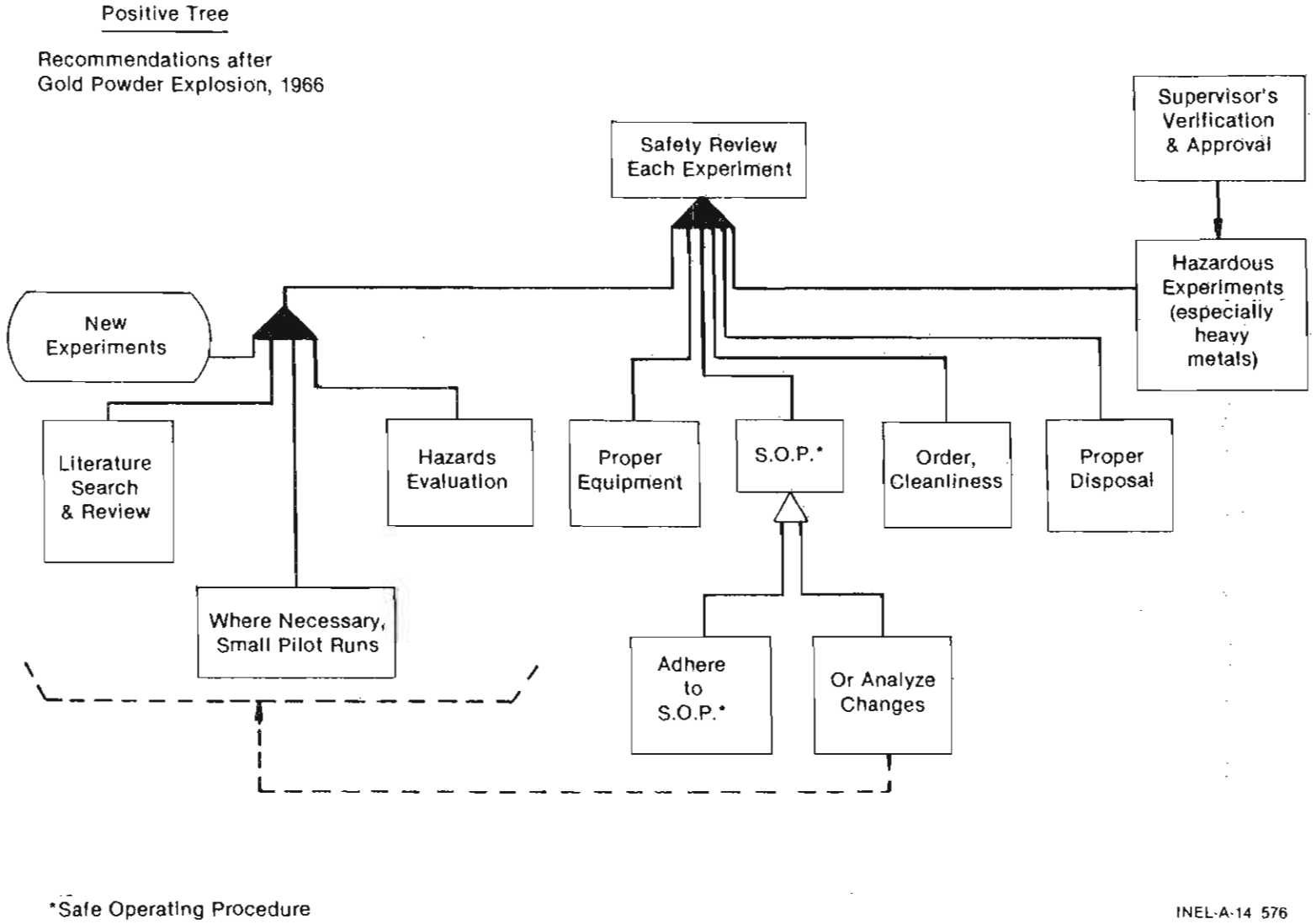

Fig. C-5 A Scientist's Procedural Positive Tree

EXHIBIT 11

Personnel Selection, Training - C8

What special training is required for various crafts and occupations?

Occupation, Specialty	Training Requirements	Qualification Test?	Field Verification
Vehicles			
Industrial Trucks			
Welding			

Field Verification means a check to be sure operators doing the work have qualified.

EXHIBIT 12

Operational Readiness Tests - C11

Make copies of the attached Figures C-6 and C-7 and use them to grade (green, red, blue) for:

(1) Your last big facility start up

(2) A major present operation

(3) A routine, typical daily job.

