INFORMATION CLEARANCE FORM

A. Information Category

- [ ] Abstract
- [ ] Summary
- [ ] Visual Aid
- [x] Full Paper
- [ ] Other ______
- [ ] Journal Article
- [ ] Internet
- [ ] Software
- [ ] Report

B. Document Number ~~Not Applicable~~ HNF-4530-FP

C. Title
TECHNICAL SAFETY REQUIREMENTS CONTROL LEVEL VERIFICATION

D. Internet Address jennifer_l_stewart@rl.gov

E. Required Information

1. Is document potentially Classified? (●) No ( ) Yes (MANDATORY)

See below for Signature CW 5-17-99
Manager's Signature Required

If Yes ______ (●) No ( ) Yes Classified
ADC Signature Required

2. Internal Review Required? (●) No ( ) Yes
If Yes, Document Signatures Below

Counsel ______

Program ______

3. References in the Information are Applied Technology (●) No ( ) Yes
Export Controlled Information (●) No ( ) Yes

4. Does Information Contain the Following: (MANDATORY)

a. New or Novel (Patentable) Subject Matter? (●) No ( ) Yes
If "Yes", Disclosure No.: ______

b. Information Received in Confidence, Such as Proprietary and/or Inventions?
(●) No ( ) Yes If "Yes", Affix Appropriate Legends/Notices.

c. Copyrights? (●) No ( ) Yes If "Yes", Attach Permission.

d. Trademarks? (●) No ( ) Yes If "Yes", Identify in Document.

5. Is Information requiring submission to OSTI? (●) No ( ) Yes
If Yes UC-______ and B&R-______

6. Release Level? (●) Public ( ) Limited

7. Charge Code 101950

F. Complete for a Journal Article

1. Title of Journal Not Applicable

G. Complete for a Presentation

1. Title for Conference or Meeting Energy Facility Contractors Group (EFCOG) Safety Analysis Workshop
2. Group Sponsoring Fluor Daniel Northwest, Inc.
3. Date of Conference 06/13-18/1999
4. City/State Portland, Oregon
5. Will Information be Published in Proceedings? ( ) No (●) Yes
6. Will Material be Handed Out? ( ) No (●) Yes

H. Author/Requestor
Jennifer L. Stewart *Jennifer L. Stewart*
(Print and Sign)

Responsible Manager
Raymond J. Puigh II *[signature]*
(Print and Sign)

I. Reviewers

Reviewers	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒	Kenneth M. Norris	*K.M. N...*	(Y) / N
Office of External Affairs	☒	Debra D. Miller	*Debra D. Miller*	(Y) / N
DOE-RL	☒	Dennis H. Irby	See page 2 for signature	(Y) / N
Other	☒	Christine Willingham	*Christine Willingham*	(Y) / N
Other	☐			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

- [ ] Applied Technology
- [ ] Personal/Private
- [ ] Proprietary
- [ ] Business-Sensitive
- [ ] Predecisional
- [ ] UCNI
- [ ] Protected CRADA
- [ ] Export Controlled
- [ ] Procurement-Sensitive
- [ ] Patentable
- [ ] Other (Specify) ______

Information Clearance Approval

APPROVED FOR RELEASE
OFFICIAL DOCUMENT
CW
Date 5-17-99

K. If Additional Comments, Please Attach Separate Sheet

page 1 of 2

A-6001-401 (02/98)

INFORMATION CLEARANCE FORM

A. Information Category

- [ ] Abstract
- [ ] Summary
- [ ] Visual Aid
- [x] Full Paper
- [ ] Journal Article
- [ ] Internet
- [ ] Software
- [ ] Report
- [ ] Other ______

