NUREG/CR-3905
ORNL/NSIC-223
Vol. 3

Sequence Coding and Search System for Licensee Event Reports

Coder's Manual
Volumes 3 and 4

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Prepared for
U.S. Nuclear Regulatory
Commission

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Manuscript Completed: November 1984
Date Published: April 1985

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NRC FIN A9451

ABSTRACT

Operating experience data from nuclear power plants are essential for safety and reliability analyses, especially analyses of trends and patterns. The licensee event reports (LERs) that are submitted to the Nuclear Regulatory Commission (NRC) by the nuclear power plant utilities contain much of this data. The NRC's Office for Analysis and Evaluation of Operational Data (AEOD) has developed, under contract with NSIC, a system for codifying the events reported in the LERs. The primary objective of the Sequence Coding and Search System (SCSS) is to reduce the descriptive text of the LERs to coded sequences that are both computer-readable and computer-searchable. This system provides a structured format for detailed coding of component, system, and unit effects as well as personnel errors. The database contains all current LERs submitted by nuclear power plant utilities for events occurring since 1981 and is updated on a continual basis.

This four volume report documents and describes SCSS in detail. Volume 1 is a User's Guide for searching the SCSS database. Chapter 2 of this guide is a tutorial on retrieving, displaying, and analyzing LERs and provides hands-on experience in executing basic commands. Volume 2 contains all valid and acceptable codes used for searching and encoding the LER data. Volumes 3 and 4 provide a technical processor, new to SCSS, the information and methodology necessary to capture descriptive data from the LER and to codify that data into a structured format and serve as reference material for the more experienced technical processor, and contains information is essential for the more advanced user who needs to be familiar with the intricate coding techniques in order to retrieve specific details in a sequence.

This volume contains updated material through amendment 1 to revision 1 of the working version of ORNL/NSIC-223, Vol. 3.

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1.1.1 Background

Operating experience data from nuclear power plants are essential for safety and reliability analyses, especially analyses of trends and patterns. The Licensee Event Reports (LERs) that are submitted to the Nuclear Regulatory Commission (NRC) by the nuclear power plant utilities contain much of this data.[1,2] Since 1967, the Nuclear Safety Information Center (NSIC), a part of Oak Ridge National Laboratory (ORNL), has abstracted and stored LERs and their generic predecessors on a computer file. From 1973 to 1981, the NRC also stored LER data on a computer file which included data beginning in 1969. The NRC terminated the latter database at the end of calendar year 1981. The NSIC database is being maintained for the NRC and is available through the Department of Energy's information system — RECON.[3]

Prior to the development of the Sequence Coding and Search System (SCSS), searching and retrieving LERs had been primarily through the use of descriptive keywords in the NSIC database. As the number of LERs increased (as more plants have come online), the size of this database also increased. The increase in size, coupled with the design characteristics of the SCSS data base, limited its adaptability of the NSIC database for detailed information searches. Therefore the need for a storage system with more efficient and sophisticated data retrieval methods became evident.

The NRC's Office for Analysis and Evaluation of Operational Data (AEOD) has developed, under contract with NSIC, a system for codifying the events reported in the LERs. The primary objective of the Sequence Coding and Search System (SCSS)[4] is to reduce the descriptive text of the LERs to coded sequences that are both computer-readable and computer-searchable. This system provides a structured format for detailed coding of such factors as components, systems, causes, and effects as well as information about personnel errors. Some distinctive features of the SCSS are:

1. SCSS has sophisticated and efficient search techniques.
2. SCSS includes information from the entire LER including NRC Form 366 and the supplemental data sheets.
3. The codes categorize the components in both fine (specific) and coarse (generic) detail.
4. Components are identified by system.
5. SCSS describes personnel actions in detail.
6. SCSS explicitly identifies the loss of one or more trains and/or systems.
7. SCSS identifies multiple initiators of an event (if they exist).

8. Information regarding unit effects and radiological releases and personnel exposures is accessible.

The LER SCSS database utilizes the Joshua database management system[5] which operates on the Oak Ridge National Laboratory's IBM 3033 computer.

1.1.2 Purpose

The purpose of this manual is threefold. First, it provides a technical processor (or coder), new to SCSS, the information and philosophy necessary to capture descriptive data from the LER and to codify that data into a structured format. Secondly, this manual is a reference document for the more experienced technical processor. Processors will often find it necessary to refer to this manual for coding guidance to maintain consistency in coding and to access the unit-specific design data in the appendices. Finally, this guide is essential to the more sophisticated user who needs to be familiar with the intricate coding techniques in order to access the details in a sequence. However, specific access commands are not detailed here, but are contained in the SCSS user's manual.[6]

1.1.3 Definition of terms

The following definitions of frequently used terms are necessary for complete understanding of the topics discussed in the following sections. These terms are:

1. Personnel error — inappropriate and undesired personnel action or inaction affecting system/component operability or otherwise affecting the initiation, course, or outcome of an event.
2. System failure — the inoperability of a system or its inability to perform the intended function.
3. Component or piece part failure — the inoperability of a component or piece part or its inability to perform the intended function.
4. Command fault — any undesired state of a component which does not require repair of the subject component for the component to return to the desired state.
5. Repair — action taken to restore operability of a component or any of the component's piece parts other than by adjustment or other minor action.
6. Occurrence — a single component, system, or personnel action that represents one of the discrete elements that characterize the initiation or course of an event and affect its outcome. Most occurrences are failures, command faults, or personnel errors. However, correct operator or system actions may be coded when they add information important to the sequence (e.g., reactor protection system actuates due to previous component failures).
7. Sequence — one or more occurrences ("chain of occurrences") that are related to each other by virtue of each occurrence contributing to the cause of the subsequent occurrences. A sequence of occurrences is ordered in time (e.g., the breaker trips open causing the

pump to stop, thereby causing the steam generator to have a low water level, which actuates the reactor protection system and scrams the reactor.)

8. Event — one or more sequences that are reported in a single LER.
9. Rule — direction or guidance for coding a specific type of occurrence or group of occurrences.

1.2 LER Processing

NSIC receives copies of Licensee Event Reports (LERs) regularly from the NRC's Division of Technical Information and Document Control. With these LERs, NSIC produces three main listings as well as smaller listings in many special studies. The main listings include:

1. the SCSS database;
2. the LER Monthly Report [NUREG/CR-2000 (ORNL/NSIC-200)]; and
3. the RECON file of LER abstracts.

The steps in producing these lists are in two phases, the coding process phase and the database process phase, as Fig. 1.1 illustrates.

1.2.1 Phase I - coding process

The coding process involves steps from the LERs being separated from other docket mail received from the NRC to the SCSS coding forms being sent to keypunch and LER abstracts being sent to the abstract file (Fig. 1.1). After the LERs are separated from the docket mail, they are added to an inventory file that monitors the completion of the processing to ensure proper handling. The inventory file also allows checking against other LER listings of NRC and the Institute of Nuclear Power Operations (INPO) to ensure that all LERs for a given year have been received. Certain LERs are not codable because the SCSS codes do not apply [for example, LERs involving the Ft. St. Vrain high-temperature gas-cooled reactor or LERs involving fish entrainment]. The abstracts of these LERs are included in the RECON file but the LERs are not sequence coded. The codable LERs are divided among technical processors to be sequence coded. Selected LERs that are designated for a quality assurance (QA) check are coded by all technical processors and the results compared for consistency. Additionally, a portion of the LERs that are coded by each technical processor are reviewed by a second technical processor for accurate and complete transfer of information from the LER to the coding form. After a spot check of the coding form by a third technical processor, the LER abstract is sent for input into the abstract holding file for eventual linking to coded data and the coding form is sent to be keypunched for input to the computer.

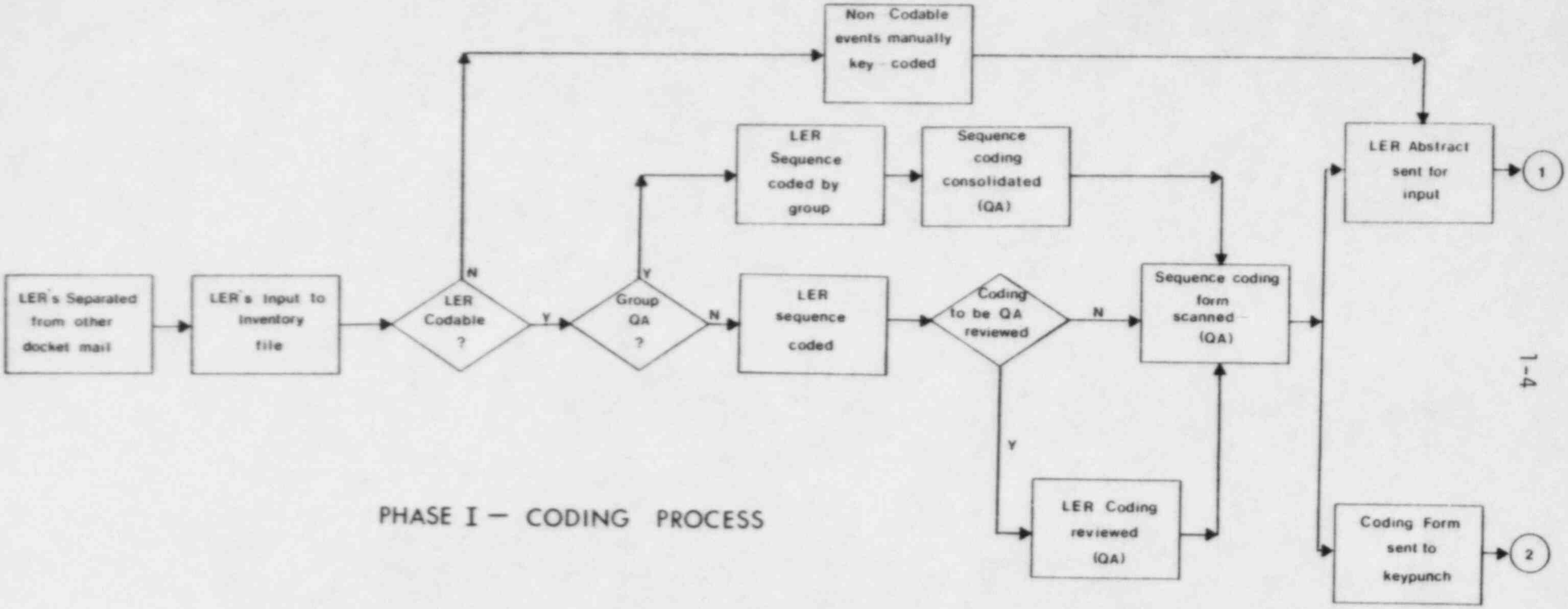


Fig. 1.1 LER Processing

PHASE II — DATABASE PROCESS

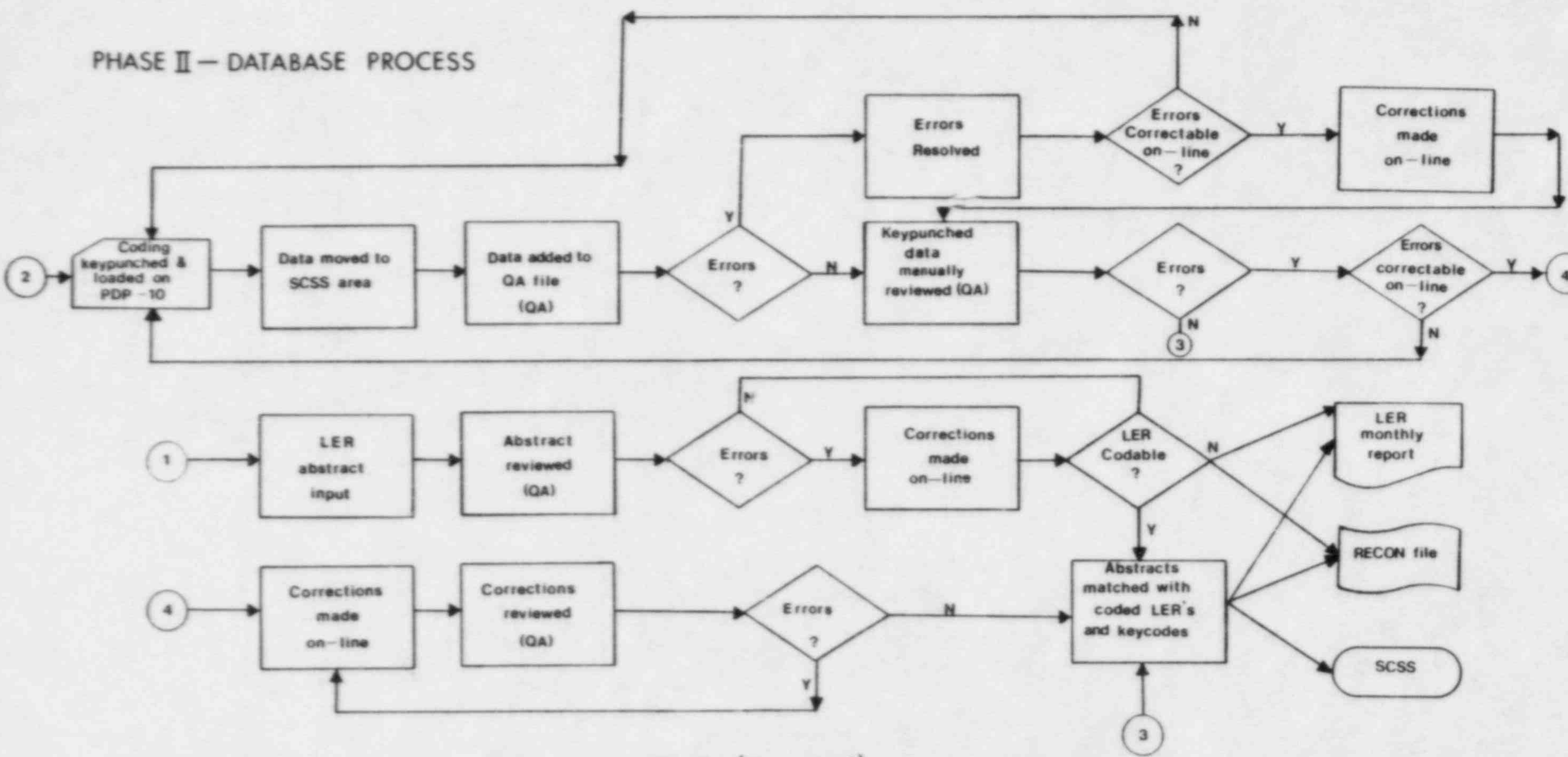


Fig. 1.1 (Continued)

1.2.2 Phase II - database process

The database process includes the steps necessary to enter the completed LER coding data and abstracts into computer files. These files ultimately supply LERs for the SCSS database, the LER Monthly Report, and the RECON file.

The LER coding data are keypunched from the LER coding form and are moved into a quality assurance (QA) file through two file manipulations. On the QA file, a standard set of computer consistency and code validation checks are performed by a computer program and error messages are generated. In addition, the remaining LER coding data are manually reviewed for errors. If the errors are more easily corrected online, the corrections are made. If not, the corrected LER coding form is resubmitted to keypunch. The SCSS QA program report[7] discusses these processes and other QA functions in greater detail.

The LER abstracts are input in an online basis on IBM equipment. After all corrections have been made to both the abstract and the coding data, the two are matched. LERs are transferred to the SCSS database in batch quantities. The LER Monthly Report is a monthly listing of those LERs added to SCSS file and those LERs received that cannot be coded. The RECON file is updated monthly with the descriptive keywords being added automatically by the computer in a process called keycoding which generates the descriptive keywords from the SCSS codes.

1.3 Coding Philosophy

SCSS is a failure oriented account of events described in Licensee Event Reports, and was developed to assist in reviewing reactor operational experience. As such, it may contain coding which reflects the informed judgments of technical processors rather than a strict translation of licensee wording. SCSS is not a data storage system for docketed materials. Further, environmental LERs and non-light water reactor LERs are not included. Individuals concerned with the legal record of any licensee should contact the U.S. NRC Public Document Room, Central Files, or the U.S. NRC Document Control System.

Each LER supplied by the licensee consists of an LER form (NRC Form 366) containing certain encoded data, a description of the event, and details on the cause of the event. Often supplemental information on the event is included with the LER form. The SCSS coding form should contain the sequential failure information from the LER form and supplemental information. The coding captures the major components involved (such as pumps, motors,# arises, and the technical processor is not required in any way to duplicate the coding used by a licensee. Other information (such as the number of trains in a specific system) may also be included when it is not specified in the LER [see specific design data (Vol. 3).] The SCSS coding form must be completed in a fashion consistent with the code descriptions and rules specified in this manual.

1.4 Organization of Text

Chapter 2 of this manual discusses generically the Licensee Event Report (LER) and SCSS coding forms. It points out the many entry fields on the LER form (NRC form 366) from which coding data are drawn and those fields on the coding forms that must be completed. Chapter 3 discusses some general coding procedures and presents a working example. Chapter 4 summarizes the purpose of SCSS and how to use this coder's manual.

Appendices A through L define the SCSS codes and contain rules for their use. Appendix M contains lists used by utilities to complete the LER forms. Sample LERs, in both coded and abstracted form, are in Appendix N. An additional volume of this coder's manual, *Sequence Coding and Search System for Licensee Event Reports — Coder's Manual (Volume 4)*, contains Appendix F — System Codes.

2. SCSS BASIC INFORMATION

SCSS uses information submitted to the NRC by licensees for inclusion in the SCSS database. Two types of data forms are involved in the process: the data forms summitted by the licensees to the NRC and the data (or coding) forms used by the SCSS technical processors. This section describes both of these data forms, defines the entry fields on these forms, and lists acceptable codes.

2.1 Licensee Event Report

Each facility licensed by the NRC must report certain events. These events, designated as reportable occurrences (RO), are instances that meet the reporting requirements delineated in the Code of Federal Regulations Title 10 - "Energy" Part 50 (10 CFR50),[8] in the facilities' technical specifications, or in the facilities' license provisions. The method of reporting these events, as established by the NRC, is in the form of Licensee Event Reports (LERs).

In 1984, the NRC made a substantial change in the LER reporting system, both in content and form. The following two subsections describe the LER prior to and since this change.

2.1.1 Pre-1984 licensee event reports

The format and guidelines for the LERs prior to 1984 were described in NUREG-0161.[2] Reportable occurrences submitted to the NRC were encoded on an LER form shown in Fig. 2.1. It is this LER form and any attached supplemental information sheets that provide the primary source of data for sequence coding. The following sections describe the items on this LER form that are most useful to the technical processor. It should be noted that in all cases text descriptions take precedence over any coded information provided by a licensee when a confict arises. For a description of the remaining items on the LER form not described here, see NUREG-0161.[2]

2.1.1.1 Item 7 - docket number. Item 7 contains the docket number assigned to the licensee at the time a license application is filed with NRC. This field contains eight spaces. Use the three right-most digits for identifying individual units. Examples of proper docket number entries are as follows:

Docket number	Unit
05000003	Indian Point 1
05000029	Yankee

2.1.1.2 Item 8 - event date. Item 8 contains the date on which the event occurred. The format for this item is month, day, and year

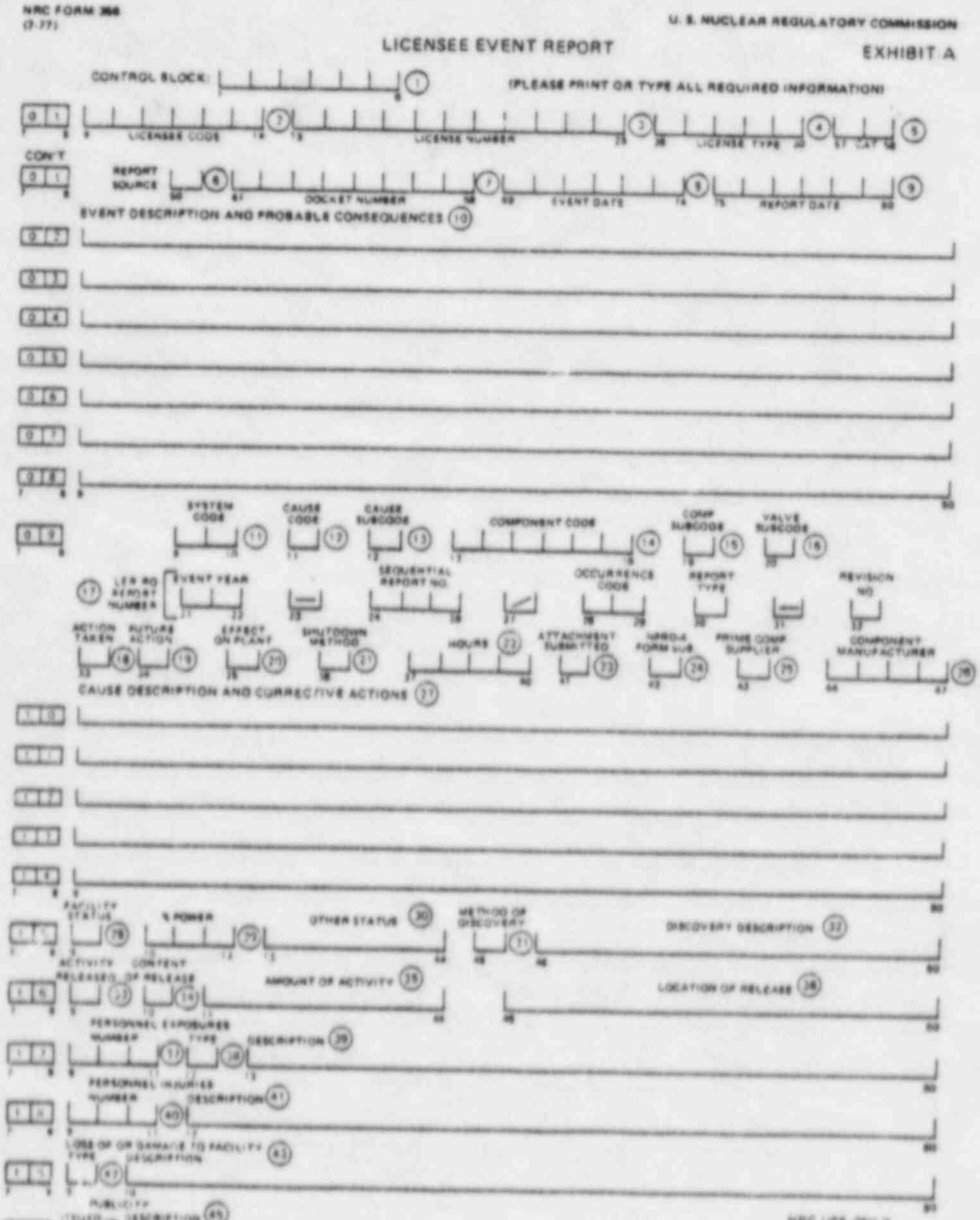


Fig 2.1 Pre-1984 LER Form

(MMDDYY - six spaces with leading zero when necessary). For example, 061081 corresponds to June 10, 1981.