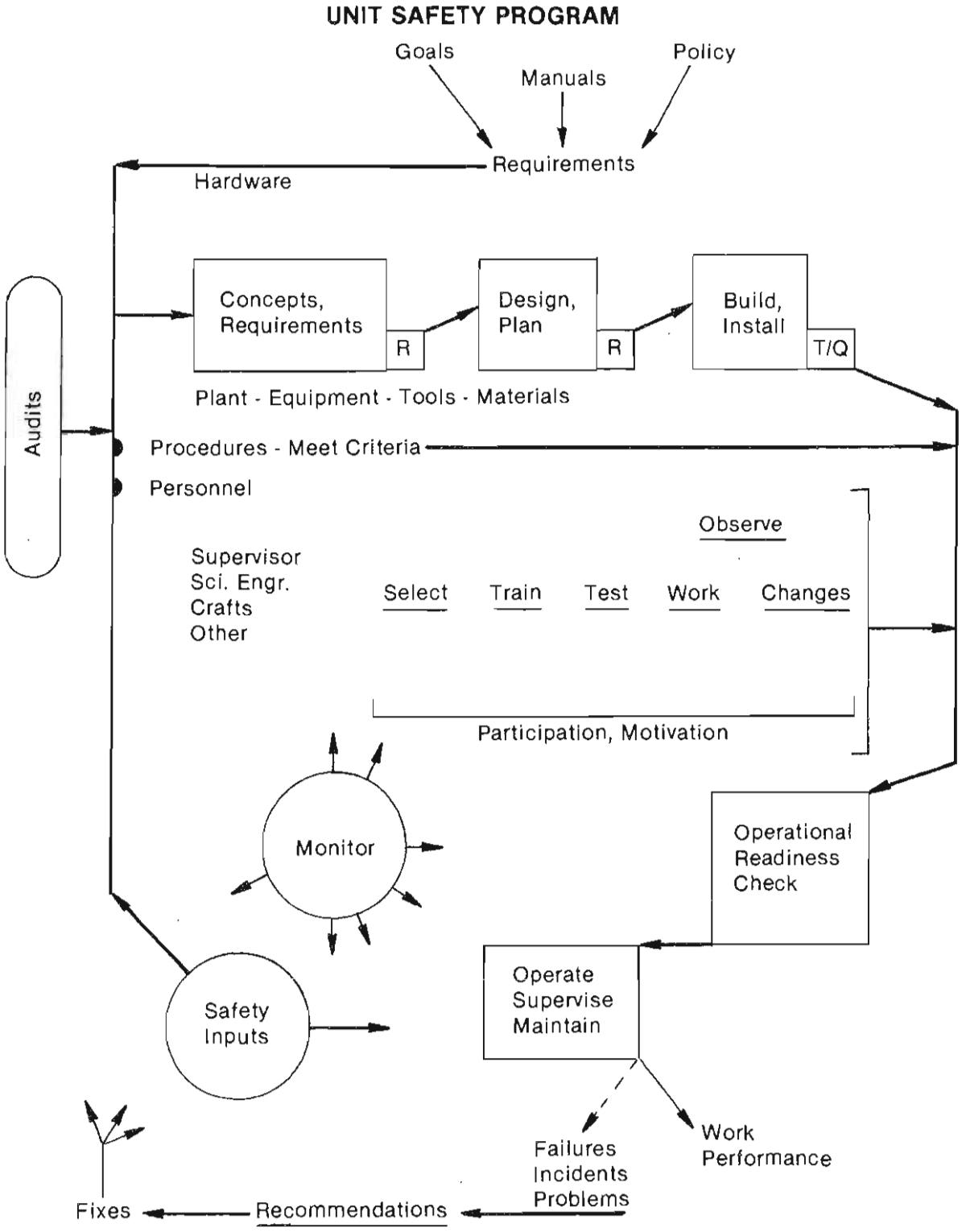

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Fig. C-6
Operational Readiness Schematic