B. Document Number Not Applicable

C. Title
TECHNICAL SAFETY REQUIREMENTS CONTROL LEVEL VERIFICATION

D. Internet Address jennifer_l_stewart@rl.gov

E. Required Information

1. Is document potentially Classified? (●) No ( ) Yes (MANDATORY)

   ______ Manager's Signature Required

   If Yes ______ ADC Signature Required (●) No ( ) Yes Classified

2. Internal Review Required? (●) No ( ) Yes
   If Yes, Document Signatures Below

   Counsel ______

   Program ______

3. References in the Information are Applied Technology (●) No ( ) Yes
   Export Controlled Information (●) No ( ) Yes

4. Does Information Contain the Following: (MANDATORY)
   a. New or Novel (Patentable) Subject Matter? (●) No ( ) Yes
      If "Yes", Disclosure No.: ______
   b. Information Received in Confidence, Such as Proprietary and/or Inventions?
      (●) No ( ) Yes If "Yes", Affix Appropriate Legends/Notices.
   c. Copyrights? (●) No ( ) Yes If "Yes", Attach Permission.
   d. Trademarks? (●) No ( ) Yes If "Yes", Identify in Document.

5. Is Information requiring submission to OSTI? (●) No ( ) Yes
   If Yes UC- ______ and B&R- ______

6. Release Level? (●) Public ( ) Limited

7. Charge Code 101950

F. Complete for a Journal Article

1. Title of Journal Not Applicable

G. Complete for a Presentation

1. Title for Conference or Meeting Energy Facility Contractors Group (EFCOG) Safety Analysis Workshop
2. Group Sponsoring Fluor Daniel Northwest, Inc.
3. Date of Conference 06/13-18/1999
4. City/State Portland, Oregon
5. Will Information be Published in Proceedings? ( ) No (●) Yes
6. Will Material be Handed Out? ( ) No (●) Yes

H. Author/Requestor

Jennifer L. Stewart *Jennifer L. Stewart*
(Print and Sign)

Responsible Manager

Raymond J. Puigh II *[signature]*
(Print and Sign)

I. Reviewers

Reviewers	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒	Kenneth M. Norris		Y / N
Office of External Affairs	☒	Debra D. Miller		Y / N
DOE-RL	☒	Dennis H. Irby	*Dennis H. Irby*	(Y) / N
Other	☒	Christine Willingham		Y / N
Other	☐			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

- [ ] Applied Technology
- [ ] Personal/Private
- [ ] Proprietary
- [ ] Business-Sensitive
- [ ] Predecisional
- [ ] UCNI
- [ ] Protected CRADA
- [ ] Export Controlled
- [ ] Procurement-Sensitive
- [ ] Patentable
- [ ] Other (Specify) ______

Information Clearance Approval

DOE SIGNATURE DOES NOT AUTHORIZE USE OF PROJECT FUNDS FOR TRIP/MEETING DHI

K. If Additional Comments, Please Attach Separate Sheet

Page 2 of 2

HNF-4530-FP

S

Technical Safety Requirements Control Level Verification

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.

Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

HNF-4530-FP

S

Technical Safety Requirements Control Level Verification

Jennifer L. Stewart
Fluor Daniel Northwest, Inc.

Date Published
May 1999

To Be Presented at
Energy Facility Contractors Group (EFCOG)
Safety Analysis Workshop
Portland, Oregon
June 13-18, 1999

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.

P.O. Box 1000
Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Technical Safety Requirements
Control Level Verification

J. L. Stewart, Fluor Daniel Northwest, Inc.
Y. G. Noorani, U.S. Department of Energy, Office of River Protection

ABSTRACT

A Technical Safety Requirement (TSR) control level verification process was developed for the Tank Waste Remediation System (TWRS) TSRs at the Hanford Site in Richland, WA, at the direction of the U.S. Department of Energy, Richland Operations Office (RL). The objective of the effort was to develop a process to ensure that the TWRS TSR controls are designated and managed at the appropriate levels as Safety Limits (SLs), Limiting Control Settings (LCSs), Limiting Conditions for Operation (LCOs), Administrative Controls (ACs), or Design Features.