2.1.1.3 Item 10 - event description and probable consequences. Item 10 is a free-form field containing a narrative description of the event and its probable consequences. This field should contain the following information:

1. activity in progress when event occurred (e.g., test, startup, shutdown);
2. circumstances leading to the event;
3. the reason for the report (e.g., violation of technical specifications);
4. a description of any significant occurrences resulting from the event (e.g., reactor scram, radioactive release, water hammer);
5. a description of the chain of events;
6. references to other units affected by the event (if any);
7. references to similar events (if any) occurring at the same or similar units;
8. whether or not redundant systems were available; and
9. any effects upon public health (radioactive releases, exposures, etc.).

2.1.1.4 Item 11 - system code. Item 11 contains the code for the system in which the event originated. Table M.1 in Appendix M lists the system codes used in this field.

2.1.1.5 Item 12 - proximate cause code. Item 12 contains the proximate cause code. The proximate cause is a classification used to describe the general nature of the cause of the event. The proximate cause codes are as follows.

Proximate cause code	Classification
A	Personnel error
B	Design, manufacturing, construction/ installation
C	External cause
D	Defective procedures
E	Component failure
X	Other

The general definitions of these proximate cause classifications are:

1. Personnel error. This classification is assigned to occurrences attributed to human errors made when personnel followed incorrect written procedures, did not follow written procedures, or when qualified personnel did not perform in accordance with accepted or approved practice.
2. Design, manufacturing, construction/installation. This classification is assigned to occurrences reasonably attributed to design,

manufacture, construction or installation of the system, component, or structure.

3. External cause. This classification is assigned to occurrences attributed to natural phenomena. A typical example includes an event such as loss of offsite power resulting from a lightning strike, a tornado, or a flood.
4. Defective procedures. This classification is assigned to occurrences caused by inadequate or incomplete written procedures (see personnel error above) or instructions.
5. Component failure. This classification is assigned to occurrences or events attributed to component malfunctions resulting in failure of the equipment to perform its intended function.
6. Other. This classification is assigned to occurrences for which the proximate cause could not be identified or which could not be assigned to one of the previous classifications noted.

2.1.1.6 Item 13 - proximate cause subcode. When proximate cause codes of A, B, or E are designated under item 12, item 13 contains the appropriate cause subcode. When item 12 is A, personnel error, the following subcodes apply indicating the type of personnel:

Item 12 code	Item 13 subcode	Subcode definition - personnel type
A	A	Licensed operators and senior operators
A	B	Nonlicensed operations personnel
A	C	Maintenance and repair personnel
A	D	Radiation protection personnel
A	E	Construction personnel
A	F	Contractor and consultant personnel
A	X	Other

When item 12 is B, design, manufacturing, or construction/installation, the following subcodes apply:

Item 12 code	Item 13 subcode	Subcode definition - cause
B	A	Design - assigned to occurrences attributed to the nuclear steam supplier's or architect engineer's design of a component, system or structure
B	B	Manufacturing - assigned to occurrences attributed to the manufacturer's design or fabrication activities.
B	C	Construction/installation - assigned to occurrences attributed to field construction and/or installation errors.

When item 12 is E, component failure, the following subcodes apply:

Item 12 code	Item 13 subcode	Subcode definition - type of component failure
E	A	Electrical
E	B	Mechanical
E	C	Metallurgical
E	D	Corrosion
E	E	Instrument
E	F	Natural end of life
E	G	Electronic
E	X	Other (explain under cause description - item 27)

2.1.1.7 Item 14 - component code. If appropriate, item 14 contains the component code. Since the LER form has only one field for component, the following criteria are applied (by the licensee) to pick the most important component:

1. The component that failed;
2. If no component failed, the related component (e.g., personnel operated wrong valve, then valve is "related" component); or
3. If a chain of failures occurred, the first component to malfunction.

Table M.4 in Appendix M lists the valid component codes.

2.1.1.8 Item 15 - component subcode. Certain components designated in item 14 are further categorized under this item. The components which are further classified are:

Component code	Component type
CKTBRK	Circuit closers/interrupters
GENERA	Generators
HTEXCH	Heat exchangers
INSTRU	Instrumentation and controls
PENETR	Penetrations, primary containment
PIPEXX	Pipes/fittings
PUMPXX	Pumps
RELAYX	Relays
SUPORT	Shock suppressors and supports
VALVEX	Valves
VALVOP	Valve operators
VESSEL	Vessels, pressure

Table M.5 in Appendix M gives the subcategories and their respective codes for each of these component types.

2.1.1.9 Item 16 - valve subcode. When item 14 is VALVEX, item 16, the valve subcode, gives the valve function/application. The valid subcodes and definitions are:

Subcode	Subcode definition - valve functions/ applications
A	One-way flow
B	Pressure relief
C	Vacuum relief
D	Shutoff, isolation, stop
E	3-way selector
F	4-way selector
G	Flow control
H	Pressure control
L	Vent
N	Sample
P	Drain
Q	Bypass
X	Other

2.1.1.10 Item 17 - LER report number. Item 17 contains the LER report number. This item contains the event year, the sequential report number assigned by the licensee, the occurrence code, the report type and the revision number. The occurrence code and report type are not needed for SCSS. However, occurrence codes of 08: acts of sabotage: 11-13: radiation exposure; and 41-43: radioactive release may be of interest. The format for this item is as follows.

	Event year	Sequential report number	Occurrence code	Report type	Revision number
LER/RO	__ __	__ __ __/	__ __	__	__

2.1.1.11 Item 20 - effect on plant. Item 20 contains information concerning the effect that the event had on the unit. The codes for this item and their definitions are:

Code	Effect on plant
A	Plant outage
B	Forced power reduction
C	Extension of preexisting shutdown
D	Delay of completion of construction
Z	No significant effect

Codes A and B are used only when the plant was in operational status (i.e., reactor power greater than zero) at the time of the event.

2.1.1.12 Item 21 - shutdown method. When an outage occurs as a result of the event (i.e., item 20 is A), item 21 indicates the method of shutdown. The codes for this item and their definitions are:

Item 20 code	Item 23 subcode	Subcode definition - method of shutdown
A	A	Manual
A	B	Manual scram
A	C	Automatic scram

When item 20 is B, C, D, or Z, item 23 is Z and does not apply.

2.1.1.13 Item 26 - component manufacturer. When a component is designated in item 14, this item contains the manufacturer of that component. A separate volume of this manual includes a listing of all codes and contains a list of the manufacturer codes. (A value of X999 in this field indicates that the manufacturer code is not in the NUREG-0161 list.) The SCSS uses the same manufacturer codes.

2.1.1.14 Item 27 - cause description and corrective actions. Item 27 is a free-form field containing a narrative description of the cause of the event, the actions taken by the licensee to correct the problem, and the action taken to prevent a recurrence. This field should contain the following information:

1. a description of the cause listing contributing factors and expanding on the proximate cause (see items 12 and 13);
2. for personnel errors, type of personnel involved (see item 13);
3. a complete description of components involved including operating parameters, design parameters, and manufacturer information;
4. cause and mode of failure for component failure;
5. a description of immediate corrective actions and repair; and
6. a description of corrective actions proposed for implementation to prevent future occurrences.

2.1.1.15 Item 28 - facility status. Item 28 contains the status of the facility at the time the event occurred. Codes for this item and their definitions are:

Code	Status
A	(Under) construction
B	Preoperational, startup or power ascension tests (in progress)
C	Routine startup operations
D	Routine shutdown operations
E	Steady state operation
F	Load changes during routine power operation
G	Shutdown (hot or cold) except refueling
H	Refueling
X	Other (including special tests, emergency shutdown operations, etc.)
Z	Item not applicable

2.1.1.16 Item 29 - percent power (thermal). Item 29 contains the percent of licensed thermal power at which the reactor was operating when the event occurred.

2.1.1.17 Item 30 - other status. When item 28 is X (other), item 30 describes (in brief narrative form) the unit's status.

2.1.1.18 Item 31 - method of discovery. Item 31 contains the method of discovery code. Codes for this item and their definitions are:

Code	Discovery method
A	Operational event - any event not included in the codes below.
B	Routine test/inspection - surveillance tests, preventive maintenance tests, annual inspections, etc.
C	Special test/inspection - nonroutine tests conducted on an ad hoc basis fall into this class.
D	External source - such as notification from the NRC, sister licensee, vendor, A/E, etc.
Z	Item not applicable.

2.1.1.19 Item 32 - discovery description. Item 31 describes (in brief narrative form) the method of discovery (e.g., operator observation, inservice inspection, notification from NSSS vendor).

2.1.1.20 Item 33 - activity released (form). Item 33 describes the form in which radioactivity was released. Codes and their definitions are:

Code	Activity
L	Liquid
S	Solid
G	Gas
M	Mixture
Z	Item not applicable

2.1.1.21 Item 34 - content of release. Item 34 describes the content of the radioactive release. Codes and their definitions are:

Code	Content
N	Noble gas
H	Halogen
P	Particulate
M	Mixture
Z	Item not applicable

2.1.1.22 Item 35 - amount of activity. Item 35 lists the total amount of activity, or the amount of the predominant or limiting isotope that was released.

2.1.1.23 Item 36 - location of release. Item 36 lists both the point of the radioactive release and final location to which the release occurred (e.g., reactor building vent to atmosphere, storm sewer to river).

2.1.1.24 Item 37 - personnel exposures: number. Item 37 gives the number of employees exposed to radiation exceeding 5 man-rem as a result of the event (including exposures received during corrective, clean-up, and repair actions).

2.1.1.25 Item 38 - personnel exposure: type. Item 38 describes the type of personnel exposure. The codes and their definitions are:

Code	Exposure type
I	Internal exposure
E	External exposure
B	Both
Z	Item not applicable

2.1.1.26 Item 39 - personnel exposures: description. Item 39 gives the categories of workers exposed (e.g., maintenance, operational, engineering), number exposed in each category, and estimated total man-rem dose received by each category.

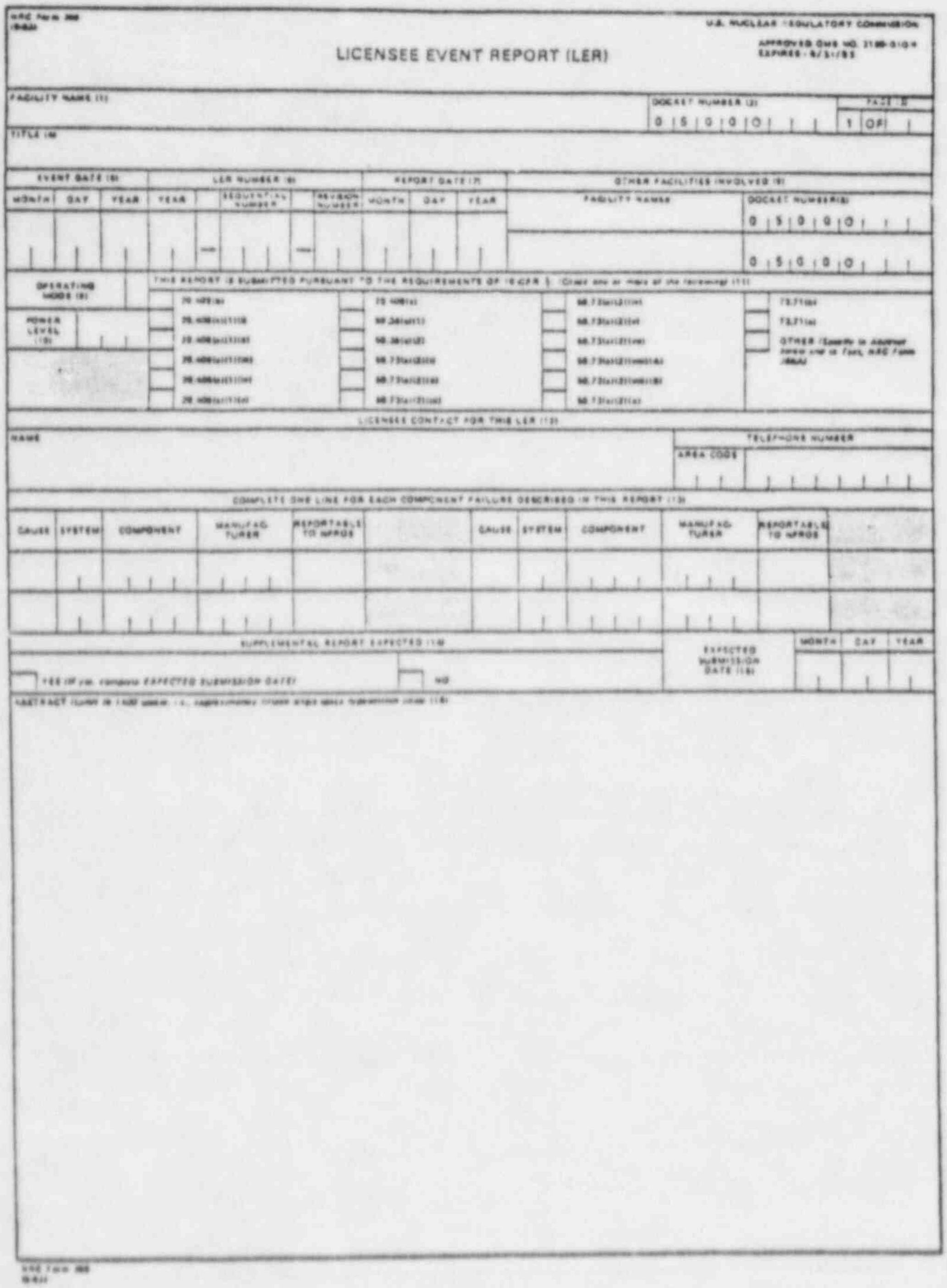
2.1.2 10 CFR 50.73 licensee event reports

Since January 1984, licensees have submitted LERs in accordance with the format and guidelines set forth in NUREG-1022.[3] Figure 2.2 shows the LER form for events reported as described in this NUREG. The following sections describe the items on this LER form that are most useful to the technical processor. Again, text descriptions take precedence over any coded information.

2.1.2.1 Item 2 - docket number. Item 2 contains the docket number assigned to the licensee at the time a license application is filed with NRC. This field contains eight spaces (only three filled in by the licensee). The three right-most digits are used for identifying individual units. Examples of proper docket number entries are as follows:

Docket number	Unit
05000003	Indian Point 1
05000029	Yankee

2.1.2.2 Item 5 - event date. Item 5 contains the date on which the event occurred. The format for this item is month, day, and year (MMDDYY - six spaces with leading zero when necessary). For example, 061081 corresponds to June 10, 1981.



U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

DOCKET NUMBER (2)

0 5 0 0 0

TITLE (4)

EVENT DATE (5) | LER NUMBER (6) | REPORT DATE (7) | OTHER FACILITIES INVOLVED (8)

MONTH | DAY | YEAR | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S)

0 5 0 0 0

0 5 0 0 0

OPERATING MODE (9)

POWER LEVEL (10)

LICENSEE CONTACT FOR THIS LER (12)

NAME

TELEPHONE NUMBER

AREA CODE

CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS | CAUSE | SYSTEM | COMPONENT | MANUFAC-TURER | REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

MONTH | DAY | YEAR

YES (If yes, complete EXPECTED SUBMISSION DATE)

NO

Fig. 2.2 10 CFR 50.73 LER Form

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150–0104

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
	0 5 0 0 0		—		—		OF

TEXT

Fig. 2.2 (continued)

2.1.2.3 Item 6 - LER number. Item 6, the Licensee Event Report (LER) number, consists of three parts: (1) the last two digits of the event year, (2) the sequential report number, and (3) the revision number. The format for the LER number is as follows.

Event year	Sequential report number	Revision number
__ __	___ ___ ___	__

2.1.2.4 Item 8 - other facilities involved. Item 8 contains the name and docket number of any additional units that were directly affected by the event. The docket number is in a format similar to Item 2.

2.1.2.5 Item 9 - operating mode. The operating mode of the unit (as defined in the unit's Technical Specifications) at the time of the event is coded in item 9. Tables M.14 and M.15 list codes for operating modes for PWRs and BWRs, respectively.

2.1.2.6 Item 10 - power level. Item 10 contains the percent of licensed thermal power at which the reactor was operating when the event occurred.

2.1.2.7 Item 11 - reporting requirements. Item 11 indicates the reporting requirements that were met by the event. The event may have met one or more of the reporting criteria.

2.1.2.8 Item 13 - component failures. Item 13 indicates the cause, system, component, and component manufacturer for each component failure in the event. Table M.16 in Appendix M lists the cause codes describing the component failures. Table M.17 contains the EIIS system code descriptions and their corresponding SCSS codes. Component codes are listed in Table M.18 and component manufacturer codes are contained in Section 6 of *Sequence Coding and Search System for Licensee Event Reports - Code Listings* (Volume 2).

2.1.2.9 Item 14 - supplemental report expected. Item 14 indicates if and when a follow-up report is expected.

2.1.2.10 Item 16 - abstract. Item 16 contains an abstract of the event. It describes the major occurrences during the event, including all actual component or system failures, all relevant operator errors or violations of procedures, and any significant corrective action taken or planned.

2.1.2.11 Item 17 - text. Item 17 describes the event in detail. It should contain the following information:

1. plant operating conditions before the event;
2. status of structures, components, or systems that were inoperable at the start of the event and that contributed to the event;

3. dates and approximate times of occurrences;
4. the cause of each component or system failure or personnel error, if known;
5. the failure mode, mechanism, and effect of each failed component, if known.
6. the Energy Industry Identification System component function identifier;
7. for failures of components with multiple functions, a list of systems or secondary functions that were also affected;
8. for failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service;
9. the method of discovery of each component or system failure or precedural error;
10. operator actions that affected the course of the event, including operator errors, procedural deficiencies, or both, that contributed to the event;
11. automatically and manually initiated safety system responses; and
12. the manufacturer and model number (or other identification) of each component that failed during the event.

2.2 Sequence Coding Form

The first steps in transforming the descriptive text and codes of an LER to the structured sequences seen on the SCSS data base involve reviewing and codifying the LER. The sequence coding form provides a structured format for the coding of an LER as well as a keypunch form for data entry. Figures 2.3 shows a sample LER coding form. The following sections describe the items on the form. A separate volume presents the code listings applicable to each item.

2.2.1 LER identification information

For unique identification of each LER, the database contains the docket number (a three digit number that excludes the 50 prefix), the year of the report (a two digit number), the sequential LER number assigned by the licensee (a three digit number), and the revision number (a two digit number). The date of the event (a six digit number furnished by the utility) and the reactor information docket system (RIDS) document control system (DCS) number (a ten digit number) also provide additional identification information. These data also provide an effective means for direct retrieval of the LER, as well as for its identification. Item 1 on the sequence coding form (Fig. 2.3) contains this information.