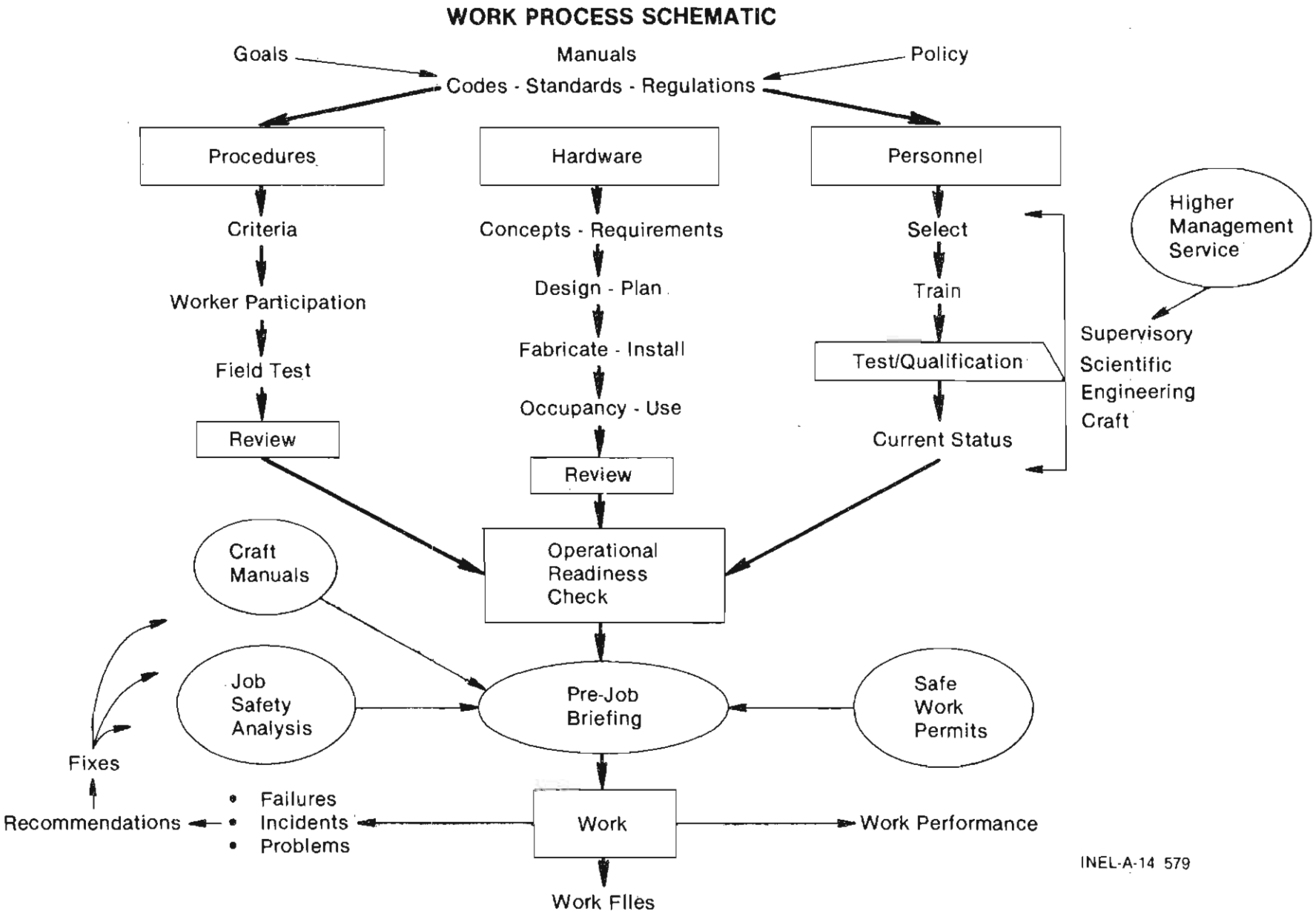

Fig. C-7
Work Process Schematic

EXHIBIT 13

Supervisor Training - D3

List the formal training courses provided in the last five years:

Course Title	Safety Subjects	Hours	Number of Supervisors Reached

If community courses are endorsed/subsidized, described as above:

For major Divisions or Departments list regular management meetings relevant to safety:

Division/Department	Frequency	Length	Safety Coverage		
			Always	Some	Seldom

EXHIBIT 14

Information Analysis and Feedback - D10

List monitoring systems which regularly provide safety feedback to supervisors?

Monitoring System	Frequency of Use	Percent of Supv. Receiving

What general performance feedback (non-safety) is routinely provided to supervisors?

Report/Monitoring System	Frequency	Significance Assessed?

EXHIBIT 15

Measurement - F

In-depth audits can detect more than monitoring systems. However, monitoring systems are needed not only for detection; but, feedback, and analysis.