The TSR control level verification process was developed and implemented by a team of contractor personnel with the participation of Fluor Daniel Hanford, Inc. (FDH), the Project Hanford Management Contract (PHMC) integrating contractor, and RL representatives. The team was composed of individuals with the following experience base: nuclear safety analysis; licensing; nuclear industry and DOE-complex TSR preparation/review experience; tank farm operations; FDH policy and compliance; and RL-TWRS oversight. Each TSR control level designation was completed utilizing TSR control logic diagrams and TSR criteria checklists based on DOE Orders, Standards, Contractor TSR policy, and other guidance. The control logic diagrams and criteria checklists were reviewed and modified by team members during team meetings. The TSR control level verification process was used to systematically evaluate 12 LCOs, 22 AC programs, and approximately 100 program key elements identified in the TWRS TSR document. The verification of each TSR control required a team consensus. Based on the results of the process, refinements were identified and the TWRS TSRs were modified as appropriate. A final report documenting key assumptions and the control level designation for each TSR control was prepared and is maintained on file for future reference. The results of the process were used as a reference in the RL review of the final TWRS TSRs and control suite.

RL concluded that the TSR control level verification process is clear and logically based upon DOE Order 5480.22, *Technical Safety Requirements*, and other TSR control selection guidelines. The process provides a documented, traceable basis for TSR level decisions and is a valid reference for preparation of new TSRs.

INTRODUCTION

This paper describes the Technical Safety Requirement (TSR) control level verification process that was developed for the Tank Waste Remediation System (TWRS), now known as the Office of River Protection, at the Hanford Site in Richland, Washington. The TSRs for which the process was developed are based on the TWRS Basis for Interim Operation (BIO) and the Final Safety Analysis Report (FSAR). The scope of the BIO and FSAR primarily addressed 177 underground waste storage tanks, equipment for transferring waste to and from tanks, and interfacing facilities.

This process provides a documented, traceable basis for TSR control level decisions and is a valid reference for verifying existing TSRs and preparing new TSRs.

DEVELOPMENT HISTORY

In December 1996, the U.S. Department of Energy (DOE), Richland Operations Office (RL) conditionally approved the TWRS BIO and TSRs for implementation. In the approval letter, RL stated that the TSRs contain a reasonable suite of controls. However, RL directed the Project Hanford Management Contract integrating contractor to propose a process to verify and refine the TSR controls to ensure whether or not there should be Safety Limits (SLs) and that the controls are managed at an appropriate level. In addition, the Contractor was directed to include selected toxicological controls in the final TWRS TSRs. The task addressed the following Contractor actions from the RL approval letter (Wagoner 1996):

- "Propose a process for the refinement of the TSRs which includes the verification of whether or not there should be Safety Limits and the basis for designating the appropriate level for each control."

- "Modify the approach to controls that prevent or mitigate toxicological hazards, such that, events with significant consequences to workers and the public are controlled by TSRs rather than the Health and Safety Plan (HASP), which applies only to facility workers."

- "As the refinement process progresses, document changes to the TSRs and submit revised TSRs for final approval prior to commencement of the readiness assessment portion of the Compliance Implementation Plan."

The BIO and TSRs were declared implemented by RL and the Project Hanford Management Contract integrating contractor, and a point transition to these documents as the Authorization Basis for TWRS occurred in September 1997.

In parallel with the development and implementation of the BIO and TSRs, a comprehensive FSAR and TSRs were completed and approved by DOE in March 1999. Official transition from the BIO to the FSAR is expected in calendar year 1999. Both the BIO and FSAR provide the supporting analyses and documentation for the single TSR document for which the TSR control level verification process was developed.

TSR CONTROL LEVEL VERIFICATION PROCESS

The TSR control level verification process was performed according to an approved TWRS TSR Verification and Revision Plan (Noorani 1997). The process individually evaluated each of the established 12 Limiting Conditions for Operation (LCOs), 22 Administrative Control (AC) programs, and approximately 100 AC program key elements identified in HNF-SD-WM-TSR-006, *Tank Waste Remediation System Technical Safety Requirements*, dated November 1996.