2.2.2 Watch list information

A key rationale for establishing any database is to provide an efficient means of storing, sorting and retrieving data. Precise and

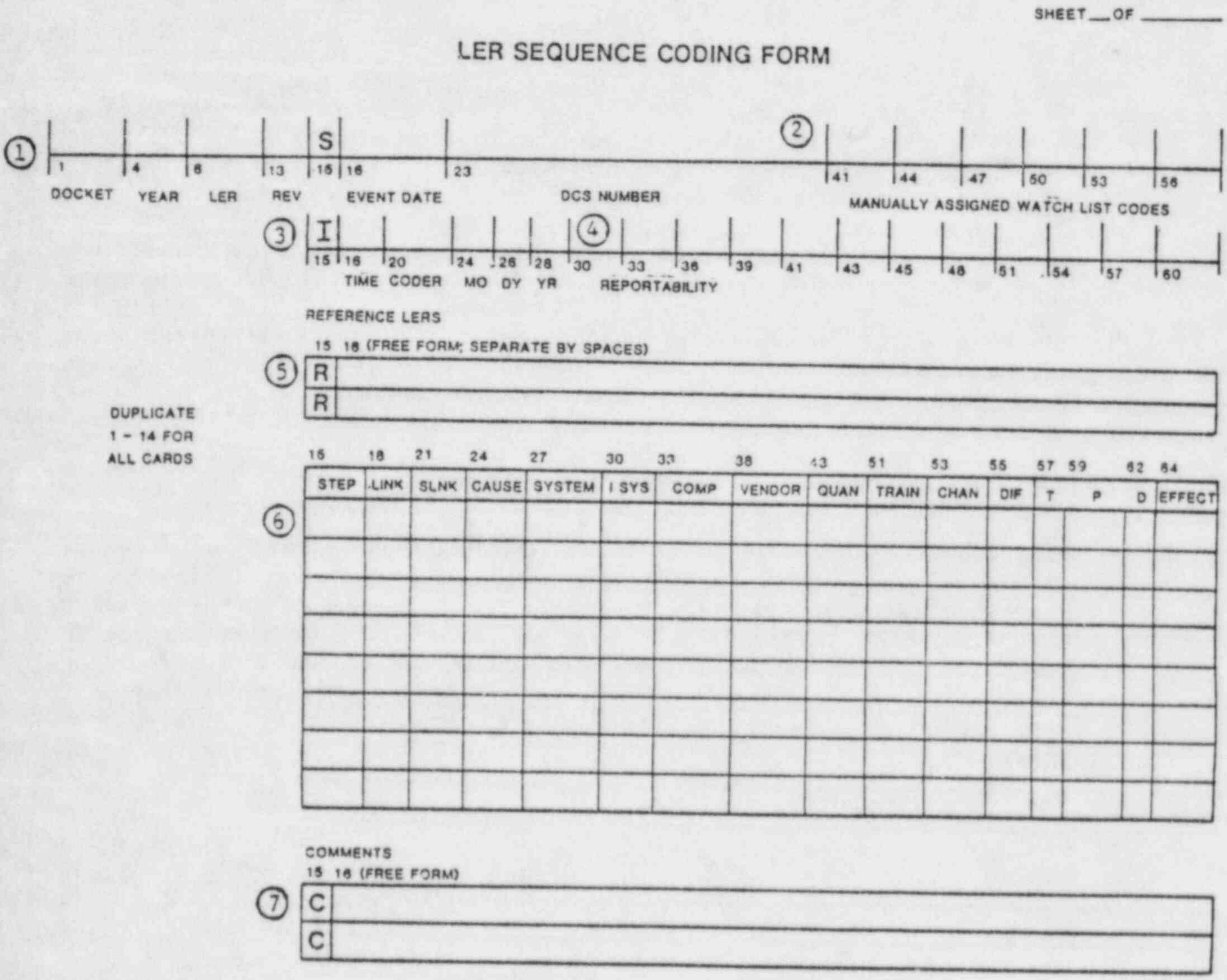


Fig. 2.3 SCSS Coding Form

simplistic data retrieval methods are essential to any effective database. Search strategies for retrieving data by detailed failure characteristics are often difficult and time consuming to perform. Therefore, for increased efficiency and ease, the database has several preprogrammed search strategies available. These preprogrammed search strategies, termed 'watch list' items, include characteristics of event types and failures that would otherwise be difficult to retrieve.

All watch list items are now hand assigned by the technical processor when coding an LER. (Future plans for the system include computer-generated watch list items.) Item 2 on the sequence coding form contains the hand-assigned watch list items. Appendix B gives a description of each watch list code, its uses, and any applicable rules.

2.2.3 Inventory information

Certain information is needed for maintaining the inventory file. This information includes the time taken to code the LER, the processor's initials, and the date the LER was coded. Item 3 on the sequence coding form contains this information.

2.2.4 Reportability

LERs describing events occurring after January 1, 1984 must indicate the reason that the LER is being submitted. This reason is indicated by the reporting criteria of CFR Title 10 (see Section 2.1.2.7). Item 4 on the sequence coding form contains the reportability information. Appendix C describes the format and any applicable rules for coding this information.

2.2.5 Reference LERs

In addition to the information describing the event, SCSS also captures any references to previous similar events by the docket, year, and LER numbers. This data provides an indication of patterns or trends for a particular plant without further searching of the database. Also, any consequences of similar events can be derived by examining those referenced LERs.

Item 5 on the sequence coding form contains reference LER information. Appendix C describes the format used in this field and any applicable rules for coding reference LER information.

2.2.6 Event information

The primary objective of the SCSS is to reduce the descriptive text of the LERs to a coded sequence that is both computer-readable and computer-searchable. When translating the event described in an LER, the technical processor must: (1) identify all individual occurrences (i.e., component failure, human errors, etc.), (2) identify their relationships to one another (e.g., operator error causes component failure, component failure causes system failure), and (3) code the occurrences on a coding form.

The types of individual occurrences that the technical processor must select from the LER's event description are:

1. component failures;
2. system failure (both partial and total);
3. personnel errors; and
4. unit and environmental information and effects.

Component failures, system failures, and personnel errors are the primary constituents of the sequence. Unit and environment information may also be part of the sequence but generally is used only to add extra information to the coded LER.

Item 6 on the sequence coding form contains each piece of information needed to completely describe the occurrences that comprise a sequence. In almost all instances, an occurrence is represented by a single "step" in the sequence. On the sequence coding form, each row in item 6 contains all the information for a single step. The columns (in item 6) are the attributes of the steps. Each attribute gives a single piece of information for the step. The following sections describe each attribute and gives its uses with a coded sequence.

2.2.6.1 Step number. The first attribute (i.e., first column) is the step number. The step number corresponds to the order in which the occurrences took place. Accepted codes for this attribute are numeric values only.

2.2.6.2 Link and sublink. The second and third columns are the link and sublink attributes, respectively. The link identifier relates each step to prior step(s) to which it is directly related. Acceptable codes for the link attribute are: (1) numeric if the step was caused by a single previous occurrence (zero if the step is an initiator), or (2) alphabetic (sublink code) if the step was caused by two or more previous occurrences.

When two or more occurrences (steps) combine to cause other occurrences (steps), the sublink attribute links these multiple occurrences together. Acceptable codes of the sublink attribute are alphabetic values only. Appendix D gives applicable rules regarding the ordering of occurrences in a sequence and the uses of step, link, and sublink.

2.2.6.3 Cause. The fourth attribute (i.e., fourth column of item 6) is the "cause" of the occurrence. As such, the cause must logically fit with or modify the combination of component (see 2.2.6.5) plus "effect" (see 2.2.6.10). The "cause" is proximate rather than root - it represents the immediate reason for the observed state or action coded in "effect." As such, the "cause" will often describe the physical condition of the component. Appendix E lists the valid cause codes, their descriptions, and applicable rules regarding their use.

2.2.6.4 System and interface system. The fifth and sixth columns of item 6 are the "system" and "interface system" attributes, respectively. When describing a component failure, the system attribute gives the system (process, instrument, electrical or structural) in which the component functions. When describing a train, channel, or total system failure, the system attribute indicates which system is involved.

The interface system attribute is used:

1. to indicate the system being communicated with (in steps concerning leaks);
2. to indicate the process system being controlled or monitored (when the step is describing an instrument failure); and
3. to indicate the process system being isolated (when the system attribute is DB - Containment Isolation System).

The interface system attribute can also be used to add extra information to the step.

Appendix F contains system summaries and any applicable rules for coding. Appendix G contains coding rules regarding the use of the interface system attribute.

2.2.6.5 Component. The seventh column of item 6 is the "component" attribute. Within a sequence, the coded steps may describe component failures, failures of trains or channels in a particular system, personnel errors or other affected units. For these kinds of steps, the component attribute contains a code indicating the component that failed, the number of trains or channels of a system, the type of person performing an action, or the docket numbers of other affected units.

Within a sequence the accepted codes for the component attribute are: (1) component codes, (2) train or channel codes, (3) personnel type codes, and (4) docket numbers. Appendicies H and K list the valid codes for the component attribute and any applicable rules.

2.2.6.6 Component specification - vendor. The eighth attribute (i.e., eighth column in item 6) is the "vendor" attribute. This attribute gives the vendor's code (if the vendor was identified in the LER) for the component that failed. The vendor codes used in SCSS are those used in the Nuclear Plant Reliability Data System (NPRDS). Appendix I lists the vendors and associated rules.

2.2.6.7 Quantity. The quantity attribute is the ninth column in item 6. This attribute indicates: (1) the number of components that failed, (2) the number of channels or trains involved, or (3) the number of personnel involved in actions described by the step. Valid codes for this attribute are numeric values indicating a specific number, an M indicating multiple components, trains or channels, and a Z indicating an unknown number of components or personnel. Appendix I gives applicable rules concerning quantity.

2.2.6.8 Train, channel, and differ. The tenth, eleventh, and twelfth columns of item 6 are the train, channel and differ attributes, respectively. The train and channel attributes group together steps that describe failures of components that are members of the same train or channel. The differ attribute provides a method of differentiating between failures of like components having both the same component code and system code. Appendix I gives applicable rules concerning the train, channel and differ attributes.

2.2.6.9 Timing (T), performance (P), and detection (D). The fourteenth, fifteenth, and sixteenth columns in item 6 are the "timing" (T), "performance" (P), and "method of detection" (D) attributes. These attributes indicate:

1. whether the failure was instantaneous, preexisting or potential (timing attribute);
2. whether component, system, or person had totally or partially failed, or not failed at all (performance attribute);
3. if repair was performed (performance attribute); and
4. how the failure or action was detected (detection attribute).

The timing and performance attributes are also used in steps giving unit and environment information. For these steps, they indicate:

1. the initial unit conditions, e.g., steady state power generation, refueling (timing attribute);
2. the effects of the sequence on the unit, e.g., forced power reduction, required scram (performance attribute);
3. the effects of the sequence on the environment, e.g., radiological release to the containment only, radiological release to the environment greater than technical specifications (timing attribute); and
4. the effects of the sequence on site personnel e.g., internal exposure, external exposure.

Appendix J lists the valid codes for the T, P, and D attributes and applicable rules for coding. Appendix J also lists valid codes and applicable rules for coding unit and environmental information steps.

2.2.6.10 Effects. The last column in item 6 is the effects attribute. The effects attribute indicates the state, action or output of the component coded in the steps. Appendix E lists the valid effect codes and any applicable rules for coding.

2.2.7 Comments

Since it is impossible to design the coding system to anticipate every peculiarity that arises in the LERs, the SCSS database contains an area for comments. Comments (item 7, Fig. 2.2) are usually made when: (1) the coded sequence does not adequately describe the event, or (2) when nonreferenced material that adds additional information to the event is available. However, one should consider the comments as supplemental data only. Appendix L lists applicable rules concerning the comments field.

3. CODING METHODOLOGY

As indicated earlier, the primary objective of the SCSS database is to reduce the descriptive text of an LER to coded sequences that are both computer-readable and computer-searchable, but that still capture the details given in the LER. This section describes a suggested sequence coding approach: that is, how the event described in the LER is translated into the computer-readable and computer-searchable codes. An example which illustrates the sequence coding procedure is also presented. The example is based on coding an LER in the pre-1984 format.

3.1 Coding Considerations

The method of encoding LER data can be summarized into seven steps:

1. initial reading;
2. recording of LER identification information;
3. rereading for details;
4. structuring the sequence of occurrences;
5. recording the sequence of occurrences;
6. searching for additional effect and reference information; and
7. checking the SCSS coding form.

The technical processor should first read the LER and all attached information to get an overall idea of the event being reported. The processor should establish a theme or the major subject on this first reading. This theme will focus the coding on the most important aspects of the event. In addition, it is important to note unusual details that will affect the coding (for example, the LER states in the event description that "On March 17, 1983..." while in the event date field "03/24/83" is coded, or LER item 12 (cause code) states that the cause was personnel error while the cause description (LER item 27) mentions no personnel involvement).

Recording the LER identification information is the next step in coding the LER. The last three digits of the docket number (LER item 7), the event year (LER item 17), the sequential report number (LER item 17), and the revision number (LER item 17) uniquely identify an LER and should be recorded in SCSS item 1. In addition, the event date (LER field 8) and the DCS number (stamped on the bottom of the LER) should also be recorded.

A technical processor must be aware of the data elements necessary to describe the event. In the third LER coding step, rereading the LER for details, the processors must find these data, including:

1. generic class of components or personnel involved;
2. systems involved (each component is grouped in its appropriate system);
3. cause of the component, system, or personnel action;
4. type of component, its manufacturer, and the quantity involved;

5. whether the failure was instantaneous, preexisting, or potential;
6. whether the component, system, or personnel totally failed, partially failed (not valid for personnel), or did not fail;
7. the method of detection of the component, system, or personnel action;
8. the effect of the failure or personnel action;
9. the effect of the reported event on the unit; and
10. information describing any radioactive releases or personnel exposures.

Using this detailed information, it is possible to construct the sequence(s) from the sequence initiator to the last failure short of repair. The technical processor should mentally reenact the event, enumerating each step and determining the cause and effect of each step. Next, the technical processor should record the sequence(s) in item 6 on the coding form in a manner consistent with the code descriptions and rules in Appendices A through M.

After recording each event sequence, the technical processor must add the additional information to complete the coding. The effect that the sequence had on the unit comes from LER items 20, 21, and 28 or the event description (LER item 10) and is recorded as XX-system unit effects step. Environmental effects, recorded as a YY-system environmental effects step, come from LER items 33 through 39. In addition to the environmental and unit effects that are required in each sequence, the technical processor should determine if there are reference LERs, or if watch list codes or comments are required and code them in SCSS items 5, 2, and 7, respectively. Utilities list reference LERs in many different places in the LER. Usually, the referenced LERs follow the event description.

As a final step in the coding process, the technical processor should review the SCSS coding form to assure that the form is complete and that the coding accurately and completely reflects the occurrences described in the LER. The processor should fill in the inventory information, time to code, coder's initials, and the date coded, and submit the LER and SCSS forms to a technical reviewer.

3.2. Example of SCSS LER

Figure 3.1 shows a representative LER (including supplemental information) sent to the NRC by a utility. Figure 3.2 shows this same event reduced to the SCSS format. Each part of the sequence coding will be described as part of this example.

The LER is first read to get a general overview of the event. The theme of this event is the outage or failure of both diesel generators in the emergency power generation system at Cooper while the unit was at 96% power (see LER items 28 and 29).

Nebraska Public Power District

CNSS817128

August 25, 1981

RECEIVED 1981

Mr. K. V. Seyfrit, Director
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Dear Sir:

This report is submitted in accordance with Section 6.7.2.3.2 of the Technical Specifications for Cooper Nuclear Station and discusses a reportable occurrence that was discovered on July 28, 1981. A licensee event report form is also enclosed.

Report No.: 50-298-81-21
Report Date: August 25, 1981
Occurrence Date: July 28, 1981
Facility: Cooper Nuclear Station
Brownville, Nebraska 68321

Identification of Occurrence:
A condition occurred which resulted in operation in a degraded mode permitted by a limiting condition for operation established in Section 3.5.F.2 of the Technical Specifications.

Conditions Prior to Occurrence:
The reactor was at 96% of rated thermal power.

Description of Occurrence:
During performance of Surveillance Procedure 6.3.12.1 to prove operability of #2 Diesel Generator (DG) because #1 DG was inoperable (reference LER's 81-19 and 81-20), an injector line failed. The DG was shut down and declared inoperable.

Designation of Apparent Cause of Occurrence:
The failure of the injector line is evaluated to be the result of the combined effects of metal fatigue and vibration. The failure is considered an isolated event.

8109150496 810825
PDR ADOCK 05000298
S PDR

Fig. 3.1 Typical LER from utility

Mr. K. V. Sevfrit
August 25, 1981
Page 2.

Analysis of Occurrence:

The station's emergency power system consists of two emergency diesel generators, each capable of supplying power for post accident safety system operation and safe reactor cool down.

The injector line connects the individual cylinder injector pumps to their respective injectors. The line is heavy-wall ¼" tubing (wall thickness = 3/16"). The line failed near the injector compression fitting due to what is evaluated to be the combined effects of metal fatigue and vibration. Failure of this line would not have made the DG inoperable under accident conditions. The engine would have carried full load on the other cylinders; however, it was shut down during the test due to equipment safety considerations. At the time this DG was shutdown, the other DG's fuel supply hose had been repaired (reference LER 81-19). The other DG had not yet been tested after maintenance, but would have functioned after clearing the equipment tagout in effect.

The normal, startup, and emergency transformers were operable during this event. This occurrence presented no adverse consequences to the public health and safety.

Corrective Action:

The injector line was immediately replaced. The DG was tested satisfactorily and returned to service. Although this is the first failure of this type at this site on either DG, components have been ordered to replace all injector lines on both diesels if such action is considered necessary. Once these components are on site, replacement and inspection of lines will be accomplished during an appropriate diesel outage.

Sincerely,

L C Lessor

L. C. Lessor
Station Superintendent
Cooper Nuclear Station

LCL:cg
Attach.

Fig. 3.1 (continued)

LICENSEE EVENT REPORT

CONTROL BLOCK: (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

01 | N E C P R 1 | (2) | 0 0 - 0 0 0 0 0 - 0 0 | (3) | 4 1 1 1 1 | (4) | (5)
LICENSEE CODE — LICENSE NUMBER — LICENSE TYPE

CON'T 01 | REPORT SOURCE L (6) | 0 5 0 0 0 2 9 8 (7) | 0 7 2 8 8 1 (8) | 0 8 2 5 8 1 (9)
DOCKET NUMBER — EVENT DATE — REPORT DATE

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

02 During the performance of a surveillance procedure on #2 diesel generator, an injec-
03 tor line failed. #2 DG was shut down and declared inoperable. Redundant #1 DG was in-
04 operable at the time of this occurrence. Applicable surveillance procedures were com-
05 menced per RTS 3.5.F.2 for both DG's being inoperable. This event is not repetitive.
06 There were no adverse effects on the public health and safety.
07
08

09 | SYSTEM CODE: E E (11) | CAUSE CODE: E (12) | CAUSE SUBCODE: A (13) | COMPONENT CODE: E N G I N E (14) | COMP SUBCODE: Z (15) | VALVE SUBCODE: Z (16)

(17) LER/RO REPORT NUMBER | EVENT YEAR: 8 1 | — | SEQUENTIAL REPORT NO.: 0 2 1 | / | OCCURRENCE CODE: 0 3 | REPORT TYPE: L | — | REVISION NO.: 0

ACTION TAKEN: A (18) | FUTURE ACTION: A (19) | EFFECT ON PLANT: Z (20) | SHUTDOWN METHOD: Z (21) | HOURS (22): 0 0 0 0 | ATTACHMENT SUBMITTED: N (23) | NPRD-4 FORM SUB. (24) | PRIME COMP. SUPPLIER: A (25) | COMPONENT MANUFACTURER: C 6 3 4 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

10 Cause of failure of fuel injector supply line is believed to be metal fatigue and vi-
11 bration. Piping is heavy wall. SS, ¼" tubing (3/16" wall thickness). Applicable part
12 number is KSV-13-13. Tubing severed completely near injector compressor fitting. Com-
13 ponent was immediately replaced. All fuel injector supply lines on #1 & #2 DG will be
14 replaced if dictated by the inspection of individual injector lines.

15 | FACILITY STATUS: E (28) | % POWER: 0 0 6 (29) | OTHER STATUS (30): NA | METHOD OF DISCOVERY: 3 (31) | DISCOVERY DESCRIPTION (32): Surveillance Testing

16 | ACTIVITY RELEASED: Z (33) | CONTENT OF RELEASE: Z (34) | AMOUNT OF ACTIVITY (35): NA | LOCATION OF RELEASE (36): NA

PERSONNEL EXPOSURES
17 | NUMBER: 0 0 0 (37) | TYPE: Z (38) | DESCRIPTION (39): NA

PERSONNEL INJURIES
18 | NUMBER: 0 0 0 (40) | DESCRIPTION (41): NA

LOSS OF OR DAMAGE TO FACILITY (43)
19 | TYPE | DESCRIPTION: NA — 8109150504

PUBLICITY (45)
20 | ISSUED | DESCRIPTION: NA — NRC USE ONLY

8109150504 810825
PDR ADOCK 05000298
S PDR

NAME OF PREPARER Scott Freborg PHONE 402-825-3811

Fig. 3.1 (continued)

SHEET 1 OF 1

LER SEQUENCE CODING FORM

DOCKET	YEAR	LER	REV		EVENT DATE	DCS NUMBER	MANUALLY ASSIGNED WATCH LIST CODES					
1	4	6	13	15	16	23	41	44	47	50	53	56
298	81	021	0	S	072881	8109150504						

	TIME	CODER	MO	DY	YR	REPORTABILITY										
15	16	20	24	26	28	30	33	36	39	41	43	45	48	51	54	57	60
I	40	WPP	01	07	82												

REFERENCE LERS

15	16 (FREE FORM; SEPARATE BY SPACES)
R	298/81-019 298/81-020
R	

DUPLICATE
1 - 14 FOR
ALL CARDS

STEP (15)	LINK (18)	SLNK (21)	CAUSE (24)	SYSTEM (27)	I SYS (30)	COMP (33)	VENDOR (38)	QUAN (43)	TRAIN (51)	CHAN (53)	DIF (55)	T (57)	P (59)	D (62)	EFFECT (64)
1	0	A	AS	EH		DSL	C634	1	1		1	G	T	S	KC
2	0		CH	EH	SI	PIAS		1	2		1	A	TR	I	BP
3	2	X	CB	EH	SI	PIAS		1	2		1	A	TR	I	BP
4	3	A	RC	EH		DSL	C634	1	2		2	A	TR	I	KC
5	A		RT	EH		XXX					1	A	T	I	IB
6				XX								E	XX		YC
7				YY								N	N		YC

COMMENTS

15	16 (FREE FORM)
C	
C	

Fig. 3.2 SCSS Coded LER

The docket number and document information are recorded on approximately half of the first line on the sequence coded form. The docket number (298) is obtained from LER item 7. The year, LER number, and revision number (81-021-0 respectively) are taken from LER item 17. The event date (7/28/81) comes from LER item 8. The DCS number (8109150504) is on the bottom of the form.