The following table is intended to be indicative. A special table showing local variations and nomenclature will probably be needed.

Type	Observer	Frequency	Plant Coverage	Trend Analyzed?	Fixes Verified?
1. Supervisor Observation Plan					
2. Error Sampling					
3. Procedural Surveillance					
4. Inspections General					
Special Purpose					
5. Environmental monitoring					
6. Safety Search-out					
7. Technical Support					
8. Outside experts					
9. RSO studies					
10. Accident statistics					
11. QA verifications					
12. Management					

Type	Observer	Frequency	Plant Coverage	Trend Analyzed?	Fixes Verified?
13. Paper audits					
Procedure sign off					
Plan review					
Work permits					
14. DOE surveillance					
15. Visitors and Miscellaneous					

Prepare a list of topics or areas controlled by step-by-step procedures. Rank them in estimated magnitude of hazard (probability x consequences).

List the leading four and then every fourth one until 10 are listed. For these, estimate the degree of compliance.

Procedure	Used in the field?	Percent of steps followed?
1.	%	%
2.	%	%
3.	%	%
4.	%	%
5.	%	%
6.	%	%
7.	%	%
8.	%	%
9.	%	%
10.	%	%

Attach evidence of support your estimates.

If evidence seems weak, try an experiment: Average for independent step-by-step surveillance of a sample of the procedures (for example, 3 to 5 with 100 to 200 steps total).

Tabulate results as follows:

Number of procedures _____

Total number of steps _____

Deviations:		Deviation Rate
Procedures	_____	_____%
Steps	_____	_____%

Procedures LTA*		Deviation Rate
Procedures	_____	_____%
Steps	_____	_____%

*vague, general, incorrect, or out of sequence.

Audits. Have the monitoring systems been audited? _____

When? _____

Fast Action: Is a fast action correction cycle specified for each system? _____

EXHIBIT 16

Accident/Incident Investigation - F3

How many investigations have been conducted to the standards of Accident/Incident Investigation Manual, ERDA-76-20, August 1975.

Check the applicable levels of review and investigations:

	Routine First Report	Supervisor Review	Supervisor Investigation	Review Higher Supv.	Review Safety	Safety Investigation
First aid cases						
Medical cases						
Lost work day cases						
10 days						
100 days						
Permanent disability						

Prepare a similar table for fires, damage, radiation exposures, releases, etc.

EXHIBIT 17

Incident Recall Studies - F4

Has your organization ever conducted an Incident Recall study (RSO's) _____

If so, describe the studies:

Department/Activity	Date	Incidents Reported

EXHIBIT 18

Audit - F10

An audit probes a function or division in greater depth than is possible in either day-to-day surveillance, or in an outside appraisal. The topical coverage of audit programs by subject can be described as follows:

1. Disciplines - nuclear, fire, radiation, waste, etc. For these, indicate whether organization-wide or for one area, and show man-days to express depth of coverage.

2. Functional.

Engineering and Design Subspecialties	Training
Quality Assurance	Procedural Systems
Transportation	Monitoring
Construction	Accident Investigation and Reporting
Safety Program	

or, as stated by one company, "each operating group and area" at appropriate periods.

3. Topical.

Electrical	High Energy Equipment
Mechanical	Reactors
Buildings, Processes	Critical Facilities
Human Factors	Pressure
Waste Management	Lasers
Transportation of Hazardous Material (on-site and off-site)	Accelerators
	Cranes and Hoists
	Heavy Equipment

3. Topical.

Flammables	Hazardous Material Control
Explosives	Personal Protective Equipment
Sanitation	Instrumentation

The criteria employed are variously described:

1. Broad, performance criteria, especially good when used by senior, experienced personnel.

2. Detailed criteria. Auditors may not go beyond these unless the first criteria are also present.

3. Detailed standards and requirements. In general these are too limited a basis for auditing safety.

4. Emerging, new, or "state of the art" criteria can be especially valuable if applied by experienced personnel.

5. RSO's critize subjective judgments, inexperienced personnel, and superficiality of external auditors (phrases like "gum wrappers," "toilet seats," and "extinguisher maintenance" are used).