Team Approach. The TSR verification process utilized a team approach to verify each TSR control level designation. The TSR verification team was assembled from various contractor organizations. RL representatives were invited to participate as observers to the TSR verification process. The TSR verification and control level designation required a consensus by the team, which included representatives from the following contractor and RL organizations:

- TWRS Nuclear Safety and Licensing
- Consultant
- Tank Farm Operations

- Lead TWRS BIO/FSAR safety analyst
- Lead TWRS BIO/FSAR TSR writer
- DOE TWRS oversight
- Fluor Daniel Hanford, Inc. Environment, Safety, and Health

TSR Control Logic - Chart A. TSR Control Logic – Chart A (Figure 1) was used first to determine control candidates based on challenging or exceeding offsite and onsite risk evaluation guidelines for unmitigated accident analyses, or facility worker safety considerations. Chart A was also used to provide an initial screening for SLs. Based on the initial screening, Chart A either identified an SL/AC candidate with direction to go to SL/LCS Control Logic – Chart B (Figure 2), or identified an LCO/AC candidate with direction to go to LCO Control Logic – Chart C (Figure 3) for further TSR verification.

Chart A key assumptions include the following:

- The definition of TSR is taken from DOE Order 5480.22, Section 6.p.
- Facility-specific approved risk evaluation guidelines are used.
- SLs relate to exceeding offsite or onsite risk evaluation guidelines and involve process variables that could directly cause failure of a primary barrier in accordance with DOE Order 5480.22, Section 22.d.
- TSR controls for worker safety relate to acute worker fatality or serious injury to workers as interpreted by DOE Standard 3009-94.
- TSR controls are not required if the control is already required by other regulatory/contractual systems of basis requirements (e.g., radiological protection, hazardous material protection, fire protection, procedures, training). That is, integrated safety management programs that provide operational control and discipline for preventing accidents are not included in the TSRs. These programs are normally discussed in the programmatic chapters of applicable supporting Authorization Basis documents.

SL/LCS Control Logic – Chart B. SL/LCS Control Logic – Chart B (Figure 2) was completed if the initial screening of the TSR control in Chart A identified an SL/AC candidate. Chart B was used to screen LCSs, or AC candidates for SLs that do not meet the DOE 5480.22 criteria.

Chart B key assumptions include the following:

- The definition of an SL is taken from DOE Order 5480.22, Section 9.e.(2).
- The process variable that is the subject of the SL is directly measured. That is, the process variable is monitored and displayed in accordance with DOE 5480.22, Attachment 1, Section 2.2.a., and is controlled in real-time or near to real-time.
- The LCS that protects the SL is combined with the LCO as part of operability of the system, as applicable.

LCO Control Logic – Chart C. LCO Control Logic – Chart C (Figure 3) was completed if the initial screening of the TSR control in Chart A identified an LCO/AC candidate. Chart C was used to identify if an LCO or AC is required. An LCO candidate was selected if the control was related to an active piece of equipment or a process variable. A piece of equipment was determined to be "active" if it required a motive force to accomplish its designed safety function and is equipment qualified to be operational by functional testing (ASME Section 11). Otherwise, an AC or Design Feature candidate was selected.

Chart C key assumptions include the following:

- LCOs meet the screening criteria of DOE Order 5480.22, Attachment 1, Section 2.3.h. That is, the LCO supports an SL, detection, actuation, part of the primary success path, fissile material handling, or experiment.
- Process variables are directly measured in real-time or near to real-time, and are monitored and displayed.
- Recovery or predetermined actions can be taken for LCO candidates.
- Design Features are managed by configuration control processes.

Verification Checklist. A TSR evaluation criteria checklist was utilized to help elucidate control selection criteria for SLs, LCSs, LCOs, ACs, and Design Features during the verification process. This checklist was used in conjunction with the control logic diagrams A, B, and C described above. Criteria sources from which checklist criteria questions were developed included the following:

- DOE Order 5480.22, *Technical Safety Requirements* (1992)
- DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* (1994)
- DOE Letters (1996)
- WHC-CM-4-46, *Safety Analysis Manual*, and associated interpretation letters (1996)
- TWRS FSAR Chapter 5.0, "Derivation of Technical Safety Requirements" (1996)
- DOE-sponsored TSR Training Course entitled "Preparing and Reviewing Technical Safety Requirements" (1995)
- Document of Example Technical Safety Requirements, Volume 2: Interpretation Guide (1995)
- Energy Facility Contractors Group (EFCOG) Safety Analysis Working Group (SAWG) Technical Safety Requirements (TSR) Subgroup: "Checklist and Guide for the Evaluation of a TSR Document for Compliance with DOE Order 5480.22 Requirements" – Draft (1996)
- NUREG 1431, *Standard Technical Specifications, Westinghouse Plants* (1992)
- TWRS Safety Analysis Training/Workshop (1996).