The LER is then reread and studied to determine the series of occurrences leading to the failure of the emergency power generation system. In this example, one chain of occurrences is the removal of diesel generator 1 for repairs which results in the removal of one train of the emergency power generating system. The second series of occurrences is the shutdown of diesel generator 2 because of a broken fuel injector line.

The chronological order of the occurrences, or steps, comprising each of the sequences can now be recorded as shown in Fig. 3.2. Step 1 shows the inoperability of the diesel (component DSL) for anticipatory maintenance (cause AS). Step 2 is the initiator of the second series of occurrences which is the failure of the 1/2-in. stainless steel injector line (component PIAS). The failure was caused by a combination of vibration (cause CH) and metal fatigue (cause CB in step 3, which is an information step used for multiple causes). This injector line failure resulted in the shutdown of diesel generator 2 (effect KC). The sublink value of A in steps 1 and 4 show that the two diesel failures caused the total failure of the emergency power generation system, shown in step 5. Steps 6 and 7 show no significant unit or environmental effects. Table 3.1 shows translated values for the codes shown in the matrix of Figure 3.2. Table 3.2. lists remarks concerning the codes used in the example.

The LER event description and supplemental information are reviewed for coding accuracy to check for any referenced LERs. In this example it is noted that two LERs describing a similar event are referenced. They are 298/81-019 and 298/81-020. Additionally, comments are added where additional clarification is necessary or desirable. In this example, the first diesel had already been repaired, but not tested, when the problem with the second one materialized. The description states that diesel generator 1 would have been available under accident situations. This fact is noted in the comments section.

After determining that the coded information is complete and accurate, the time to code the LER (40 minutes), the initials of the coder, W. P. Poore (WPP), and the date the LER was sequence coded (01/07/82) are added. Other coding examples are presented in Appendix N. The reader should study each appendix well enough to be familiar with the information each contains.

Table 3.1 Translation of codes used in the example

Type code	Value	Description
Cause	AS	Anticipatory maintenance
	CH	Vibration
	CB	Mechanical fatigue
	RC	Component resultant
	RT	Total system resultant
System	EH	Emergency power generation
	XX	Unit effects
	YY	Environmental effects
ISYS	SI	Emergency generator building
Component	DSL	Engine, diesel
	PIAS	Pipe, less than 4" diameter, stainless steel
	XXX	Total system
Vendor	C634	Cooper-Bersemer Co.
Timing	G	Actual pre-existing, detected
	A	Actual, immediate
	E	Steady-state operation (unit effect)
	N	No release (environmental effect)
Performance	T	Total fault
	TR	Total fault/repair
	XX	No significant effect (unit effect)
	N	No exposure (environmental effect)
Detection	S	Preventive maintenance
	I	Routine testing/inspection
Effect	KC	Cessation of operation
	BP	External system leakage (unknown rate)
	IB	Undercurrent
	YC	Additional information

Table 3.2 Remarks concerning assignment of codes in the example

Step	Remark
1	Initiator of train 1 failure. Vendor code C634 noted on LER item 26.
2	Initiator of second sequence. Severing of the fuel injector line is assumed to result in its leaking. Note that the train is now 2.
3	This step is used to record the second of a two-cause failure of the injector line by using an "X" in the sublink column and coding the line as in step 3 except for the second cause.
4	Diesel generator 2 is shut down (ceases to operate). Differ value of 2 distinguishes this diesel from the diesel in step 1. Diesel suffers a piece-part failure of the injector line and must be repaired (P-column TR).
5	Resultant failure of the emergency power generation system. Note that failures of diesels 1 and 2 combine (by use of the link and sublink columns) to show failure of the entire system.
6	Unit effect step. No significant effect.
7	Environmental effect step. No release to environment or personnel exposure.

4. SUMMARY

NRC's Office for Analysis and Evaluation of Operational Data (AEOD) has developed the Sequence Coding and Search System (SCSS) through the Nuclear Safety Information Center (NSIC) for codifying events at nuclear power stations, as reported in LERs, in a computer-readable and computer-searchable format. SCSS offers considerably more precision for storage and retrieval of LER information compared to keyword systems.

AEOD conceived SCSS based upon two requirements: (1) all the relevant technical information from the LER form (NRC form 366) and supplemental information should be encoded, and (2) all the technical information should be sufficiently tagged for precise retrieval. Furthermore, the objective of SCSS is to reduce the descriptive text of the LER for computer entry and computer retrieval through a structured format. This format allows the detailed coding of component occurrences, system occurrences, unit effects, and personnel actions.

Information coded in SCSS includes data that provide answers to the following questions concerning LERS:

1. What plant, type of plant, and nuclear steam-supply system vendor was involved?
2. How many occurrences were reported in the LER?
3. What sequences were involved in each event?
4. What steps took place in each sequence?
5. What system or component was involved in each step?
6. What was the mode of failure and functional effect on each system or component?
7. Were there multiple independent failures?
8. What was the ultimate effect on the unit, plant, environment, and personnel?

Questions 1 and 8 are presently answered in the LER coded information and therefore are present in the previous computer data files. Questions 2 through 7 are coded for only a single component occurrence. Information on other occurrences during the event is reported only in the narrative. Thus only a small portion of the data which answer questions 2 through 7 is entered in the present LER data files. SCSS encodes all other information needed to answer questions 2 through 7 along with the information needed to answer questions 1 and 8.

4.1 Searching SCSS

SCSS is intended to be used for conducting searches of LERs. The range of the complexity of such searches can vary from simple (e.g., find all occurrences involving RHR pumps at Sequoyah 1) to complex (e.g., find all occurrences where moisture in the control air system resulted in loss of one or more trains of the RHR).

SCSS provides statistical information on failures of components and systems to support the analysis and evaluation of failure patterns and trends. The SCSS database can provide the data and information to support engineering evaluations and case studies of specific problems or specific types of events. Component failure data can be retrieved for a related system (a pump in an RHR system) or independent of any particular system (all failures of pumps).

The relational aspects of individual occurrences within an event are also captured by SCSS. The individual occurrences that are related and ordered in time are identifiable as sequences. This capability to tie individual occurrences together permits searching for systems interactions problems and common cause failures. SCSS also distinguishes between command faults and actual failures.

4.2 Use of This Manual

The purpose of this coder's manual is to provide the philosophy for capturing descriptive information from an LER and codifying that information into a structured format. In addition, this manual identifies the types of data to be extracted from the LER and provides the codes and their descriptions for translating this information to the SCSS coding form. The new as well as the experienced technical processors, and the more sophisticated SCSS users alike will find it useful to refer to this manual often.

This manual begins, specifically for the new technical processor, with a description of the LER and SCSS coding forms (Sect. 2). Examples of coded LERs are presented in Sect. 3 and Appendix N. Section 3 gives a step-by-step approach to coding an LER and details, using an example, the selection of appropriate codes and applicable rules. This example focuses on filling in the SCSS coding form in a logical and ordered manner by translating the information given in the LER to the appropriate locations on the SCSS coding form.

The examples in Appendix N illustrate SCSS coding concepts. They show how to code certain types of failures and how to capture certain key facts included in the LER. These examples include how to code personnel success steps, train failures, total system failures, and events affecting a second unit.

Appendices A through L present the descriptions and acceptable codes for the SCSS attributes such as systems, components, personnel, etc. Following the descriptions and codes, the rules that further clarify and provide instructions for the application of the codes are given. Each section contains all rules that apply to the particular group of codes described in that section. Some rules contain examples illustrating coding principles with a coded matrix. The matrices contain all codes required by the rule or specified in the example. Asterisks indicate where codes are required but the specific codes are optional.

5. REFERENCES

1. Nuclear Regulatory Commission, *Reporting of Operating Information - Appendix A: Technical Specifications*, Regulatory Guide No. 1.16, Rev. 4 (August 1975).

2. Nuclear Regulatory Commission, *Instructions for Preparation of Data Entry Sheets for Licensee Event Report (LER) File*, NUREG-0161 (July 1977).

3. U.S. Department of Energy, Technical Information Center, *DOE/RECON User's Manual*, TID-4586/UD6 (May 1981).

4. R. B. Gallaher, *Development of Licensee Event Report Sequence Coding and Search Procedure*, NUREG/CR-1928, (January 1981).

5. H. C. Honeck, *The JOSHUA System*, Savannah River Laboratories, DB-138 (April 1975).

6. *Sequence Coding and Search System for Licensee Event Reports — User's Guide, (Volume 1)*, NUREG/CR-3905 (August 1984).

7. *Sequence Coding and Search System Quality Assurance Program*, Nuclear Operations Analysis Center, Oak Ridge National Laboratory, January 1985 (Revised).

8. *Code of Federal Regulations, Title 10 — Energy*, Part 50, Revised as of January 1, 1984.

Appendix A: GENERAL OR MISCELLANEOUS

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Appendix A: GENERAL OR MISCELLANEOUS

A.1 General

This appendix, "General" contains rules which do not fit any of the defined categories in the other appendices.

A.2 General Rules

A.2.1 Rule 1 — Code only what is stated

Code only what is stated in the LER or in the attached supplemental information.

A.2.2 Rule 2 — Inconsistencies between text and codes in the LER

Narrative descriptions on the LER form or supplemental information supersede coded information. However, coded information supersedes the lack of a narrative description. For example, when items 12 and 13 on the pre-1984 LER form indicate personnel involvement which is not described in the narratives, the coded information supersedes the narrative information and the personnel action must be sequence coded. See Appendix K.

A.2.3 Rule 241 — Postulated events

Postulated events must be coded as potential events (T-column P). They must be coded as a total failure (P-column T)) and as being detected through a review (D-column R).

A.2.4 Rule 259 — ESF Actuations

Code an engineered safety feature (ESF) actuation in the unit effects step (system XX, P-code EA — Required ESF Actuation or EB — Unintentional ESF Actuation) when a signal is generated to actuate an ESF system. An ESF actuation must be coded each time a signal is generated but not for each system actuated because a single signal often actuates several systems. The ESF actuation must be coded whether it was required or not and whether the ESF system actuated properly or not. Do not code a system occurrence for successful operation of an ESF system.

Systems that are designated as an ESF vary from plant to plant. However, the following systems are ESFs for most plants and must have an ESF actuation step when they are called upon.

PWR

Combustible Gas Control System [DH]
Containment Cooling System [HA]
Containment Isolation System [DB]
Containment Vacuum Relief System [HC]
Core Flooding System [BS]
Containment Spray System [DE]
Emergency Boration System [BD]
Emergency Power System [EH]
High Pressure Safety Injection System [BK]

Intermediate Pressure Injection System [BL]
Low Pressure Safety Injection System [BF]
Safety Injection System [BK or BL]
Upper Head Injection System [BT]

BWR

Automatic Depressurization System [BR]
Containment Atmosphere Control System [DH]
Containment Isolation System [DB]
Containment Spray System [DE]
Containment Vacuum Relief System [HC]
Core Spray System (high and low pressure) [BW or BX]
Emergency Power System [EH]
High Pressure Coolant Injection System [BN]
Low Pressure Coolant Injection System [BH]
Standby Gas Treatment System [HD]

The Reactor Core Isolation Cooling System (RCIC) [BC] is generally not considered to be an engineered safety feature. Therefore actuation of the RCIC must not be coded as an ESF actuation unless it is specified in the LER text that RCIC is an ESF for that unit.

The Auxiliary Feedwater System [BA] is an ESF in some units and not in others. In addition, some units have both ESF and non-ESF auxiliary feedwater pumps. Use the reportability field and the LER text to determine if actuation of the Auxiliary Feedwater System is an ESF actuation.

A.2.2.2 Rule 260 — Reportability 13 — ESF or RPS Actuation. When a licensee indicates that the LER is being submitted under Paragraph 50.73(a)(2)(iv) (reportability field 13), an engineered safety feature actuation and/or a scram actuation must be coded in the unit effects step.

Appendix B: MANUALLY ASSIGNED WATCH LIST NUMBERS

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Appendix B: MANUALLY ASSIGNED WATCH LIST NUMBERS

B.1 General Description

The rationale for establishing manually assigned watch list numbers is to provide the capability to identify and subsequently search for certain characteristics of events. In general, these special characteristics cannot be formally coded and cannot be selected by a preprogrammed computer search strategy. Currently, there are 28 manually assigned watch list numbers. The manually assigned watch list numbers and their descriptions are included in Table B.1.

Table B.1. Manually assigned watch list numbers

Code	Description
231	Unexpected system action or response.
232	Unexpected component action or response.
233	Transient proceeds in a way significantly different from what would be expected.
241	Component failure that could easily escape detection by normal testing or examination until needed.
384	Use of fibrous insulation.
385	Paint stripping.
401	Vulnerability of buried components.
402	Railroad and heavy transport influences.
403	Heavy equipment handling (including above exposed fuel).
404	Construction interactions.
405	Hazardous fluids and gases.
570	Unusual structural situations.
655	Siphon effects.
791	Administrative, procedural, or operating errors resulting from a fundamental misunderstanding of plant performance or safety requirements.
810	Security considerations.
900	Post event data availability.
911	Misfiled information.
913	Update needed.
914	Inadequate information content in LER.
920	Initially identified during Accident Sequence Precursor (ASP) project (1969—1979) but not selected.
921	Selected as precursor in the ASP project (1969—1979).
922	Selected as precursor in the ASP project (1980).
931	Report associated with 10-CFR-21.
932	Result of IE Bulletin or Order.
933	Result of NRR generic letter.
970	Possible watch list item.
975	Possible significant event.
990	Complex event.

B.2 Unexpected Responses

B.2.1 No. 231 — unexpected system responses

Infrequent system actions or responses which are unplanned (i.e., not considered in a safety analysis, etc.) or which are not a normal failure or operating mode are considered to be unexpected system actions or responses.

B.2.2 No. 232 — unexpected component action or response

Infrequent component actions or responses which are unplanned (i.e., not considered in a safety analysis, etc.), not a normal failure, or not a normal operating mode, are considered to be unexpected component actions or responses.

B.2.3 No. 233 — transient proceeds in an unexpected way

A transient is considered to have proceeded in an unexpected way when its sequence of occurrences differs significantly from what has occurred in the past or from what a safety analysis says should happen. This difference can result in the consequences having significantly less impact than expected or the consequences having significantly more impact than expected.

B.2.4 Rules for watch list codes 231, 232, and 233

B.2.4.1 Rule 27 — inadvertent safety injection exclusion from watch list. Do not code inadvertent safety injections as an unexpected response (watch list code 231). Although it is an undesired action, system designs account for some infrequent inadvertent safety actuations.

B.3 Undetectable Failures

B.3.1 No. 241 — component failures that could escape detection by normal testing or examination until needed

Component failures escaping detection normally result when procedures, for whatever reason, do not include the component for testing. Components which normally cannot be tested or examined should also be included here (e.g., containment spray nozzles are not a part of the containment spray test loop).

B.3.2 Rules for watch list code 241

B.3.2.1 Rule 28 — failure to test exclusion from watch list. When a component's test was not completed or performed it should not be coded as a failure that escaped detection (watch list code 241).

B.4 Primary Containment Considerations

B.4.1 No. 384 — use of fibrous insulation

Fibrous insulation is important because of the possibility of it becoming loose and falling into the containment sump with the possibility of blocking flow to the recirculation emergency cooling pumps.

B.4.2 No. 385 — paint stripping

Paint stripping or peeling is important because of the possibility of it blocking flow to pumps taking suction from the torus or the containment sump.

B.4.3 Rules for watch list codes 384 and 385

None to date.

B.5 Unusual External Challenges

B.5.1 No. 401 — vulnerability of buried components

Usually during construction activities, as a result of inadequate procedures, drawings, etc., buried cables can be severed. This can result in the loss of systems or components.

B.5.2 No. 402 — railroad and heavy transport influences

Plant site transportation systems are used for moving heavy equipment and for moving fuel assemblies outside of the fuel handling building. Such transportation systems have the potential to adversely affect plant operations by damaging equipment through misoperation or failure. For example, a heavy truck crushes an underground fuel line to the diesel generators.

This code can also be used to identify the transportation of hazardous material (i.e. explosives, liquid gas, chlorine, etc.) by nearby railway, barge, trucks, etc. For example, a train derailment releases a toxic gas that drifts over the plant site.

B.5.3 No. 403 — heavy equipment handling

Heavy equipment includes cranes, fuel handling, and other handling equipment used within any building such as the fuel handling building, spent fuel pool, and the containment. When such equipment activities influence an event (i.e., by operator error, by design or manufacturing error, by failure, etc.), assign this watch list code.

B.5.4 No. 404 — construction interactions

Interactions between an operating unit and another unit in the construction stage may include personnel error, component failure, design problems, and construction activities due to TMI modifications or other required backfits. Installation activities are included as well.

B.5.5. No. 405 — hazardous fluids and gases

Asphyxiants, chlorine, ammonia, nitrogen, oxygen, hydrogen, acetylene, chemical explosions due to liquid, solid, or gaseous radwaste, etc. are safety concerns in operating a nuclear station.

B.5.6 Rules for watch list codes 401, 402, 403, 404, 405

None to date.

B.6 Unusual Structural Considerations

B.6.1 No. 570 — unusual structural considerations

Unusual structural considerations may include component failure, design inadequacies, etc. Seismic design studies may be included under this watch list number.

B.6.2 Rules for watch list code 570

None to date.

B.7 Fluid Hydraulic Effects

B.7.1 No. 655 — siphon effects

The primary concern of siphoning is the draining of the spent fuel pool. Other systems and components where siphoning occurs should also be assigned this watch list code.

B.7.2 Rules for watch list code 655

None to date.

B.8 Fundamental Misunderstanding

B.8.1 No. 791 — administrative, procedural, or operating errors resulting from a fundamental misunderstanding of plant performance or safety requirements

A fundamental misunderstanding (by plant personnel) may occur due to lack of training, lack of communication, or use of wrong procedures, etc. A fundamental error is not an action resulting from carelessness or incorrect procedures.

B.8.2 Rules for watch list code 791

None to date.

B.9 Security Considerations

B.9.1 No. 810 — security considerations

This watch list item includes attempted sabotage, actual sabotage, weapons found inside the plant, labor disputes, theft, drug use, etc.

B.9.2 Rules for watch list code 810

None to date.

B.10 Post Event Data Availability

B.10.1 No. 900 — post event data availability

This watch list item concerns equipment and instrumentation whose only function is to provide post accident data. In general, these are identified as post accident monitors, post accident instrumentation, etc.

B.10.2 Rules for watch list code 900

None to date.

B.11 LER Reporting Deficiencies

B.11.1 No. 911 — misfiled information

The purpose of this watch list code is to indicate when the utility has misfiled or misplaced information which was needed and not included in the LER.

B.11.2 No. 913 — update needed

The utility will state in the LER if it intends to supply a follow-up report, an update, or a revision for the current event or problem.

B.11.3 No. 914 — inadequate information content in LER

Whenever the technical reviewer cannot understand what occurred in the event due to lack of information, contradictory information, or information poorly written, then the LER is considered inadequate.

B.11.4 Rules for watch list codes 911, 913, and 914

None to date.

B.12 Precursor Study

B.12.1 No. 920 — initially identified during ASP project (1969—1979) selected

Those LERs and reportable events during 1969—1979 time period which were initially identified but not selected as accident sequence precursors in the ASP project are identified with this watch list code.

B.12.2 No. 921 — selected as precursor in the ASP project (1969—1979)

Those LERs and reportable events during 1969—1979 time period which were finally selected as accident sequence precursors in the ASP project are identified with this watch list code.

B.12.3 No. 922 — selected as precursor in the ASP project (1980)

LERs from 1980 which were selected as accident sequence precursors in the ASP project (1980) are identified with this watch list code.

B.12.4 Rules for watch list codes 920, 921, and 922

None to date.

B.13 NRC Correspondence

B.13.1 No. 931 — report associated with 10-CFR-21

These reports are described in Title 10 of the Federal Code of Regulations. Use only when identified as such a report in the LER.

B.13.2 No. 932 — result of IE Bulletin or order

Some LERs are written as a result of an IE Bulletin or order. Use this watch list code only when stated in the LER.

B.13.3 No. 933 — result of NRR generic letter

Some LERs are written as a result of an NRR generic letter. Use this watch list code only when stated in the LER.

B.13.4 Rules for watch list codes 931, 932, and 933

B.13.4.1 Rule 29 — listing NRC correspondence. Include pertinent information (such as IE Bulletin or order number, NRR letter number, etc.) for watch list codes 931, 932, and 933 in the comments field.

B.14 Other Possible Considerations

B.14.1 No. 970 — possible watch list items

If a type of event or failure is not currently identified by a watch list code and possibly should be, include it under this watch list code so it is not forgotten. Do not use this watch list code until the computer search strategies have been developed to assign watch list codes.

B.14.2 No. 975 — possible significant event

When the technical reviewer judges that an LER describes a potentially significant event, the LER should be assigned this watch list number. Types of events that might be included are failure of equipment in safety systems, incorrect flow paths due to valve misalignment, steam generator tube leaks, cracks in piping, inadvertent ECCS operation, loss of offsite power, etc.

B.14.3 Rules for watch list codes 970 and 975

B.14.3.1 Rule 30 — reasons for watch list codes 970, 975, and 990. Describe the specific reasons for assigning watch list code numbers 970, 975, or 990 in the comments field of each coding form.