6. Audits which assess "chains of problems" and systemic weaknesses are especially valuable.

7. Fast action cycles for serious problems should always be stated.

8. The audit function should be seen in a comprehensive approach to safety assurance, and this has been called the "triple redundant system." Line and independent functions are one redundancy. Monitoring and audit programs provide another redundancy. Separate review of technical (hardware, process or subject matter content) and required analytic work is a third redundancy. This can be expressed in a matrix:

	Line	Independent	
Monitoring	x	x	(Technical Content
Audit	x	x	(Analytic Method

Nomenclature: In this discussion the word "audit" as defined is largely used. Many organizations describe audits as "reviews" or "appraisals" which are otherwise defined in this Workbook.

In summary - these descriptions should indicate why audit is a major determinant of program quality.

***

1. Do you have an audit system? _____

   If so, attach descriptive documentation.

2. Complete the following table, entering man-days for each audit.

Audit Topic	Organization-wide or sub unit	1974	1975	1976	1977	1978	1979
Example: Waste Management	organization-wide		30				27

Audit Topic	Organization-wide or sub unit	1974	1975	1976	1977	1978	1979
Example: Waste Management	organization-wide		30				27

3. Try an audit experiment:

   a. Select three processes which have NOT been covered by audit or in-depth study. Examples might be:

      Engineering
      Project engineering
      Procedure preparation
      Maintenance work orders
      Personnel protective equipment - procurement, issuance, maintenance and use of one type of equipment.

   b. Prepare a simple block function schematic of the process.

   c. List steps necessary to fulfill each function. Consult directives, memos, and add your judgment of requirements for a good process.

   d. Walk through the process discussing the functions and steps with the personnel who do the work. Add or amend steps as indicated.

   e. Summarize your findings as follows:

Topic or Function	Subunits Involved	Deviations from Written Directives	Deviations or Omissions, Good Practices

EXHIBIT 19

Priority Problem Lists - G5

It is common for monitoring-audit-appraisal functions to produce lenthy "laundry lists" of desirable corrections. These must be processed in two ways:

1. Prioritized in rank order, or by a three category system.

2. Traced to generic system weaknesses for correction of underlying causes.

The Pareto principle suggests that 20% of the problems may account for 80% of the difficulty and should get 80% of the preventive effort.

1. In what year did your organization first compile a master Priority Problem List (PPL)? _____

   To date, how many problems have been

   (a) cleared by action? _____

   (b) alleviated? _____

   (c) remain on current list? _____

2. Have PPL's been compiled by and for major division or department managers? _____

   If so, compile data on their effectiveness:

Date _____

Division	1st Year	Total No.	Cleared: Fully	Cleared: Partially	Not Cleared

3. How many of your current PPL's reflect need for improved services (R&D, standards, guides, etc.) from higher echelons of DOE?

Problem	Service Need	Reported to: Field	Reported to: Hq

EXHIBIT 20

Fix Controls - G6

Tabulations of pending fixes by building, discipline, priority, etc., is obvious. The periodic (e.g., year end) tabulation of fixes needed may show the sources, departments or other areas which produce the largest number of fix needs, and are likely candidates for system corrections. If recommendations of outside observers are not being detected by internal observers, the questions of what, who, where, when, etc., may lead to substantial improvements of internal appraisal.

Use Table C-2 for all recommendations which affect the safety program.

TABLE C-2

FIX CONTROL EXPLORATORY STUDY

	Sources of Recommendation (a)			
	Professional Search-Out	Accident/Incident Investigation	Appraisal	Audit
Department and Building Affected				
Person/Organization Responsible				
Tickler Files				
Location				
Frequency of Lists to those responsible				
Number cleared in past year				
On-time				
Late				
Number Pending				

(a) Other sources may be utilized, i.e., OSHA deficiency lists, RSOs, inspections, PPLs, etc.

EXHIBIT 21

Information Networks - G8

The objective of information networks is to provide persons with information they need at the time they need it.

1. Does your Safety Division have a good Information system? _____

   Or, does it have dozens of decentralized subsystems? _____

   a. To how many individuals did you go when you collected the information shown below.