Position Statement. A final position statement was developed in the final report to document the TSR verification teams' recommendation for TSR control level designation and associated refinements. The position statement provided further evaluation and justification of the TSR control level designation to ensure that a change to a TSR control level was indeed necessary to enhance safety and management of safety at TWRS. Administrative Controls at TWRS are considered equivalent in importance to LCOs. Therefore, an AC was recommended over an LCO if the control is better controlled and implemented by a program rather than by a direct measurement and ensuing action. This approach is consistent with DOE Standard 3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, which states: "judgement should be used to determine what controls warrant use of operational limits" and "the decision as to whether an operating limit (such as an LCO) or a TSR Administrative Control is more appropriate is left to the judgement of the SAR preparer." Consistent with this philosophy, the following criteria were used to make a final TSR level designation:

- Would a change to the TSR control level designation enhance or degrade overall TWRS safety?
- Would a change to the TSR control level designation change operations in the field? That is, would the change require a different implementation requirement, equipment, or surveillance requirement?

- Would changing a single program key element of an AC program to an LCO lead to increased complexity in the field or reduction in safety compliance?
- Would a change to the TSR control level designation be cost effective? That is, would equipment need to be purchased or upgraded under budget constraints?
- Other considerations included: (1) ease of parameter measurement, (2) control of field conditions, (3) response actions, (4) surveillance requirements if an element is changed to an AC program, and (5) current control method.

RESULTS

RL concluded that the TSR control level verification process fulfilled the Contractor actions in the RL letter that conditionally approved the BIO and TSRs (Wagoner 1996). In the RL letter that approved the process (Sohn 1997), RL stated that "the process is clear and logically based upon DOE Order 5480.22 and other TSR control selection guidelines. It provides a traceable basis for TSR level decisions and is a valid reference for preparation of the final TSR package."

Based on the results of the process, the following refinements were made to the TWRS TSRs, which were approved by RL for implementation in May 1997:

- One SL for waste temperature was included for single-shell, double-shell, and aging-waste facility tanks, based on the postulated organic salt-nitrate reaction accident analysis ("chemical runaway" reaction).

- One toxicological control was included based on the postulated caustic spray leak accident analysis (piping system failure).

- AC program controls for passive physical barriers (vehicle controls) based on several postulated accidents became Design Features.

DOCUMENTATION

A final report documenting key assumptions and the control level designation for each TSR control was prepared and is maintained in the TWRS project files for future reference.

REFERENCES

DOE Order 5480.22, 1992, *Technical Safety Requirements*, Change 1 (1992), and Change 2 (1996), U.S. Department of Energy, Washington, D.C.

DOE-Sponsored TSR Training Course, 1995, "Preparing and Reviewing Technical Safety Requirements," U.S. Department of Energy, Washington, D.C.

DOE-STD-3009-94, 1994, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, U.S. Department of Energy, Washington, D.C.

Energy Facility Contractors Group (EFCOG) Safety Analysis Working Group (SAWG) Technical Safety Requirements (TSR) Subgroup: "Checklist and Guide for the Evaluation of a TSR Document for Compliance with DOE Order 5480.22 Requirements," (Draft) 1996.

Noorani, Y. G., 1997, *Tank Waste Remediation System (TWRS) Technical Safety Requirements (TSRs) Verification and Revision Plan* (letter 2N110-YGN-97001 to G. L. Dunford, DE&S Hanford, Inc., January 15), DE&S Hanford Inc., Richland, Washington.