B.15 Complex Events

B.15.1 No. 990 — complex events

Complex events are usually characterized by several independent occurrences (single failures). They are, in general, difficult or complex to review and code completely and accurately. They are also considered to be significant events.

B.15.2 Rules for watch list code 990

B.15.2.1 Rule 30 — reasons for watch list codes 970, 975, and 990. Describe the specific reasons for assigning watch list code numbers 970, 975, or 990 in the comments field of each coding form.

Appendix C: REFERENCE LERs AND REPORTABILITY

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Appendix C: REFERENCE LERs AND REPORTABILITY

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Appendix C: REFERENCE LERs AND REPORTABILITY

C.1 Reference LERs

C.1.1 Description

An LER form and/or its attached supplemental information may reference similar events which have occurred at a particular station. Referenced LERs may indicate significant failure patterns or may show significant consequences from similar events. Although it is a reporting requirement to provide a reference to previous events, the utilities do not have to include docket, year, and LER number for each event. Utilities may list reference LERs in a format consistent with their own reporting system format or just list the number of similar events.

C.1.2 Rules for reference LERs

C.1.2.1 Rule 31 — Reference LER format. Code the reference LERs in the following format:

15 16 (FREE FORM; SEPARATE BY SPACE)

R xxx/yy-nnn xxx/yy-nnn xxx/yy-nnn xxx/yy-nnn

R xxx/yy-nnn

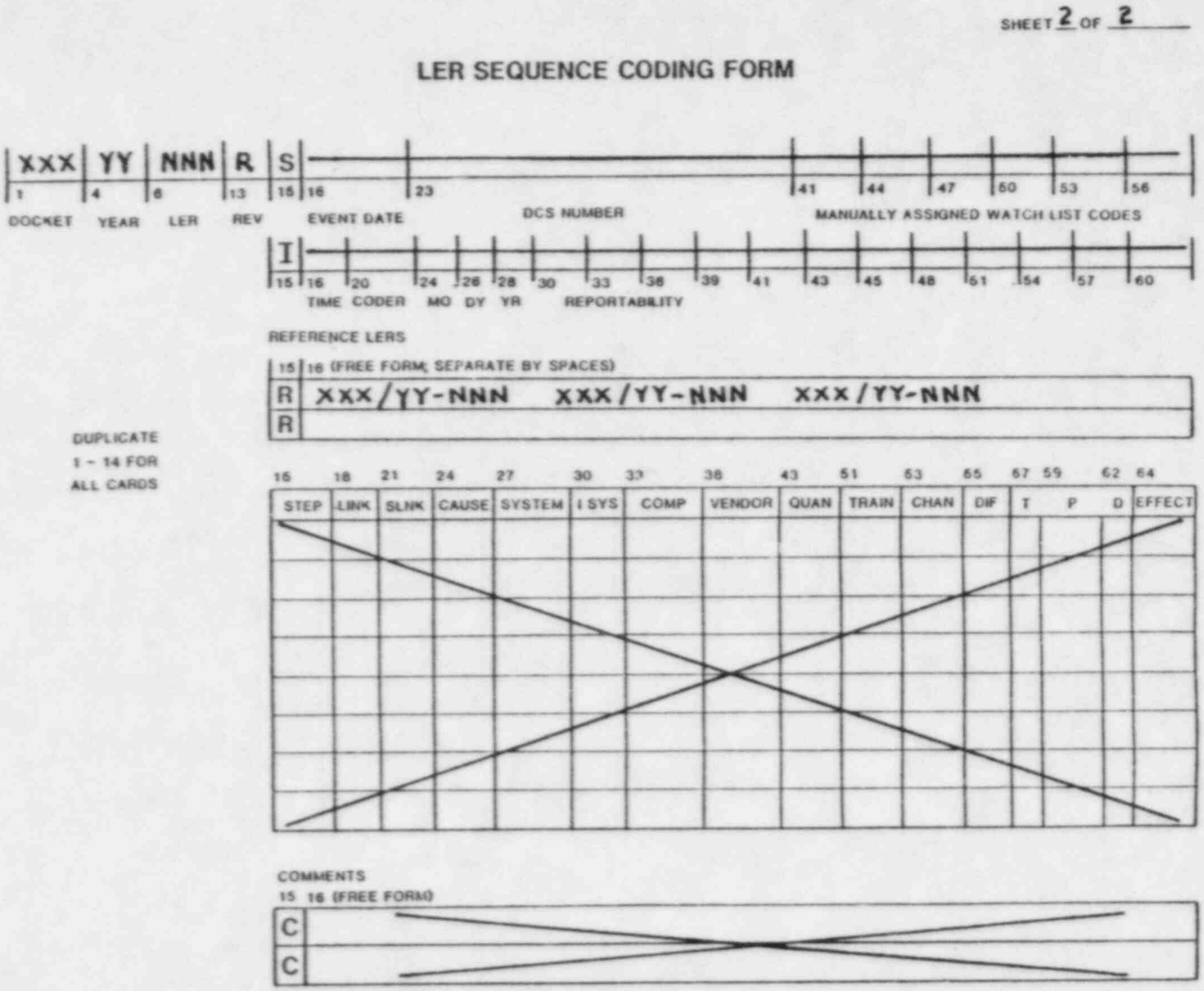
where

1. "xxx" represents the docket number of the unit issuing the LER,
2. "yy" represents the year, and
3. "nnn" represents an LER number.

Separate docket (xxx) and year (yy) by a "/" (slash). Separate the year (yy) and LER number (nnn) by a "-" (dash). Each "xxx/yy-nnn" represents a different reference LER. Separate reference LERs by blank spaces. Do not separate them by using commas, colons, semicolons, or any other character. Field format restrictions limit the input to six reference LERs per line. To handle lists of reference LERs greater than 12 in number, use another coding form crossing out all unnecessary coding fields (Fig. C.1). The following information must be filled in on all supplemental coding forms — sheet number, docket, year, LER, and revision number.

C.1.2.2 Rule 32 — Similar events referenced but not identified. If the reference LERs listed cannot be identified in the format given in Rule C.1.2.1, the technical processor should use the comments section to state that similar events have occurred.

C.1.2.3 Rule 33 — Noting similar events not referenced. When coding a group of LERs from the same station, a technical processor may notice that there are similar LERs among those reported by that station, but those events do not reference each other. List such events as reference LERs to each other.


SHEET 2 OF 2

LER SEQUENCE CODING FORM

| XXX | YY | NNN | R | S |
1 4 8 13 15 16 23 41 44 47 50 53 56
DOCKET YEAR LER REV EVENT DATE DCS NUMBER MANUALLY ASSIGNED WATCH LIST CODES

I
15 16 20 24 26 28 30 33 36 39 41 43 45 48 51 54 57 60
TIME CODER MO DY YR REPORTABILITY

REFERENCE LERS
15 16 (FREE FORM; SEPARATE BY SPACES)
R XXX/YY-NNN XXX/YY-NNN XXX/YY-NNN
R

DUPLICATE
1 - 14 FOR
ALL CARDS

16 18 21 24 27 30 33 38 43 51 53 55 57 59 62 64
STEP LINK SLNK CAUSE SYSTEM I SYS COMP VENDOR QUAN TRAIN CHAN DIF T P D EFFECT

COMMENTS
15 16 (FREE FORM)
C
C

Fig. C.1 Examples of second sheet for reference LERs

C.2 Reportability

C.2.1 Description

After January 1, 1984, utilities are required to specify the reporting requirements met by the event being reported. A single event may meet more than one reporting requirement. Valid reportability numbers are the number from 1 to 21 corresponding to the following requirements:

Reportability Code	Requirement
1	10 CFR 20.402 (b)
2	10 CFR 20.405 (a) (1) (i)
3	10 CFR 20.405 (a) (1) (ii)
4	10 CFR 20.405 (a) (1) (iii)
5	10 CFR 20.405 (a) (1) (iv)
6	10 CFR 20.405 (a) (1) (v)
7	10 CFR 20.405 (c)
8	10 CFR 50.36 (c) (1)
9	10 CFR 50.36 (c) (2)
10	10 CFR 50.73 (a) (2) (i)
11	10 CFR 50.73 (a) (2) (ii)
12	10 CFR 50.73 (a) (2) (iii)
13	10 CFR 50.73 (a) (2) (iv)
14	10 CFR 50.73 (a) (2) (v)
15	10 CFR 50.73 (a) (2) (vii)
16	10 CFR 50.73 (a) (2) (viii) (A)
17	10 CFR 50.73 (a) (2) (viii) (B)
18	10 CFR 50.73 (a) (2) (x)
19	10 CFR 73.71 (b)
20	10 CFR 73.71 (c)
21	Other

C.2.2 Rules for reportability

C.2.2.1 Rule 34 — Specifying other reportability requirements. When code 21 — Other is used in reportability, the specific requirement, voluntary report, or special report must be recorded in the comments field in the following format:

Other Reportability — 10 CFR xx.yy

Appendix D: ORDERING OF EVENTS

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Appendix D: ORDERING OF EVENTS

D.1 Introduction

The first descriptors of the occurrence order events into a logical progression of occurrences. These three descriptors are step number, link and sublink. The step number generally corresponds to chronological order of the occurrences. Accepted codes for this descriptor are numeric values only.

The second descriptor is the link. The link identifier ties the object step to related prior step(s). If the link descriptor is numeric (corresponding to a previous step number), the object step is directly related to that previous step.

Two or more occurrences can combine to produce resulting occurrences. The sublink and link descriptors are used to link such multiple occurrences together. An alphabetic sublink code is used to link multiple occurrences to the same alphabetic code in the link of a subsequent step. This indicates that the object step (the step with the alphabetic link code) resulted from prior occurrences. Both alphabetic and numeric codes are accepted for the link descriptor. Only alphabetic codes are accepted for the sublink descriptor.

D.2 Rules

D.2.1 Rule 35 — Initiating steps

The link value for any initiating step must be 0. (Step 1 is always an initiating step). A step number of 0 can never be used. An environmental effect step (system code YY) can never be an initiating step.

D.2.2 Rule 36 — Link less than step

The step number and link number can never be the same for a given step. The value of a numeric link must always be less than the step number.

D.2.3 Rule 37 — Link for unit and environmental effect steps

The link column must be blank for unit effect (system XX) or environmental effect (system YY) steps having no effect on the unit or environment. For others, the link column for unit and environmental effect steps must be non-blank and should link back to the step(s) that caused the abnormal unit or environmental condition.

D.2.4 Rule 38 — Alphabetic link

The sublink and link values in a single step can never be equal. Always use a sublink value of A before B before C, etc., except for a sublink value of X which can occur anywhere within a sequence. A sublink value of X is used in containment isolation system or instrumentation system leak steps, or with steps having multiple causes or effects.

D.2.5 Rule 39 — Multiple initiators

The following examples illustrate the use of the link and sublink columns for multiple initiators.

Example 1: Isolation Valve Failure

In this example, steps 1, 2, and 3 are shown to be sublinked together (sublink A in steps 1, 2, and 3) to cause step 4 (link A). Step 1 shows a small within system leak (effect BA) through a valve seat (component VLVS) in the liquid radwaste system (system WA) combined with step 2 which shows a small pressure boundary leak (effect BK) through a valve packing (component SEAL) to the waste management building (ISYS SN). These steps combine with step 3 showing a corrosion-weakened (cause EF) valve shaft (component SHFT) breaking (effect DA), thereby preventing the isolation valve (component ISVZ) in step 4 from opening (effect AL).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	ZZ	WA		VLVS		1	1		1	M	TR	K	BA
2	0	A	ZZ	WA	SN	SEAL		1	1		1	M	TR	K	BK
3	0	A	EF	WA		SHFT		1	1		1	A	TR	K	DA
4	A		RC	WA		ISVZ		1	1		1	A	TR	I	AL
5				XX								E	XX		YC
6				YY								N	N		YC

Example 2: Multiple Diesel Generator Failure

Example 2 shows independent failures in two diesel generators leading to a complete failure of the emergency generating system (system EH) and a unit power reduction. Step 1 is the initiator of the failure of the first diesel. Here, a fuel pump (system CI, component PMPZ) low flow condition (effect HI) resulted in the diesel engine (system EH, component DSL) failure to start (effect KB).

The utility then tried to verify operability of the second emergency generator. Step 3 shows that a governor (component 65) in the emergency generation control system (system IH, ISYS EH) was out of calibration (effect LB) resulting in a diesel failure due to underspeed (effect CK). This resulted in a loss of the second emergency generating system train. The sublink values of A for each of the train failures link to step 5 showing the loss of the entire emergency generating system (link A, system EH, component XXX). The unit was forced to reduce power (P-column BZ) as a result.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		ZZ	CI		PMPZ		1	1		1	A	TR	I	HI
2	1	A	RC	EH		DSL		1	1		1	A	T	I	HB
3	0		ZZ	IH	EH	65		1	2	1	1	M	TR	I	LB
4	3	A	RC	EH		DSL		1	2		2	A	T	I	CK
5	A		RT	EH		XXX					1	A	T	I	KB
6	5			XX								E	BZ		YC
7				YY								N	N		YC

D.2.6 Rule 40 — Use of interface systems and information step with containment isolation events

Focus:

An X in the sublink column denotes that a step is an information step and that it is adding information to a prior step when used in a containment isolation occurrence. The information step must be linked to the first step of the occurrence.

Rule:

I. Interface system identifies the system being isolated.

When the system in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a system of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.6) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetrations. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component code ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system 'DB' — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A		DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SF	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

D.2.7 Rule 41 — Information steps

Often a single step is insufficient to describe an occurrence because two codes must be used in the same field (for example, two cause codes). When this occurs, additional steps called information steps must be used to include all of the description. The most common uses of information steps are containment isolation leaks, instrumentation system leaks, multiple causes, and multiple effects.

An information step is designated by an X in the sublink column. All information steps must link to the first step of the occurrence. All fields in the information steps must be the same as in the first step of the occurrence except the step, link, and sublink columns and columns where additional information is being added.

Example: Corroded Bolt

A bolt (component FAS — fastener) on a piece of equipment was found heavily corroded. The corrosion was caused by the high operating temperature and high humidity in the area.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
5	*		NP	**		FAS		1	1		1	P	*	*	DA
6	5	X	NC	**		FAS		1	1		1	P	*	*	DA
7	5	X	EF	**		FAS		1	1		1	P	*	*	DA

D.2.8 Rule 42 — Link steps

When a step must be sublinked in more than one subsequence, use a link step. A link step adds no new information. It merely shows the cause relationships in a complex sequence.

A link step has all blank fields except step, link, sublink, and effect. It is linked to the step that must have more than one sublink. The sublink of the link step must differ from the referenced step's sublink. The effect code must be YC — Additional Information.

Example: Redundant Pump Failures

While a pump (component PMPZ — Pump, Unknown Type) was out of service for maintenance, a redundant pump failed on two occasions causing the loss of a train.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	**		PMPZ		1	1		1	*	*	*	**
2	1	B													YC
3	0	A	**	**		PMPZ		1	1		2	*	*	*	**
4	A		**	**		1XZ		1	1		1	*	*	*	**
5	0	B	**	**		PMPZ		1	1		2	*	*	*	**
6	B		**	**		1XZ		1	1		1	*	*	*	**

D.2.9 Rule 43 — Multiple sequences in the same LER

An LER contains multiple sequences when the occurrences reported are separated in time by more than 24 hours and the occurrences have no common link. Occurrences within 24 hours of each other have the potential to worsen the consequences of both occurrences by affecting common systems or by requiring the same resources for repair. Because of these potential effects, occurrences within 24 hours of each other must be coded as one sequence (Example 1).

In addition, any time a common link exists between occurrences, they must be coded as a single sequence (Example 2). Examples of common links are direct causal relationships among occurrences, occurrences having the same cause or common effect, redundant equipment out of service at the same time, independent occurrences revealed by a common test, and occurrences caused by a generic design error.

Each sequence must have at least one unit effects step (system XX) and only one environmental effects step (system YY). The last two steps of each sequence must be a unit effects step followed by an environmental effects step (Example 3). These steps must be linked to other steps in the sequence only when the occurrences have had adverse effects on the unit or the environment, or when there are no direct causal relationships among occurrences in the same sequence as described below.

The step, link, and sublink columns must designate each sequence within an LER as a distinct group. All steps within one sequence, except unit and environmental effects steps, must be connected to each other through a system of links and sublinks (for example, step 3 linked to step 2, step 2 linked to step 1, and step 1 an initiator with link 0). If no direct causal relationships exist, the steps must be sublinked to the unit effects step (see Example 1). A new sequence must begin with the step number immediately following the environmental effects step of the previous sequence.

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER (see Appendix I). For example, if a component in train A of a system fails in the first sequence and a component in train B of the same system fails in the second sequence, the train column in the second sequence must be 2 (Example 4).

Example 1: Two Diesel Generators Fail to Start

Diesel generator A (system EH — Emergency Power Generation, component DSL — Engine, Diesel) failed to start (effect KB — Failure to Operate) on March 17 at 6:15 p.m. On March 18, diesel generator B failed to start at 12:01 p.m.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	EH		DSL		1	1		1	*	*	*	KB
2	0	A	**	EH		DSL		1	2		2	*	*	*	KB
3	A		**	EH		2XZ		2	M		1	*	*	*	**
4				XX								*	**		**
5				YY								*	*		**

Example 2: Snubbers Found Inoperable

On March 17, two snubbers (component SNB) in the Chemical Volume and Control System (CVCS) (system BK) were found inoperable. On March 24, one snubber in the CVCS and two snubbers in the Fire Protection System (system KF) were found inoperable. These failures were found during the annual inspection of piping supports.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	BK		SNB		3	*		*	*	*	I	**
2	0	A	**	KF		SNB		2	*		*	*	*	I	**
3	A			XX								*	**		YC
4				YY								*	*		YC

Example 3: Multiple Unrelated Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12, December 28, and March 24. Each time the pump was repaired and returned to service.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		PMPZ		1	1		1	*	*	*	**
2	1		**	BA		1XZ		1	1		1	*	*	*	**
3				XX								*	**		**
4				YY								*	*		**
5	0		**	BA		PMPZ		1	1		1	*	*	*	**
6	5		**	BA		1XZ		1	1		1	*	*	*	**
7				XX								*	**		**
8				YY								*	*		**
9	0		**	BA		PMPZ		1	1		1	*	*	*	**
10	9		**	BA		1XZ		1	1		1	*	*	*	**
11				XX								*	**		**
12				YY								*	*		**

Example 4: Multiple Related Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12 and December 28. After the first occurrence, the pump was tested satisfactorily and returned to service. After the second occurrence, the pump was dismantled and it was found that the impellor (component MSC — Miscellaneous Subcomponent) had been rubbing the casing on both occasions.

Auxiliary feedwater pump B failed on March 24. Its internals were examined but there was no evidence of the impellor rubbing the casing.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		MSC		1	1		1	*	*	*	**
2	1		**	BA		PMPZ		1	1		1	*	*	*	**
3	2		**	BA		1XZ		1	1		1	*	*	*	**
4	1		**	BA		PMPZ		1	1		1	*	*	*	**
5	4		**	BA		1XZ		1	1		1	*	*	*	**
6				XX								*	**		**
7				YY								*	*		**
8	0		**	BA		PMPZ		1	2		2	*	*	*	**
9	8		**	BA		1XZ		1	2		2	*	*	*	**
10				XX								*	**		**
11				YY								*	*		**

Appendix E. CAUSE EFFECT CODES

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E.1 Assembly/Adjustment

AA	Missing	AL	Failure to open
AB	Maladjusted/mispositioned	AN	Closed
AC	Improper physical separation	AP	Transfer closed
AD	Loose	AR	Failure to close
AE	Tight	AS	Anticipatory maintenance
AF	Wrong component/part	AT	Temporary modification
AH	Wrong material	AU	Improper previous repair
AI	Open	AW	Ineffective previous repair
AK	Transfer Open	AX	Other (assembly/adjustment)

E.1.1 Missing — AA

E.1.1.1 Description. This code describes a condition of physical location. It should be used when a component or part is absent from its proper location. Missing indicates total absence, not something that is just mispositioned (cause/effect AB). When it is clear that the component was once in the proper location and subsequently broke off (cause/effect DA) or corroded/eroded away (cause/effect EF and FA respectively), do not use AA — Missing.

E.1.1.2 Rules for cause/effect AA. None to date.

E.1.2 Maladjusted/mispositioned — AB

E.1.2.1 Description. This code describes a condition of physical location. It should be used when a component or part is present but is not in its proper location due to improper adjustment or positioning. It should not be used for an improper setting (for example, a valve out of position) nor for an instrument that is out of calibration (cause/effect LB).

E.1.2.2 Rules for cause/effect AB. None to date.

E.1.3 Improper physical separation — AC

E.1.3.1 Description. This code describes a condition of physical location when an adverse condition of one component affects a nearby component that is not adequately separated. It includes both when a common element (such as dust) affects more than one component and when the condition of one component (such as fire) propagates to another component. It does not include components that are dependent on one another or that are physically connected (for example, a motor catches on fire and the connected pump burns up).

A

E.1.3.2 Rules for cause/effect AC. None to date.

E.1.4 Loose — AD

E.1.4.1 Description. This code describes a condition where a component or part is not properly secured or has undesired free movement. It includes both "was installed loose" (e.g., not properly tightened) and "became loose" (e.g., due to vibration).

E.1.4.2 Rules for cause/effect AD. None to date.

E.1.5 Tight — AE

E.1.5.1 Description. This code describes when a component or part has been tightened or torqued too much.

E.1.5.2 Rules for cause/effect AE. None to date.