Adverse Events	The Past Record			The Risks?	
	10 Years	Last Year	Next Year	Likely	10 Years Worst
Occupational Injury					
Deaths					
Disabling					
Total					
$ Costs					
Motor Vehicle					
Number of Accidents					
$ Costs					
Fire					
Number of Fires					
$ Costs					

Adverse Events	The Past Record			The Risks?	
	10 Years	Last Year	Next Year	Likely	10 Years Worst
Other Damage					
Number of Accidents					
$ Costs					
Total $ Costs					

b. Would radiation data, effluent and environmental accident data, non-motor vehicle transport data require going to more persons? _____

How many? _____

c. To how many persons did you go to collect error rate trend analysis data from monitoring systems? _____

d. What is the grand total? _____

2. A new facility is to be built. It is the successor to a prototype and a pilot facility. The project manager insists on the best possible data bank for use by the designers. He specifies he's to have full information on the following:

		Sources to be searched?
a.	Accident/incident experience and causal factors and patterns:	
	(1) Ours	_____
	(2) Other Laboratories	_____
b.	Failure rates of components	_____
c.	Operator reports of problems and incidents	_____
d.	Codes, standards and regulations - all disciplines	
	(1) In house - internal	_____
	(2) Outside requirements	_____
e.	"State of the Art" technical literature, all disciplines.	
	(1) In house	_____
	(2) Outside laboratories	_____
f.	Sources of expertise on specific functions and components	_____
	Total sources:	_____

3. Have you ever seen a good safety information system operating with information responsibilities decentralized? _____

4. List in detail your stores of data and technical information.

   How many? _____

   How many are indexed for quick retrieval? _____

   How many are computerized? _____

   How many are key-word indexed? (e.g., cranes, valves, chemicals, etc.) _____

5. Do you have a standard practice that all information will be reduced, analyzed and interpreted before distribution? _____

   Your primary business is information.

   Is your business well organized? _____

EXHIBIT 22

Safety Services - H

A service charting and analysis method was developed about twenty years ago and has shown great power for objective analysis and long range planning.

See Figure C-8, which is a completed typical brief service chart for an organization.

Reproduce many copies of the Figure C-9.

Analyze your present services.

List priority problems. For each, as applicable, list services needed to expedite solutions. Plan and schedule the successive, sequential steps in service production.

ANALYSIS OF SERVICES

Who is served?	Research, Fact Finding	Exchange of Information	Standards, Recom-mendations	Training	Technical Assistance	Program Aids	Measurement	Implementation
Managers		Safety Policy Committee	Safety Policy Recommendations PPL Solutions		Independent review and hazard analysis		Program audit Data reduction Performance indicators PPL's Fix Controls	Vigor FAst Pace Expediting corrections and solutions
Designers	Literature search R, D & D New information		Methods Manuals CSR New standards Analytic Methods e.g., Change Analysis	Human Factors Workbook	Hazard Analysis	Data Stores	Independent Review	Expediting
Supervisors	Diagnostic cause and source data	Safety included in regular meetings	H & S Manual Supervisor's Manual Inspection Methods	Safety Mgt Trng "Key man" Program "STOP" Program JSA Training	Inspection & Search out Hazard Analysis	"Industrial Supervisor" magazine	Performance data Accident Investigation Expert audits Error sampling plans	Expediting, especially inter-department problems
Employees	RSO & JSA Involvement	Meetings Suggestion Systems	Procedures and Rules	Orientation Special	Expert response to perceived problems	Literature	Awards	
Procurement			Specifications				Tests	
Experimentors	Safety data		Checklists and Planning Guides	As necessary	Help them do their thing SAFELY	Instruments and Equipment	Independent Review	Watch for Changes!
Those who need help	Personal protective equipment Research to get better standards			Pressure Pers. Prot. Equip. Radiation		Registry of Pressure Equip.		
Breakthrough Plans for major needs.	Develop better solutions →	Get views and comments →	Guide for trial →	Coach the →	Experiment →	Provide tools →	Evaluate if "OK"	Expedite
			Guide for application →	Train →	Assist →	Good aids →	Evaluate →	Success!

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Fig. C-8
Completed Analysis of Services Chart

ANALYSIS OF SERVICES

	Research, Fact Finding	Exchange of Information	Standards, Recom mendations	Training	Technical Assistance	Program Aids	Measurement	Implementation

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Fig. C-9
Blank Analysis of Services Chart

EXHIBIT 23

Improvement Plans - H11

Detailed lists covering each major function of the basic processes should highlight common weaknesses, but only provide preliminary qualitative judgment to get an overview. It would be expected that such lists, as shown below, would be lengthy.

Uncertainties.

		SPIP	
Basic Process	Major Function	Prepared	Executed

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SSDC-13	Management Factors in Accident and Incident Prevention (Including Management Self-Evaluation Checksheets)
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SSDC-23	Safety Appraisal Guide