NUREG 1431, 1992, *Standard Technical Specifications, Westinghouse Plants*, Rev. 0, U.S. Nuclear Regulatory Commission, Washington, D.C.

Sohn, C. L., 1997, *Contract Number DE-AC06-96RL13200; U.S. Department of Energy, Richland Operations Office (RL), Tank Waste Remediation System (TWRS) Technical Safety Requirements (TSR) Verification Process* (letter 97-MSD-182 to H. J. Hatch, Fluor Daniel Hanford, Inc., March 5), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

TSR Example Document Interpretation Guide, 1995, Volume 2: "Interpretation Guide," U.S. Department of Energy, Washington, D.C.

TWRS Safety Analysis Training/Workshop, 1996.

WHC-CM-4-46, 1989, *Nonreactor Facility Safety Analysis Manual*, Section 6, "Technical Safety Requirements," Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Wagoner, J. D., 1996, *Contract Number DE-AC06-96RL13200; Approval of Tank Waste Remediation System (TWRS) Basis for Interim Operation (BIO)* (letter 96-MSD-390 to H. J. Hatch, Fluor Daniel Hanford, Inc., December 12), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

FIGURE 1. TSR CONTROL LOGIC - CHART A

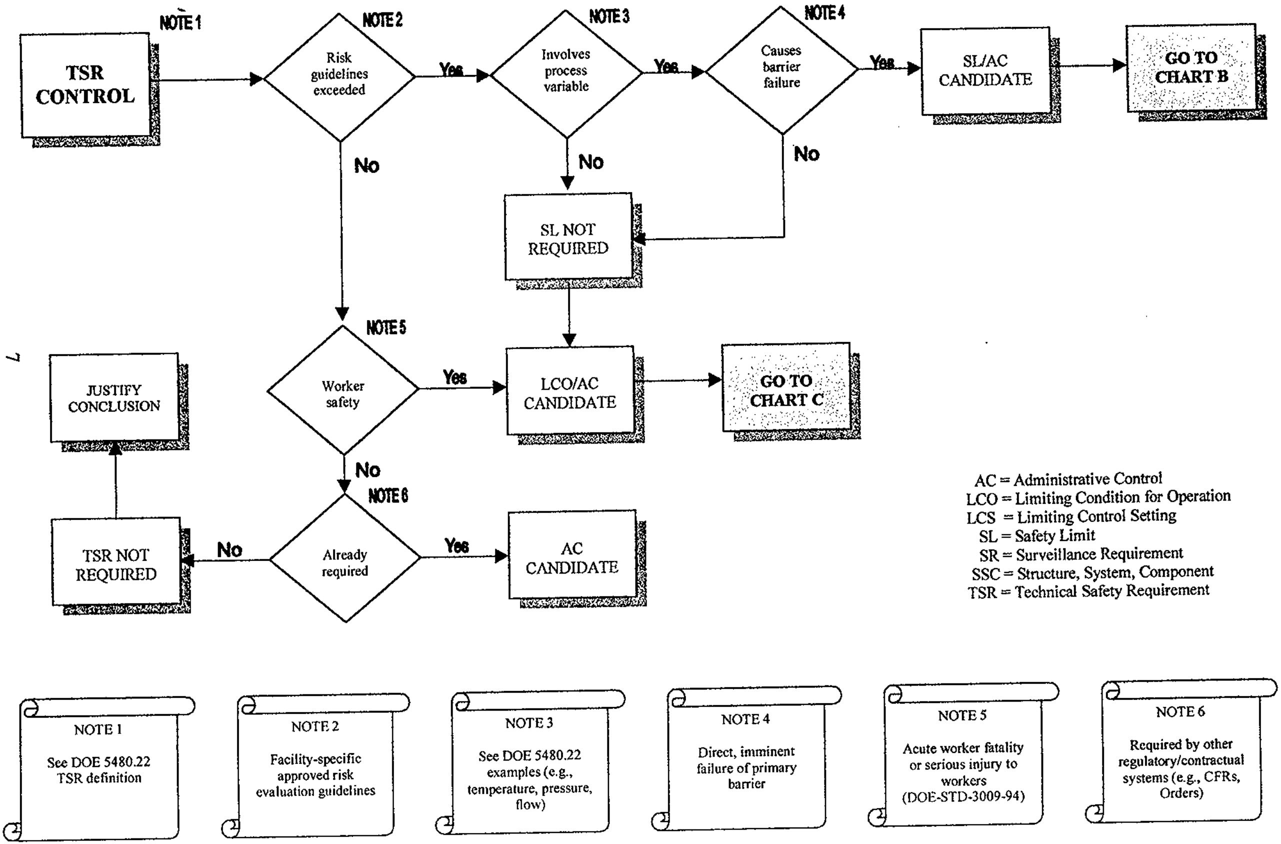

FIGURE 2. SL/LCS CONTROL LOGIC - CHART B

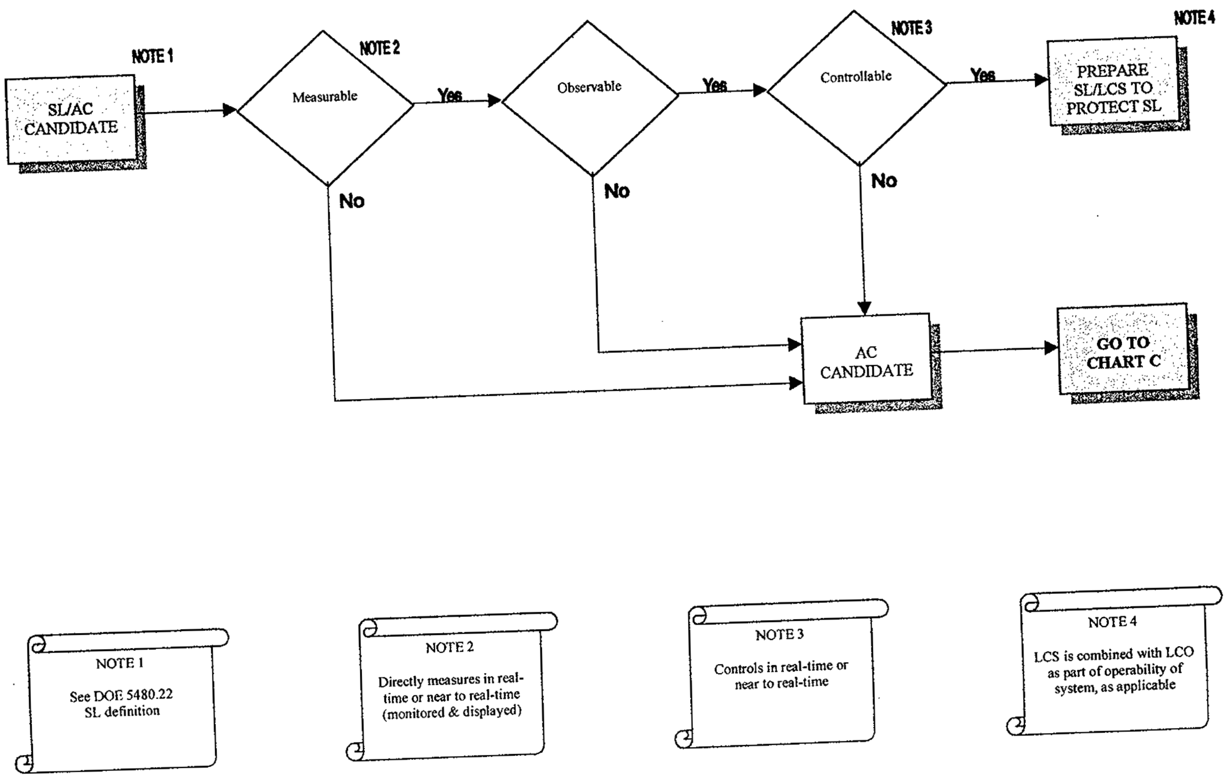

FIGURE 3. LCO CONTROL LOGIC - CHART C