E.1.6 Wrong component/part — AF

E.1.6.1 Description. This code describes when a component is improper for the service it is intended to perform (such as not being seismically qualified) or when an incorrect part is used in a component. This is frequently a result of a personnel error during installation, design, or maintenance.

E.1.6.2 Rules for cause/effect AF.

E.1.6.2.1 Rule 141 — Cause/effect type for code AF. Cause/effect code AF — Wrong Component/Part may only be used as a cause code.

E.1.7 Wrong material — AH

E.1.7.1 Description. This code describes a condition when the material of which a component or part is made is inappropriate for the component's intended function. For example, if a component must operate in the harsh containment environment following a LOCA but it contains rubber that breaks down in a high radiation field, it has the wrong material.

E.1.7.2 Rules for cause/effect AH.

E.1.7.2.1 Rule 142 — Cause/effect type for code AH. Cause/effect AH — Wrong Material may only be used as a cause code.

E.1.7.2.2 Rule 143 — Ineffective lubricating oil. Substandard lubricating oil must be coded by using cause AH — Wrong Material. Insufficient lubricating oil must be coded by using cause PI — Improper Lubrication.

A

E.1.8 Open — AI

E.1.8.1 Description. This code describes when a component is in the open position. No change of state (open or closed) occurs nor is demanded. This does not include an open circuit (cause/effect IF).

E.1.8.2 Rules for cause/effect AI.

E.1.8.2.1 Rule 144 — Cause/effect type for Code AI. Cause/effect AI — Open may only be used as an effect code.

E.1.9 Transfer open — AK.

E.1.9.1 Description. This code describes a change in a component's state in the open direction. This code should be used when a circuit breaker "trips" or a valve "opens."

E.1.9.2 Rules for cause/effect AK.

E.1.9.2.1 Rule 146 — Cause/effect type for code AK. Cause/effect AK — Transfer Open may only be used as an effect code.

E.1.10 Failure to open — AL

E.1.10.1 Description. This code describes a failure of a component to change state when it is expected that the component will move in the open direction. It should be used when a circuit breaker "fails to trip" or a valve "fails to open."

E.1.10.2 Rules for cause/effect code AL.

E.1.10.2.1 Rule 147 — Cause/effect type for code AL. Cause/effect AL — Failure to Open may only be used as an effect code.

E.1.11 Closed — AN

E.1.11.1 Description. This code describes a condition where a component is in the closed position. No change of state (open or closed) occurs nor is demanded. This does not include a closed or short circuit (cause/effect IF).

E.1.11.2 Rules for cause/effect AN.

E.1.11.2.1 Rule 148 — Cause/effect type for code AN. Cause/effect AN — Closed may only be used as an effect code.

E.1.12 Transfer closed — AP

E.1.12.1 Description. This code describes a change in a component's state in the closed direction.

A

E.1.12.2 Rules for cause/effect code AP.

E.1.12.2.1 Rule 149 — Cause/effect type for code AP. Cause/effect AP — Transfer Closed may only be used as an effect code.

E.1.13 Failure to close — AR

E.1.13.1 Description. This code describes a failure of a component to change state when it is expected that the component will move in the closed direction.

E.1.13.2 Rules for cause/effect code AR.

E.1.13.2.1 Rule 150 — Cause/effect type for code AR. Cause/effect AR — Failure to Close may only be used as an effect code.

E.1.14 Anticipatory maintenance — AS

E.1.14.1 Description. This code describes maintenance or repair which was performed either periodically or in anticipation of future failure, but where the component has not failed to perform its intended function.

E.1.14.2 Rules for cause/effect AS.

E.1.14.2.1 Rule 151 — Cause/effect type for code AS. Cause/effect AS — Anticipatory Maintenance may only be used as a cause code.

E.1.14.2.2 Rule 152 — T-column code with cause/effect AS. A T-column of M — Actual Preexisting, Undetected should not be used in conjunction with cause/effect AS.

E.1.15 Temporary modification — AT

E.1.15.1 Description. This code describes a short term change, normally to bypass equipment for testing or maintenance. It frequently involves installation of additional equipment (for example, a jumper around relay contacts).

E.1.15.2 Rules for cause/effect AT.

E.1.15.2.1 Rule 153 — Cause/effect type for code AT. Cause/effect AT — Temporary Modification may only be used as a cause code.

E.1.16 Improper previous repair — AU

E.1.16.1 Description. This code describes a previous repair that was performed improperly.

A

E.1.16.2 Rules for cause/effect AU.

E.1.16.2.1 Rule 154 — Cause/effect type for code AU. Cause/effect AU — Improper Previous Repair may only be used as a cause code.

E.1.17 Ineffective previous repair — AW

E.1.17.1 Description. This code describes a prior repair that was performed correctly but was ineffective at preventing recurrence.

E.1.17.2 Rules for cause/effect AW.

E.1.17.2.1 Rule 155 — Cause/effect type for code AW. Cause/effect AW — Ineffective Previous Repair may only be used as a cause code.

E.1.18 Other (Assembly/adjustment) — AX

E.1.18.1 Description. This code includes any cause/effect related to assembly/adjustments that does not meet the criteria for any other cause/effect code beginning with A.

E.1.18.2 Rules for cause/effect AX.

E.1.18.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system code ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) :(ATTRIBUTE) (CODE) - (EXPLANATION)

A

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.2 Leakage

BA Within system leakage, small
BB Within system leakage, medium
BC Within system leakage, large
BD Within system leakage, unknown rate
BE Between systems leakage, small
BF Between systems leakage, medium
BH Between systems leakage, large
BI Between systems leakage, unknown rate
BK Extermal system leakage, small
BL External system leakage, medium
BN External system leakage, large
BP External system leakage, unknown rate
BX Other (leakage)

E.2.1 Within system leakage, small — BA

E.2.1.1 Description. This code describes leakage from one part of a system to another part of the same system at 1 gpm (or 10 SCFH) or less.

E.2.1.2 Rules for cause/effect BA.

E.2.1.2.1 Rule 156 — Cause/effect type for code BA. Cause/effect BA — Within System Leakage, Small may only be used as an effect code.

E.2.2 Within system leakage, medium — BB

E.2.2.1 Description. This code describes leakage from one part of a system to another part of the same system at greater than 1 gpm (or 10 SCFH) but less than 100 gpm (or 1000 SCFH).

E.2.2.2 Rules for cause/effect BB.

E.2.2.2.1 Rule 157 — Cause/effect type for code BB. Cause/effect BB — Within System Leakage, Medium may only be used as an effect code.

E.2.3 Within system leakage, large — BC

E.2.3.1 Description. This code describes leakage from one part of a system to another part of the same system at 100 gpm (or 1000 SCFH) or greater.

E.2.3.2 Rules for cause/effect BC.

E.2.3.2.1 Rule 158 — Cause/effect type for code BC. Cause/effect BC — Within System Leakage, Large may only be used as an effect code.

E.2.4 Within system leakage, unknown rate — BD

E.2.4.1 Description. This code describes leakage from one part of a system to another part of the same system at an unknown rate.

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E.2.4.2 Rules for cause/effect BD.

E.2.4.2.1 Rule 159 — Cause/effect type for code BD. Cause/effect BD — Within System Leakage, Unknown Rate may only be used as an effect code.

E.2.5 Between systems leakage, small — BE

B.2.5.1 Description. This code describes leakage from one system to another system at 1 gpm (or 10 SCFH) or less.

B.2.5.2 Rules for cause/effect BE.

B.2.5.2.1 Rule 179 — Cause/effect type for code BE. Cause/effect BE — Between Systems Leakage, Small may only be used as an effect code.

E.2.5.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolatei.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

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There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

- SA — indicates an inner door (Primary Reactor Containment),
- SF — indicates an outer door (Reactor Auxiliary Building), and
- SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB). B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.5.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the systems to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.6 Between systems leakage, medium — BF

E.2.6.1 Description. This code describes leakage from one system to another system at greater than 1 gpm (10 SCFH) but less than 100 gpm (or 1000 SCFH).

E.2.6.2 Rules for cause/effect BF.

E.2.6.2.1 Rule 180 — Cause/effect type for code BF. Cause/effect BF — Between Systems Leakage, Medium may only be used as an effect code.

E.2.6.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

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Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB].

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Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.6.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the system to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

B

E.2.7 Between systems leakage, large — BH

E.2.7.1 Description. This code describes leakage from one system to another system at 100 gpm (or 1000 SCFH) or greater.

E.2.7.2 Rules for cause/effect BH.

E.2.7.2.1 Rule 181 — Cause/effect type for code BH. Cause/effect BH — Between Systems Leakage, Large may only be used as an effect code.

E.2.7.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from

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which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW - Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which

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allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak On a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.7.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the systems to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.8 Between systems leakage, unknown rate — BI

E.2.8.1 Description. This code describes leakage from one system to another system at an unknown rate.

E.2.8.2 Rules for cause/effect BI.

E.2.8.2.1 Rule 182 — Cause/effect type for code BI. Cause/effect BI — Between Systems Leakage, Unknown Rate may only be used as an effect code.

E.2.8.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

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Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB].

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Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

- SA — indicates an inner door (Primary Reactor Containment),
- SF — indicates an outer door (Reactor Auxiliary Building), and
- SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolat ISYS SA — Primary Reactor Containment (PWR), component PNA] wh allowed a maintenance personnel to open (effect AK) the outer conta ment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	DA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak On a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.8.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the system to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

B

E.2.9 External system leakage, small — BK

E.2.9.1 Description. This code describes a component pressure boundary failure resulting in leakage of 1 gpm (or 10 SCFH) or less.

E.2.9.2 Rules for cause/effect BK.

E.2.9.2.1 Rule 184 — Cause/effect type for code BK. Cause/effect BK — External System Leakage, Small may only be used as an effect code.

E.2.9.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from

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which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

<u>Example 1: Containment Isolation Valve Not Tested</u>

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB -- Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which

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allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS code SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*R	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.9.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the systems to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.9.2.4 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of pressure boundary are coded with a leak effect (code beginning with B), not DA — Break/Shear.

E.2.10 External system leakage, medium — BL

E.2.10.1 Description. This code describes a component pressure boundary failure resulting in leakage of greater than 1 gpm (or 10 SCFH) but less than 100 gpm (or 1000 SCFH).

E.2.10.2 Rules for cause/effect BL.

E.2.10.2.1 Rule 185 — Cause/effect type for code BL. Cause/effect BL — External System Leakage, Medium may only be used as an effect code.

E.2.10.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

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III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak On a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.10.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the system to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.10.2.4 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of pressure boundary are coded with a leak effect code (code beginning with B), not DA — Break/Shear.

E.2.11 External system leakage, large — BN

E.2.11.1 Description. This code describes a component pressure boundary failure resulting in leakage of 100 gpm (or 1000 SCFH) or larger.

E.2.11.2 Rules for cause/effect BN.

E.2.11.2.1 Rule 186 — Cause/effect type for code BN. Cause/effect BN — External System Leakage, Large may only be used as an effect code.

E.2.11.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

B

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

B

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component code ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS code SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.11.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the system to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.11.2.4 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of pressure boundary are coded with a leak effect code (code beginning with B), not DA — Break/Shear.

B

E.2.12 External system leakage, unknown rate — BP

E.2.12.1 Description. This code describes a component pressure boundary failure resulting in leakage at an unknown rate.

E.2.12.2 Rules for cause/effect BP.

E.2.12.2.1 Rule 187 — Cause/effect type for code BP. Cause/effect BP — External System Leakage, Unknown Rate may only be used as an effect code.

E.2.12.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

There are two types of containment isolation leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different nonstructural systems.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS

B

of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

- SA — indicates an inner door (Primary Reactor Containment),
- SF — indicates an outer door (Reactor Auxiliary Building), and
- SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SH).

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which

B

allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*R	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

B

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

E.2.12.2.3 Rule 183 — Interface system for between systems and external leaks. The interface system column must be used when coding between systems leakage or external system leakage events. This captures the system to which the component belongs and the system or environment to which the leak communicates. For example, a leak of unknown rate (effect BP) from the RHR system (system BR) to the primary containment (ISYS SA) should be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BF	SA	***		*	*		*	*	*	*	BP

E.2.12.2.4 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of pressure boundary are coded with a leak effect code (code beginning with B), not DA — Break/Shear.

E.2.13 Other (leakage) — BX

E.2.13.1 Description. This code includes any effect related to leakage that does not meet the criteria for any other cause/effect code beginning with B.

E.2.13.2 Rules for cause/effect BX.

E.2.13.2.1 Rule 188 — Cause/effect type for code BX. Cause/effect BX — Other (Leakage) may only be used as an effect code.

E.2.13.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

B

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER)] : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.3 Mechanical

CA	Mechanical overload	CH	Vibration
CB	Fatigue	CI	Overspeed
CC	Impact	CK	Underspeed
CD	Drop	CX	Other (mechanical)
CE	Wear/age/end of life		

E.3.1 Mechanical overload — CA

E.3.1.1 Description. This code describes the condition of a component which has been subject to a mechanical load which exceeds the normally expected range. The load may exceed specified operating limits. Mechanical overload should not be used for electrical overload (cause/effect IA).

E.3.1.2 Rules for cause/effect CA. None to date.

E.3.2 Fatigue — CB

E.3.2.1 Description. This code describes a component failure due to cyclic stress applied to the component.

E.3.2.2 Rules for cause/effect CB.

E.3.2.2.1 Rule 164 — Cause/effect type for code CB. Cause/effect CB — Fatigue may only be used as a cause code.

E.3.3 Impact — CC

E.3.3.1 Description. This code is used when a force is produced by an object or person striking a component. It should not be used for damage caused by dropping an object (cause/effect CD).

E.3.3.2 Rules for cause/effect CC.

E.3.3.2.1 Rule 165 — Cause/effect type for code CC. Cause/effect CC — Impact may only be used as a cause code.

E.3.4 Drop — CD

E.3.4.1 Description. This code is used when a component fell due to gravity.

E.3.4.2 Rules for cause/effect CD.

E.3.4.2.1 Rule 96 — Rod drop accidents. Cause/effect CD — Drop should be used to describe a "rod drop" event.

C

E.3.5 Wear/age/end of life — CE

E.3.5.1 Description. This code describes a component which has deteriorated due to friction or attrition usually due to extended use or effects of time.

E.3.5.2 Rules for cause/effect CE. None to date.

E.3.5.2.1 Rule 258 - Cause/effect type for code CE. Cause/effect CE - Wear/Age/End of Life may only be used as a cause code.

E.3.6 Vibration — CH

E.3.6.1 Description. This code should be used for a component which experiences mechanical or flow-induced vibration. It does not include seismic activity (cause/effect NN).

E.3.6.2 Rules for cause/effect CH. None to date.

E.3.7 Overspeed — CI

E.3.7.1 Description. This code applies to a component which operates at a speed above the normally expected range. The speed may exceed specified limits.

E.3.7.2 Rules for cause/effect CI.

E.3.7.2.1 Rule 166 — Cause/effect type for code CI. Cause/effect CI — Overspeed may only be used as an effect code.

E.3.8 Underspeed — CK

E.3.8.1 Description. This code applies to a component which operates at a speed below the normally expected range; the speed may violate specified limits.

E.3.8.2 Rules for cause/effect CK.

E.3.8.2.1 Rule 167 — Cause/effect type for code CK. Cause/effect CK — Underspeed may only be used as an effect code.

E.3.9 Other (mechanical) — CX

E.3.9.1 Description. This code should be used when the cause/effect is related to a mechanical condition but does not meet any of the defined criteria.

C

E.3.9.2 Rules for cause/effect CX.

E.3.9.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

C

E.4 Mechanistic

DA	Break/shear	DD	Overtravel
DB	Bend/deform	DE	Crack
DC	Bind/jam	DX	Other (mechanistic)

E.4.1 Break/shear — DA

E.4.1.1 Description: This code is used to describe the physical severing of a component. This code should not be used when something "breaks down."

E.4.1.2 Rules for cause/effect DA.

E.4.1.2.1 Rule 168 — Cause/effect type for code DA. Cause/effect DA — Break/Shear may only be used as an effect code.

E.4.1.2.2 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of pressure boundary are coded with a leak effect code (code beginning with B), not DA — Break/Shear.

E.4.2 Bend/deform — DB

E.4.2.1 Description. This code should be used for a component which is physically distorted in shape.

E.4.2.2 Rules for cause/effect DB.

E.4.2.2.1 Rule 169 — Cause/effect type for code DB. Cause/effect DB — Bend/Deform may only be used as an effect code.

E.4.3 Bind/jam — DC

E.4.3.1 Description. This code describes a component whose performance is inhibited typically by foreign material, crud, or friction. This code should be used for components that "stick."

E.4.3.2 Rules for cause/effect DC.

E.4.3.2.1 Rule 170 — Cause/effect type for code DC. Cause/effect DC — Bind/Jam may only be used as an effect code.

E.4.4 Overtravel — DD

E.4.4.1 Description. This code is used for a component that moves beyond its design limits.

D

E.4.4.2 Rules for cause/effect DD.

E.4.4.2.1 Rule 171 — Cause/effect type for code DD. Cause/effect DD — Overtravel may only be used as an effect code.

E.4.5 Crack — DE

E.4.5.1 Description. This code should be used when there is a physical crack in a component or structural element but no resulting leakage. If leakage is present, use cause/effect codes involving leakage (BA through BX).

E.4.5.2 Rules for cause/effect DE.

E.4.5.2.1 Rule 172 — Cause/effect type for code DE. Cause/effect DE — Crack may only be used as an effect code.

E.4.6 Other (mechanistic) — DX

E.4.6.1 Description. This code should be used when the cause/effect is related to a mechanistic condition but does not meet any of the defined criteria.

E.4.6.2 Rules for cause/effect DX.

E.4.6.2.1 Rule 173 — Cause/effect type for code DX. Cause/effect DX — Other (Mechanistic) may only be used as an effect code.

E.4.6.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

D

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

D

E.5 Chemical

EA	Boron precipitation	EE	Low concentration/pH
EB	High boron concentration	EF	Corrosion/oxidation
EC	Low boron concentration	EX	Other (chemical)
ED	High concentration/pH		

E.5.1 Boron precipitation — EA

E.5.1.1 Description. This code describes the formation of boron crystals when boron precipitates from solution.

E.5.1.2 Rules for cause/effect EA.

E.5.1.2.1 Rule 79 — Heat tracing. The component HTTR — Heat Tracing is only coded when the system is EF — Electrical Heat Tracing and the ISYS is the system being heat traced.

E.5.2 High boron concentration — EB

E.5.2.1 Description. This code describes when boron concentration is above the normally expected range; it may exceed specified operating limits. This code is also used for boron stratification if the stratification resulted in a high boron concentration.

E.5.2.2 Rules for cause/effect EB.

E.5.2.2.1 Rule 174 — Cause/effect type for code EB. Cause/effect EB — High Boron Concentration may only be used as an effect code.

E.5.3 Low boron concentration — EC

E.5.3.1 Description. This code describes when boron concentration is below the normally expected range; it may violate specified operating limits. It is also used for boron stratification if the stratification resulted in a low boron concentration. This code should not be used to describe low battery specific gravity or low concentration (cause/effect EE).

E.5.3.2 Rules for cause/effect EC.

E.5.3.2.1 Rule 175 — Cause/effect type for code EC. Cause/effect EC — Low Boron Concentration may only be used as an effect code.

E.5.4 High concentration/pH — ED

E.5.4.1 Description. This code describes when the concentration or pH or a fluid is above the normally expected range; it may exceed specified operating limits. This code should not be used to describe high boron concentration (cause/effect EB).

E

E.5.4.2 Rules for cause/effect ED.

E.5.4.2.1 Rule 176 — Cause/effect type for code ED. Cause/effect ED — High Concentration/pH may only be used as an effect code.

E.5.5 Low concentration/pH — EE

E.5.5.1 Description. This code should be used when the concentration or pH of a fluid is below the normally expected range; it may violate specified operating limits. This code should not be used to describe low boron concentration (cause/effect EC).

E.5.5.2 Rules for cause/effect EE.

E.5.5.2.1 Rule 177 — Cause/effect type for code EE. Cause/effect EE — Low Concentration/pH may only be used as an effect code.

E.5.5.2.2 Rule 78 — Battery cause/effect codes. For a battery with a failure mode of "low specific gravity," "low voltage," or "out of tolerance on voltage or specific gravity," use cause/effect EE — Low Concentration/pH. Exception: if the low voltage is due to a shorted battery cell, use cause/effect ID — Undervoltage.

E.5.6 Corrosion/oxidation — EF

E.5.6.1 Description. This code describes a component which has worn away gradually because of chemical action. It should not be used for flow-caused erosion (cause/effect FA).

E.5.6.2 Rules for cause/effect code EF.

E.5.6.2.1 Rule 178 — Cause/effect type for code EF. Cause/effect EF — Corrosion/Oxidation may only be used as a cause code.

E.5.7 Other (chemical) — EX

E.5.7.1 Description. This code includes any cause/effect related to a chemical condition that does not meet any of the criteria for any other cause/effect code beginning with E.

E.5.7.2 Rules for cause/effect EX.

E.5.7.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E

E.6 Mechanical-Hydraulic

FA	Erosion	FD	Loss of pump suction/prime
FB	Cavitation	FE	Pressure pulse/water hammer
FC	Air/steam binding	FX	Other (mechanical-hydraulic)

E.6.1 Erosion — FA

E.6.1.1 Description. Cause/effect FA — Erosion describes the wearing away of a component by normal or excessive fluid flow.

E.6.1.2 Rules for cause/effect FA.

E.6.1.2.1 Rule 209 — Cause/effect type for code FA. Cause/effect FA — Erosion may only be used as a cause code.

E.6.2 Cavitation — FB

E.6.2.1 Description. Liquid that is close to its saturation temperature can easily flash to vapor at lower pressures, typically where there is a pressure reduction at the eye of a pump impeller. The flashing of liquid to vapor forms cavities within the liquid. This process is called cavitation (cause/effect FB).

E.6.2.2 Rules for cause/effect FB.

E.6.2.2.1 Rule 210 — Cause/effect type for code FB. Cause/effect FB — Cavitation may only be used as an effect code.

E.6.3 Air/steam binding — FC

E.6.3.1 Description. Cause/effect FC — Air/Steam Binding describes the accumulation of air or steam in a component that prevents the component's normal operation.

E.6.3.2 Rules for cause/effect FC. None to date.

E.6.4 Loss of pump suction/prime — FD

E.6.4.1 Description. Cause/effect FD — Loss of Pump Suction/Prime describes the inability of a pump to draw the liquid it is intended to pump because of a loss of that liquid.

E.6.4.2 Rules for cause/effect FD. None to date.

E.6.5 Pressure pulse/water hammer — FE

E.6.5.1 Description. Cause/effect FE — Pressure Pulse/Water Hammer describes a pressure rise or fluctuations caused by a sudden change in the rate of flow or stoppage of flow.

F

E.6.5.2 Rules for cause/effect FE. None to date.

E.6.6 Other (mechanical-hydraulic) — FX.

E.6.6.1 Description. Cause/effect FX — Other (Mechanical-Hydraulic) describes a mechanical-hydraulic condition that does not meet the defined criteria for the other mechanical-hydraulic cause/effects (cause/effects beginning with F).

E.6.6.2 Rules for cause/effect FX.

E.6.6.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

F

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

F

E.7 Thermal-Hydraulic

HA	High temperature	HH	High flow
HB	Low temperature	HI	Low flow
HC	Freezing condition	HK	High static pressure
HD	High thermal change rate	HL	Low static pressure
HE	High level/volume	HX	Other (thermal-hydraulic)
HF	Low level/volume		

E.7.1 High temperature — HA

E.7.1.1 Description. Cause/effect HA — High Temperature describes when a component or system temperature is above the normally expected range; it may exceed specified limits. This code does not include a high temperature in the area surrounding a component or system (cause/effect NP).

E.7.1.2 Rules for cause/effect HA. None to date.

E.7.2 Low temperature — HB

E.7.2.1 Description. Cause/effect HB — Low Temperature describes when a component or system temperature is below the normally expected range; it may exceed specified limits. This code does not include a low temperature in the area surrounding a component or system (cause/effect NP) nor a temperature low enough to cause freezing (cause/effect HC).

E.7.2.2 Rules for cause/effect HB.

E.7.2.2.1 Rule 211 — Cause/effect type for code HB. Cause/effect HB — Low Temperature may only be used as an effect code.

E.7.3 Freezing condition — HC

E.7.3.1 Description. Cause/effect HC — Freezing Condition describes when a temperature is so low that a fluid medium freezes in or on a component or system. This code should not be used for low temperature where freezing does not occur (cause/effect HB) nor for environmental ice (cause/effect NA).

E.7.3.2 Rules for cause/effect HC.

E.7.3.2.1 Rule 212 — Cause/effect type for code HC. Cause/effect HC — Freezing Condition may only be used as a cause code.

E.7.4 High thermal change rate — HD

E.7.4.1 Description. Cause/effect HD — High Thermal Change Rate describes changes in temperature that exceed their expected frequency or magnitude. This includes high heatup or cooldown rates.

H

E.7.4.2 Rules for cause/effect HC. None to date.

E.7.5 High level/volume — HE

E.7.5.1 Description. Cause/effect HE — High Level/Volume describes when the physical level in a component or area (such as an intake structure) is above the normally expected range; it may exceed specified limits.

E.7.5.2 Rules for cause/effect HE.

E.7.5.2.1 Rule 213 — Cause/effect type for code HE. Cause/effect HE — High Level/Volume may only be used as an effect code.

E.7.6 Low level/volume — HF

E.7.6.1 Description. Cause/effect HF — Low Level/Volume describes when the physical level in a component or area (such as an intake structure) is below the normally expected range; it may exceed specified limits.

E.7.6.2 Rules for cause/effect HF.

E.7.6.2.1 Rule 214 — Cause/effect type for code HF. Cause/effect HF — Low Level/Volume may only be used as an effect code.

E.7.7 High flow — HH

E.7.7.1 Description. Cause/effect HH — High Flow describes when flow is above the normally expected range; it may exceed specified limits.

E.7.7.2 Rules for cause/effect HH.

E.7.7.2.1 Rule 215 — Cause/effect type for code HH. Cause/effect HH — High Flow may only be used as an effect code.

E.7.8 Low flow — HI

E.7.8.1 Description. Cause/effect HI — Low Flow describes when flow is below the normally expected range; it may exceed specified limits.

E.7.8.2 Rules for cause/effect HI.

E.7.8.2.1 Rule 216 — Cause/effect type for code HI. Cause/effect HI — Low Flow may only be used as an effect code.

H

E.7.9 High static pressure — HK

E.7.9.1 Description. Cause/effect HK — High Static Pressure describes when the static pressure in a component or system is above the normally expected range; it may exceed specified limits.

E.7.9.2 Rules for cause/effect HK.

E.7.9.2.1 Rule 217 — Cause/effect type for code HK. Cause/effect HK — High Static Pressure may only be used as an effect code.

E.7.10 Low static pressure — HL

E.7.10.1 Description. Cause/effect HL — Low Static Pressure describes when the static pressure in a component or system is below the normally expected range; it may exceed specified limits.

E.7.10.2 Rules for cause/effect HL.

E.7.10.2.1 Rule 218 — Cause/effect type for code HL. Cause/effect HL — Low Static Pressure may only be used as an effect code.

E.7.11 Other (thermal-hydraulic) — HX

E.7.11.1 Description. Cause/effect HX — Other (Thermal-Hydraulic) describes a thermal-hydraulic condition that does not meet the defined criteria for the other thermal-hydraulic cause/effects (cause/effects beginning with H).

E.7.11.2 Rules for cause/effect HX.

E.7.11.2.1 Rule 83 — Specifying other and miscellaneous codes using the comment field.

Focus:

When using an other code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an other code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a miscellaneous code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H

E.8 Electrical

IA	Overcurrent/overload	IF	Open circuit/high impedance fault
IB	Undercurrent	IH	Electric power removed
IC	Overvoltage	II	Electric power supplied
ID	Undervoltage	IX	Other (electrical)
IE	Short circuit/low impedance fault		

E.8.1 Overcurrent/overload — IA

E.8.1.1 Description. Cause/effect IA — Overcurrent/Overload describes when current is above the normally expected range; it may exceed specified limits.

E.8.1.2 Rules for cause/effect IA. None to date.

E.8.2 Undercurrent — IB.

E.8.2.1 Description. Cause/effect IB — Undercurrent describes when a current is below the normally expected range; it may exceed specified limits.

E.8.2.2 Rules for cause/effect IB. None to date.

E.8.3 Overvoltage — IC

E.8.3.1 Description. Cause/effect IC — Overvoltage describes when voltage is above the normally expected range; it may exceed specified limits.

E.8.3.2 Rules for cause/effect IC. None to date.

E.8.4 Undervoltage — ID

E.8.4.1 Description. Cause/effect ID — Undervoltage describes when a voltage is below the normally expected range; it may exceed specified limits.

E.8.4.2 Rules for cause/effect ID. None to date.

E.8.5 Short circuit/low impedance fault — IE

E.8.5.1 Description. Cause/effect IE — Short Circuit/Low Impedance Fault describes a condition of higher than expected conductance. It includes short to power supply, short to ground, arcing, and other low impedance faults.

E.8.5.2 Rules for cause/effect IE. None to date.

E.8.6 Open circuit/high impedance fault — IF

E.8.6.1 Description. Cause/effect IF — Open Circuit/High Impedance Fault describes a condition of lower than expected conductance or circuit interruption.

E.8.6.2 Rules for cause/effect IF. None to date.

E.8.7 Electric power removed — IH

E.8.7.1 Description. Cause/effect IH — Electric Power Removed describes when power is not available to passive components. This code does not apply to active components. When power is removed from active components, use a functional cause/effect (cause/effect beginning with K).

E.8.7.2 Rules for cause/effect IH.

E.8.7.2.1 Rule 219 — Cause/effect type for code IH. Cause/effect IH — Electric Power Removed may only be used as an effect code.

E.8.8 Electric power supplied — II

E.8.8.1 Description. Cause/effect II — Electric Power Supplied describes when power is made available to passive components. This code does not apply to active components. When power is supplied to active components, use a functional cause/effect (cause/effect beginning with K).

E.8.8.2 Rules for cause/effect II.

E.8.8.2.1 Rule 220 — Cause/effect type for code II. Cause/effect II — Electric Power Supplied may only be used as an effect code.

E.8.9 Other (electrical) — IX

E.8.9.1 Description. Cause/effect IX — Other (Electrical) describes an electrical condition that does not meet the defined criteria for the other electrical cause/effects (cause/effects beginning with I).

E.8.9.2 Rules for cause/effect IX.

E.8.9.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.9 Functional

KA	Operate	KH	Engage/couple
KB	Failure to operate	KI	Disengage/decouple
KC	Cessation of operation	KK	Inoperable
KD	Failure to cease operation	KL	No failure
KE	Long response time	KX	Other (functional)
KF	Short response time		

E.9.1 Operate — KA

E.9.1.1 Description. Cause/effect KA — Operate describes when a component in the non-working state changes to the working state. This code is not applicable to passive components.

E.9.1.2 Rules for cause/effect KA.

E.9.1.2.1 Rule 221 — Cause/effect type for code KA. Cause/effect KA — Operate may only be used as an effect code.

E.9.2 Failure to operate — KB

E.9.2.1 Description. Cause/effect KB — Failure to Operate describes when a component in the non-working state remains in the non-working state. This code is not applicable to passive components.

E.9.2.2 Rules for cause/effect KB.

E.9.2.1.2 Rule 222 — Cause/effect type for code KB. Cause/effect KB — Failure to Operate may only be used as an effect code.

E.9.3 Cessation of operation — KC

E.9.3.1 Description. Cause/effect KC — Cessation of Operation describes when a component in the working state changes to the non-working state. This code is not applicable to passive components.

E.9.3.2 Rules for cause/effect KC.

E.9.3.2.1 Rule 223 — Cause/effect type for code KC. Cause/effect KC — Cessation of Operation may only be used as an effect code.

E.9.4 Failure to cease operation — KD

E.9.4.1 Description. Cause/effect KD — Failure to Cease Operation describes when a component in the working state remains in the working state. This code is not applicable to passive components.

K

E.9.4.2 Rules for cause/effect KD.

E.9.4.2.1 Rule 224 — Cause/effect type for code KD. Cause/effect KD — Failure to Cease Operation may only be used as an effect code.

E.9.5 Long response time — KE

E.9.5.1 Description. Cause/effect KE — Long Response Time describes when a component or system acts properly in every aspect except that the response time was longer than that normally expected. If the component or system experiences some other type of failure, do not use cause/effect KE.

E.9.5.2 Rules for cause/effect KE.

E.9.5.2.1 Rule 225 — Cause/effect type for code KE. Cause/effect KE — Long Response Time may only be used as an effect code.

E.9.6 Short response time — KF

E.9.6.1 Description. Cause/effect KF — Short Response Time describes when a component or system acts properly in every aspect except that the response time was shorter than that normally expected. If the component or system experiences some other type of failure, do not use cause/effect KF.

E.9.6.2 Rules for cause/effect KF.

E.9.6.2.1 Rule 226 — Cause/effect type for code KF. Cause/effect KF — Short Response Time may only be used as an effect code.

E.9.7 Engage/couple — KH

E.9.7.1 Description. Cause/effect KH — Engage/Couple describes when two components engage, mesh, or couple, or remain interlocked when they are normally not expected to do so. This code does not include mechanical breaks (cause/effect DA).

E.9.7.2 Rules for cause effect KH.

E.9.7.2.1 Rule 227 — Cause/effect type for code KH. Cause/effect KH — Engage/Couple may only be used as an effect code.

E.9.8 Disengage/Decouple — KI

E.9.8.1 Description. Cause/effect KI — Disengage/Decouple describes when two components do not interlock when they are normally expected to engage, mesh, or couple. This code does not include mechanical breaks (cause/effect DA).

K

E.9.8.2 Rules for cause/effect KI.

E.9.8.2.1 Rule 228 — Cause/effect type for code KI. Cause/effect KI — Disengage/Decouple may only be used as an effect code.

E.9.9 Inoperable — KK

E.9.9.1 Description. Cause/effect KK — Inoperable describes when a system or subsystem was removed from service or declared inoperable.

E.9.9.2 Rules for cause/effect KK.

E.9.9.2.1 Rule 229 — Cause/effect type for code KK. Cause/effect KK — Inoperable may only be used as an effect code.

E.9.9.2.2 Rule 251 — Use of cause/effect KK — Inoperable. Do not use cause/effect KK — Inoperable when another cause/effect is more descriptive. For example, if a train of the Auxiliary Feedwater System was declared inoperable, effect HI — Low Flow is more descriptive and KK — Inoperable should not be used.

E.9.10 No failure — KL

E.9.10.1 Description. Cause/effect KL — No Failure describes a success step where a system or component did not experience an actual physical failure. This code should only be used in a step that is necessary for a clear understanding of a sequence.

E.9.10.2 Rules for cause/effect KL.

E.9.10.2.1 Rule 230 — Cause/effect type for code KL. Cause/effect KL — No Failure may only be used as an effect code.

E.9.10.2.2 Rule 232 — P-column with cause/effect KL — No Failure. The P-column must have an M — No Fault when the effect is KL — No Failure.

E.9.11 Other (functional) — KX

E.9.11.1 Description. Cause/effect KX — Other (Functional) describes a functional condition that does not meet the defined criteria for other functional cause/effects (cause/effects beginning with K).

E.9.11.2 Rules for cause/effect KX.

E.9.11.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

K

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.9.11.2.2 Rule 231 — Cause/effect type for code KX. Cause/effect KX — Other (Functional) may only be used as an effect code.

K

E.10 Instrumentation

LA Drift
LB Out of calibration
LC Instrument repeatability
LD Electromagnetic interference/noise
LE Erroneous/no signal
LF Erratic signal
LX Other (instrumentation)

E.10.1 Drift — LA

E.10.1.1 Description. Cause/effect LA — Drift describes a change in setpoint or calibration due to aging, change in physical characteristics, etc.

E.10.1.2 Rules for cause/effect LA.

E.10.1.2.1 Rule 233 — Cause/effect type for code LA. Cause/effect LA — Drift may only be used as a cause code.

E.10.1.2.2 Rule 234 — Setpoint drift. Setpoint drift for instrumentation must be coded with LA — Drift as the cause and LB — Out of Calibration as the effect. Set point drift is considered an actual preexisting, undetected event (T-column M).

E.10.2 Out of calibration — LB

E.10.2.1 Description. Cause/effect LB — Out of Calibration describes a condition when the setpoint, zero, or calibration of an instrument is no longer within the acceptable range.

E.10.2.2 Rules for cause/effect LB.

E.10.2.2.1 Rule 235 — Cause/effect type for code LB. Cause/effect LB — Out of Calibration may only be used as an effect code.

E.10.2.2.2 Rule 234 — Setpoint drift. Setpoint drift for instrumentation must be coded with LA — Drift as the cause and LB — Out of Calibration as the effect.

E.10.3 Instrument repeatability — LC

E.10.3.1 Description. Cause/effect LC — Instrument Repeatability describes an inherent inability to maintain a setting or reading. For example, an instrument calibrated to 0.1% accuracy when it is rated to only 1.0% accuracy will likely not repeat within the 0.1% accuracy. This code does not include setpoint drift (cause/effect LA).

E.10.3.2 Rules for cause/effect LC.

L

E.10.3.2.1 Rule 236 — Cause/effect type for code LC. Cause/effect LC — Instrument Repeatability may only be used as a cause code.

E.10.4 Electromagnetic interference/noise — LD

E.10.4.1 Description. Cause/effect LD — Electromagnetic Interference/Noise includes any unanticipated signal that interferes with the primary signal of interest. This includes background noise, electromagnetic fields, and electrical interference.

E.10.4.2 Rules for cause/effect LD.

E.10.4.2.1 Rule 237 — Cause/effect type for code LD. Cause/effect LD — Electromagnetic Interference/Noise may only be used as a cause code.

E.10.5 Erroneous/no signal — LE

E.10.5.1 Description. Cause/effect LE — Erroneous/No Signal includes any signal or indication that is steady but does not present a true indication of the conditions being monitored.

E.10.5.2 Rules for cause/effect LE.

E.10.5.2.1 Rule 238 — Cause/effect type for code LE. Cause/effect LE — Erroneous/No Signal may only be used as an effect code.

E.10.6 Erratic signal — LF

E.10.6.1 Description. Cause/effect LF — Erratic Signal describes a condition where a true indication of conditions being monitored cannot be determined because an instrument is giving an unsteady or inconsistent signal.

E.10.6.2 Rules for cause/effect LF.

E.10.6.2.1 Rule 239 — Cause/effect type for code LF. Cause/effect LF — Erratic Signal may only be used as an effect code.

E.10.7 Other (instrumentation) — LX

E.10.7.1 Description. Cause/effect LX — Other (Instrumentation) describes an instrumentation problem that does not meet the defined criteria for the other instrumentation cause/effects (cause/effects beginning with L).

E.10.7.2 Rules for cause/effect LX.

E.10.7.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component "MSC" — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.11 Ambient Condition

NA	Ice	NH	Radiation
NB	Water spray/flood/condensation	NK	Aquatic organism
NC	High humidity/steam	NN	Seismic activity
ND	High wind	NP	High ambient temperature
NE	Lightning	NR	Low ambient temperature
NF	External fire/smoke	NX	Other (ambient condition)

E.11.1 Ice — NA

E.11.1.1 Description. Cause/effect NA — Ice includes any freezing water on the outside of a component. It does not include water freezing inside a pipe, sensing line, or other component.

E.11.1.2 Rules for cause/effect NA.

E.11.1.2.1 Rule 138 — Cause/effect type for code NA. Cause/effect NA — Ice may only be used as a cause code.

E.11.2 Water spray/flood/condensation — NB

E.11.2.1 Description. Cause/effect code NB — Water Spray/Flood/Condensation includes all damage from water. Potential sources of the water can be rain, waves, leaks from other components, plant site floods, condensation, or action of fire prevention equipment.

E.11.2.2 Rules for cause/effect NB.

E.11.2.2.1 Rule 139 — Cause/effect type for code NB. Cause/effect NB — Water Spray/Flood/Condensation may only be used as a cause code.

E.11.3 High humidity/steam — NC

E.11.3.1 Description. Cause/effect code NC — High Humidity/Steam describes when the environment surrounding a component or system contains entrained water droplets or steam exceeding the normally expected range; it may exceed specified limits.

E.11.3.2 Rules for cause/effect NC.

E.11.3.2.1 Rule 189 — Cause/effect type for code NC. Cause/effect NC — High Humidity/Steam may only be used as a cause code.

E.11.4 High wind — ND

E.11.4.1 Description. This code includes all sources of moving ambient air including storms, tornadoes, and hurricanes. Other effects

N

that accompany wind such as rain, lightning, etc. are included in other codes.

E.11.4.2 Rules for cause/effect ND.

E.11.4.2.1 Rule 190 — Cause/effect type for code ND. Cause/effect ND — High Wind may only be used as a cause code.

E.11.5 Lightning — NE

E.11.5.1 Description. This code includes discharges of atmospheric electricity.

E.11.5.2 Rules for cause/effect NE.

E.11.5.2.1 Rule 191 — Cause/effect type for code NE. Cause/effect NE — Lightning may only be used as a cause code.

E.11.6 External fire/smoke — NF

E.11.6.1 Description. This code includes the flames and smoke from a fire that originates external to the component affected. This code applies only to fires that propagate from another source. For fires that originate at or on the affected component, use cause/effect code PB — Smoking/Burning. For example, if a pump motor catches on fire and burns a nearby valve, the motor will have cause PB and the valve cause NF.

E.11.6.2 Rules for cause/effect NF.

E.11.6.2.1 Rule 192 — Cause/effect type for code NF. Cause/effect NF — External Fire/Smoke may only be used as a cause code.

E.11.7 Radiation — NH

E.11.7.1 Description. This code includes all radiation levels external to a component or system that is outside the normally expected range. The range may exceed specified operating limits. This code does not include internal radiation or radioactive contamination (cause/effect PF).

E.11.7.2 Rules for cause/effect NH.

E.11.7.2.1 Rule 193 — Cause/effect type for code NH. Cause/effect NH — Radiation may only be used as a cause code.

E.11.8 Aquatic organism — NK

E.11.8.1 Description. Cause/effect NK — Aquatic Organism describes all aquatic organisms including algae, clams, fish, etc.

N

E.11.8.2 Rules for cause/effect NK

E.11.8.2.1 Rule 194 — Cause/effect type for code NK. Cause/effect NK — Aquatic Organism may only be used as a cause code.

E.11.9 Seismic activity — NN

E.11.9.1 Description. Cause/effect NN — Seismic Activity includes any conditions associated with an earthquake.

E.11.9.2 Rules for cause/effect NN.

E.11.9.2.1 Rule 195 — Cause/effect type for code NN. Cause/effect NN — Seismic Activity may only be used as a cause code.

E.11.10 High ambient temperature — NP

E.11.10.1 Description. Cause/effect NP — High Ambient Temperature describes a temperature surrounding a component or system that is above the normally expected range; it may exceed specified limits. This code does not describe a condition of a component or system having a high temperature (cause/effect HA — High Temperature).

E.11.10.2 Rules for cause/effect NP.

E.11.10.2.1 Rule 196 — Cause/effect type for code NP. Cause/effect NP — High Ambient Temperature may only be used as a cause code.

E.11.11 Low ambient temperature — NR

E.11.11.1 Description. Cause/effect NR — Low Ambient Temperature describes a temperature surrounding a component or system that is below the normally expected range; it may exceed specified limits. This code does not describe a condition of a component or system having a low temperature (cause/effect HB — Low Temperature).

E.11.11.2 Rules for cause/effect NR.

E.11.11.2.1 Rule 197 — Cause/effect type for code NR. Cause/effect NR — Low Ambient Temperature may only be used as a cause code.

E.11.12 Other (ambient condition) — NX

E.11.12.1 Description. Cause/effect NX — Other (Ambient Condition) describes an ambient condition that does not meet the defined criteria for the other ambient condition cause/effects (cause effects beginning with N).

E.11.12.2 Rules for cause/effect NX.

N

E.11.12.2.1 Rule 198 — Cause/effect type for code NX. Cause/effect NX — Other (Ambient Conditions) may only be used as a cause code.

E.11.12.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

N

E.12 Miscellaneous

PA	Weld-related flaw	PF	Radioactive contamination
PB	Smoking/burning	PH	Foreign object/material
PC	Cladding degradation	PI	Improper lubrication
PD	Xenon buildup/burnout	PK	Expected transient result
PE	Flux anomaly	PL	Test not performed

E.12.1 Weld-related flaw — PA

E.12.1.1 Description. This code describes a defect in the weld or heat affected zone of a pipe or other component.

E.12.1.2 Rules for cause/effect PA.

E.12.1.2.1 Rule 199 — Cause/effect type for code PA. Cause/effect PA — Weld-Related Flaw may only be used as a cause code.

E.12.2 Smoking/burning — PB

E.12.2.1 Description. This code describes a component which is itself smoking or on fire because of an internal failure. It should not be used to describe fire or smoke external to a component (cause/effect NF).

E.12.2.2 Rules for cause/effect PB.

E.12.2.2.1 Rule 200 — Cause/effect type for code PB. Cause/effect PB — Smoking/Burning may only be used as an effect code.

E.12.3 Cladding degradation — PC

E.12.3.1 Description. This code describes cladding distortion, corrosion, perforation, etc.

E.12.3.2 Rules for cause/effect PC.

E.12.3.2.1 Rule 201 — Cause/effect type for code PC. Cause/effect PC — Cladding Degradation may only be used as a cause code. In the example below, fuel element (component FLE) leakage (effect BI) was caused by degraded cladding (cause PC).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		PC	AA	AE	FLE		Z	Z		1	*	*	*	BI

P

E.12.4 Xenon buildup/burnout — PD

E.12.4.1 Description. This code describes a significant change in Xenon concentration.

E.12.4.2 Rules for cause/effect PD

E.12.4.2.1 Rule 202 — Cause/effect type for code PD. Cause/effect PD — Xenon Buildup/Burnout may only be used as a cause code.

E.12.5 Flux anomaly — PE

E.12.5.1 Description. This code describes the condition where neutron flux characteristics are outside the normally expected range; they may exceed operating limits.

E.12.5.2 Rules for cause/effect PE.

E.12.5.2.1 Rule 203 — Cause/effect type for code PE. Cause/effect PE — Flux Anomaly may only be used as an effect code.

E.12.6 Radioactive contamination — PF

E.12.6.1 Description. This code describes a component, system, or area which has accumulated an amount of radioactive material that is outside the normally accepted range; the radioactivity may exceed specified limits. Radioactive contamination should not be used to describe high radiation external to a component or system (cause/effect NH).

E.12.6.2 Rules for cause/effect PF.

E.12.6.2.1 Rule 204 — Cause/effect type for code PF. Cause/effect PF — Radioactive Contamination may only be used as an effect code.

E.12.7 Foreign object/material — PH

E.12.7.1 Description. This code describes a component, system, or area which is contaminated by nonradioactive material such as chemical pollution or buildup of dust, scale, or trash. This code should not be used for corrosion or oxidation (cause/effect EF) nor for aquatic organisms (cause/effect NK).

E.12.7.2 Rules for cause/effect PH

E.12.7.2.1 Rule 205 — Cause/effect type for code PH. Cause/effect PH — Foreign Object/Material may only be used as a cause code.

P

E.12.8 Improper lubrication — PI

E.12.8.1 Description. This code describes a component which has improper or insufficient lubrication.

E.12.8.2 Rules for cause/effect PI.

E.12.8.2.1 Rule 105 — Hydraulic fluid for snubbers. Loss of snubber hydraulic fluid should not be considered a lubrication related failure since the fluid is for dampening.

E.12.8.2.2 Rule 206 — Cause/effect type for code PI. Cause/effect PI — Improper Lubrication may only be used as a cause code.

E.12.9 Expected transient result — PK

E.12.9.1 Description. This code describes a transitory change in system parameters not exceeding the normally expected range but exceeding specified limits. An example of an expected transient result is low boron concentration in the boron injection tank following safety injection.

E.12.9.2 Rules for cause/effect PK.

E.12.9.2.1 Rule 207 — Cause/effect type for code PK. Cause/effect PK — Expected Transient Result may only be used as a cause code.

E.12.10 Test not performed — PL

E.12.10.1 Description. This code shows that a test required by plant technical specifications was not performed on a component or system within the required time period.

E.12.10.2 Rules for cause/effect PL.

E.12.10.2.1 Rule 208 — Cause/effect type for code PL. Cause/effect PL — Test Not Performed may only be used as an effect code.

E.12.10.2.2 Rule 87 — Test not performed. A single test not performed requires two steps. The first step describes the personnel error; the second describes the equipment or system that was not tested. Both steps must be actual preexisting, undetected (T-code M). The personnel step must be a total failure (P-code T). The equipment/system step may have any P-code depending on the results of the retest. For example, if a retest shows the equipment/system worked properly, the P-code must be M — No Failure. The effect code of the personnel step must be TC — Omission Within Allotted Time. For the component/system step, the effect must be PL — Test Not Performed.

P

Example: Auxiliary Feedwater Pump Test Not Performed

A review of test results (D-code R) revealed that operators had not tested auxiliary feedwater pump 1A (system BA, component PMPZ). Upon retest, the pump operated properly.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	PO		PUX		1			A	M	T	R	TC
2	1		RC	BA		PMPZ		1	1		1	M	M	R	PL

E.13 Resultant

RC Component resultant
RS Train or channel resultant
RT Total system resultant

E.13.1 RC - Component resultant

E.13.1.1 Description. A component or subcomponent was affected as a result of a prior step.

E.13.1.2 Rules for code RC.

E.13.1.2.1 Rule 259 — Cause/effect type for code RC. Cause/effect RC — Component Resultant may only be used as a cause code.

E.13.2 RS - Train or channel resultant

E.13.2.1 Description. A system, train, or instrument channel was affected as a result of a prior step.

E.13.2.2 Rules for code RS.

E.13.2.2.1 Rule 260 — Cause/effect type for code RS. Cause/effect RS — Train or Channel Resultant may only be used as a cause code.

E.13.3 RT - Total system resultant

E.13.3.1 Description. A total system was affected by a prior step.

E.13.3.2 Rules for code RT.

E.13.3.2.1 Rule 261 — Cause/effect type for code RT. Cause/effect RT — Total System Resultant may only be used as a cause code.

R

E.14 Human Factor Cause

SA Intrinsic human error
SB Task description inadequacy
SC Inadequate human environment
SD Inadequate man-machine interface
SE Proper human action or response
SX Other human factor cause
SZ Unknown human factor cause

E.14.1 SA — Intrinsic human error

E.14.1.1 Description. Cause SA — Intrinsic Human Error deals with a single person's reasons behind an improper action or error. An intrinsic error means the individual commits an error due to an inadequacy within himself. The error is attributable to only one individual or a closely related group of individuals. Groups of individuals can have intrinsic human errors when the individuals work together closely to reach decisions. Such is the case when control room operators fail to recognize an abnormal condition. This type of error arises because of day-to-day habits workers develop, the limited experience a new worker brings to the job, too much or too little stress, or fatigue. Blunders, carelessness, ignoring oral or written instructions, being unaware of a requirement, or being unfamiliar with the plant are examples of intrinsic human error.

E.14.1.2 Rules for code SA.

E.14.1.2.1 Rule 85 — Cause codes for personnel occurrences. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used as cause codes.

E.14.2 SB — Task description inadequacy

E.14.2.1 Description. Cause SB — Task Description Inadequacy describes a deficiency in properly communicating all of the information necessary to perform a task. Communication is composed of five steps:

1. perceiving an idea,
2. encoding the idea,
3. transmitting the idea,
4. decoding the transmission, and
5. understanding the idea.

A breakdown in any of these steps, whether by the information sender or receiver, must be coded as a task description inadequacy (cause "SB"). Examples of inadequate task description include being unaware of changes in requirements, errors in procedures, lack of a procedure, and misinterpreting oral or written instructions. For example, if one operator tells another to open valve 2A and the second operator — thinking he heard valve 1A — opens valve 1A, there has been a communication error (cause SB).

S

E.14.2.2 Rules for code SB.

E.14.2.2.1 Rule 85 — Cause codes for personnel occurrences. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used as cause codes.

E.14.3 SC — Inadequate human environment

E.14.3.1 Description. Cause SC — Inadequate Human Environment deals with inadequate environmental conditions for the human body in an area where workers are expected to perform tasks. Several environmental conditions influence a worker's ability to perform. Examples are heat, cold, rain, noise, illumination, oxygen content, radiation, and the presence of airborne irritants.

E.14.3.2 Rules for code SC.

E.14.3.2.1 Rule 85 — Cause codes for personnel occurrences. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used as cause codes.

E.14.4 SD — Man-machine interface failure

E.14.4.1 Description. Cause SD — Man-machine Interface Failure describes a breakdown in the ability of a worker to interact with the process. This can occur through the use of the wrong tools, the unavailability of the correct tools, and/or improper anthropometric design. Anthropometric design refers to using data regarding body dimensions so that a worker can physically get to the equipment on which he must work.

E.14.4.2 Rules for code SD.

E.14.4.2.1 Rule 85 — Cause codes for personnel occurrences. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used a cause codes.

E.14.5 SE — Proper action or response.

E.14.5.1 Description. On occasion it is necessary to code a proper personnel action to adequately describe the entire event in an LER. When a worker takes proper action based on the apparent process conditions, SE — Proper Action or Response should be the cause. The action may or may not be proper based on actual process conditions.

E.14.5.2 Rules for code SE.

S

E.14.5.2.1 <u>Rule 85 — Cause codes for personnel occurrences</u>. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used as cause codes.

E.14.5.2.3 <u>Rule 122 — P-column for proper personnel action</u>. When a worker acts properly based on the <u>apparent</u> process conditions, the action may be proper or improper based on <u>actual</u> conditions. Code an M — No Failure in the P-column when the action was proper based on actual conditions. Code a T — Total Fault when the action was improper based on actual conditions.

E.14.6 <u>SX — Other human factor cause</u>

E.14.6.1 <u>Description</u>. Cause SX — Other Human Factor Cause applies when the cause of human occurrence is known but does not fit any of the above definitions.

E.14.6.2 <u>Rules for SX</u>.

E.14.6.2.1 <u>Rule 85 — Cause codes for personnel occurrences</u>. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause effect codes beginning with S may only be used as cause codes.

E.14.6.2.2 <u>Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field</u>.

<u>Focus</u>:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP <u>(STEP NUMBER)</u>: <u>(ATTRIBUTE)</u> <u>(CODE)</u> — <u>(EXPLANATION)</u>

<u>Rule</u>:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP <u>(STEP NUMBER)</u>: <u>(ATTRIBUTE)</u> <u>(CODE)</u> — <u>(EXPLANATION)</u>

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

E.14.7 SZ — Unknown human factor cause

E.14.7.1 Description. Cause SZ — Unknown Human Factor Cause applies when the cause for the personnel action is unknown.

E.14.7.2 Rules for SZ.

E.14.7.2.1 Rule 85 — Cause codes for personnel occurrences. Cause codes for personnel occurrences begin with S. No other cause/effect code may be used. In addition, cause/effect codes beginning with S may only be used as cause codes.

E.15 Human Factor — Omission

TA Omission of task, analysis, or step
TC Omission within allotted time
TD Omission of alarm response
TE Omission of adjustment or calibration
TX Other omission human factor

E.15.1 TA — Omission of task, analysis, or step

E.15.1.1 Description. Effect TA — Omission of Task, Analysis, or Step describes instances where personnel completely fail to perform all or part of a task. It includes all tasks except periodic testing, acting under time constraints (such as an LCO), responding to an alarm, and adjusting or calibrating instrumentation.

E.15.1.2 Rules for code TA.

E.15.1.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.15.2 TC — Omission within allotted time

E.15.2.1 Description. Effect TC — Omission Within Allotted Time includes non-performance on all tasks that have specified time frames. This includes periodic testing and time-condition constraints (such as an LCO). Normal corrective action on a missed test or condition is to perform the test or restore the condition. Therefore the net result is not complete omission, but rather omission within the allotted time.

E.15.2.2 Rules for code TC.

E.15.2.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.15.2.2.2 Rule 87 — Test not performed. A single test not performed requires two steps. The first step describes the personnel error; the second describes the equipment or system that was not tested. Both steps must be actual preexisting, undetected (T-code M). The personnel step must be a total failure (P-code T). The equipment/system step may have any P-code depending on the results of the retest. For example, if a retest shows the equipment/system worked properly, the P-code must be M — No Failure. The effect code of the personnel step must be TC — Omission Within Allotted Time. For the component/system step, the effect must be PL — Test Not Performed.

T

Example: Auxiliary Feedwater Pump Test Not Performed

A review of test results (D-code R) revealed that operators had not tested auxiliary feedwater pump 1A (system BA, component PMPZ). Upon retest, the pump operated properly.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	PO		PUX		1			A	M	T	R	TC
2	1		RC	BA		PMPZ		1	1		1	M	M	R	PL

E.15.3 TD — Omission of alarm response

E.15.3.1 Description. Effect TD — Omission of Alarm Response includes omission of any action required by an alarm. Simple acknowledging or resetting an annunciator does not constitute proper response unless that is all that is required.

E.15.3.2 Rules for code TD.

E.15.3.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.15.4 TE — Omission of adjustment or calibration

E.15.4.1 Description. Effect TE — Omission of Adjustment or Calibration includes all failures to adjust or calibrate instrumentation except those that are part of periodic testing or a response to an alarm.

E.15.4.2 Rules for code TE.

E.15.4.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.15.5 TX — Other omission human factor

E.15.5.1 Description. Effect TX — Other Omission Human Factor includes all omissions of required action that are not included in the above descriptions.

E.15.5.2 Rules for code TX.

T

E.15.5.5.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.15.5.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the in the comments field in the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

T

E.16 Human Factors — Commission

UA Commission of undesired task, analysis, or step
UD Commission of undesired alarm response
UE Commission of undesired calibration or adjustment
UF Commission of a desired task, analysis, or step
UX Other commission human factor

E.16.1 UA — Commission of undesired task, analysis, or step

E.16.1.1 Description. Effect UA — Commission of Undesired Task, Analysis, or Step describes when personnel perform all or part of an undesired task. It includes all undesired tasks except responding to an alarm and adjusting or calibrating instrumentation.

E.16.1.2 Rules for code UA.

E.16.1.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition cause/effect codes beginning with T or U may only be used as effect codes.

E.16.2 UD — Commission of undesired alarm response

E.16.2.1 Description. Effect UD — Commission of Undesired Alarm Response includes any undesired action that is indirect response to an alarm.

E.16.2.2 Rules for code UD.

E.16.2.2.1 Rules 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.16.3 UE — Commission of undesired calibration or adjustment

E.16.3.1 Description. Effect UE — Commission of Undesired Calibration or Adjustment includes all improper setting of instrumentation except those that are in response to an alarm.

E.16.3.2 Rules for code UE.

E.16.3.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

U

E.16.4 UF — Commission of a desired task, analysis, or step

E.16.4.1 Description. On occasion it is necessary to code a proper personnel action to adequately describe the entire event in an LER. When a worker takes proper action based on the information presented by process instrumentation, UF — Commission of a Desired Task, Analysis, or Step should be the effect.

E.16.4.2 Rules for code UF.

E.16.4.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.16.5 UX — Other commission human factor

E.16.5.1 Description. Effect UX — Other Commission Human Factor includes all commissions of undesired action that are not included in the above descriptions.

E.16.5.2 Rules for code UX.

E.16.5.2.1 Rule 86 — Effect codes for personnel occurrences. Effect codes for personnel occurrences begin with T or U. No other cause/effect code may be used. In addition, cause/effect codes beginning with T or U may only be used as effect codes.

E.16.5.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

U

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1			A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

U

E.17 Other

XA Change in regulatory requirements or industry standards
XX Other

E.17.1 XA — Change in regulatory requirements or industry standards

E.17.1.1 Description. When regulatory requirements or industry standards change, a utility must reevaluate their unit(s) to determine if they comply. Often they find that they no longer meet the requirement. This can occur because the new requirement uses more conservative analysis criteria or because it has broadened the analysis bounds to include additional equipment.

E.17.1.2 Rules for code XA.

E.17.1.2.1 Rule 84 — Coding changes in requirements or standards. Cause/effect code XA — Change in Regulatory Requirements or Industry Standards should not be used if a component or system fails because of a new, more stringent test. Use it only when the component or system operates properly, but a reanalysis shows an inadequacy. If the component/system has an actual failure, use a cause code that more clearly states the cause of the failure. For example, if a regulatory requirement change says an indicator must be tested under high temperature, and the indicator fails under such conditions, use cause code HA — High Temperature.

E.17.2 XX — other

E.17.2.1 Description. Cause/effect is known but does not meet other defined criteria.

E.17.2.2 Rules for code XX.

E.17.2.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

X

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER): (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

X

E.18 Information

YC — Additional information

E.18.1 YC — Additional information

E.18.1.1 Description. Effect code YC — additional information designates steps which either add information concerning the facility as a whole or show subsequence relationships. Specifically, effect code YC is used only for unit effect steps, environmental effect steps, and link steps.

E.18.1.2 Rules for code YC.

E.18.1.2.1 Rule 42 — Link steps. When a step must be sublinked in more than one subsequence, use a link step. A link step adds no new information. It merely shows the cause relationships in a complex sequence.

A link step has all blank fields except step, link, sublink, and effect. It is linked to the step that must have more than one sublink. The sublink of the link step must differ from the referenced step's sublink. The effect code must be YC — additional information.

Example: Redundant Pump Failures

While a pump (component PMPZ — Pump, Unknown Type) was out of service for maintenance, a redundant pump failed on two occasions causing the loss of a train.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	**		PMPZ		1	1		1	*	*	*	**
2	1	B													YC
3	0	A	**	**		PMPZ		1	1		2	*	*	*	**
4	A		**	**		1XZ		1	1		1	*	*	*	**
5	0	B	**	**		PMPZ		1	1		2	*	*	*	**
6	B		**	**		1XZ		1	1		1	*	*	*	**

E.18.1.2.2 Rule 252 — Use of cause/effect YC — Additional Information. Do not use cause/effect YC — Additional Information when another cause/effect is more descriptive. For example, if a train of the Auxiliary Feedwater System fails, effect HI — Low Flow is more descriptive and YC — Additional Information should not be used.

E.19 Unknown

E.19.1 ZZ — Unknown

E.19.1.1 Description. ZZ — Unknown means that the cause/effect is unknown or not mentioned in LER.

E.19.1.2 Rules for code ZZ. None to date.

Z

Appendix G: INTERFACE SYSTEM

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Appendix G: INTERFACE SYSTEM

G.1 Description

The interface system or ISYS attribute on the sequence coding form (Fig. 2.2) has several functions. In all cases, it adds information to amplify relationships between systems within the steps in the coded sequence. Uses of this attribute include the following:

1. to indicate the process system being monitored or controlled (when system attribute is an instrument system);
2. to indicate the process system being isolated (when system attribute is DB — Containment Isolation System);
3. to indicate the other system being communicated with on leaks (when the effect attribute is BE through BX);
4. to indicate the process or instrument system being fed by electrical component such as motor control center (component MCC), batteries (component BY), etc; and
5. to add additional information.

The technical processor should exercise some discretion when using the interface system attribute, in that superfluous interfaces could be confusing or meaningless. For example, an instrument in the ESFAS (system IW) monitors pressure in the pressurizer (system AF), and signals the ESFAS to actuate the Emergency Core Cooling Systems (ECCS). By coding the instrument as belonging in the ESFAS with an interface system of an ECCS (ISYS BL), the important fact that the pressurizer was being monitored by that instrument is lost. The proper way to code this is that the instrument belongs in the ESFAS (system IW) and the interface system is the Pressurizer System (ISYS AF). Acceptable codes for this attribute field are the system codes (see Appendix F).

G.2 Rules Concerning the Interface System Attribute

G.2.1 Rule 44 — Use of interface system for instrumentation

For instrumentation (both monitoring and control), code the process system being monitored and controlled in the interface system descriptor, not the process or instrument system that receives the signal.

G.2.2 Rule 40 — Use of interface system and information step with containment isolation events

I. Interface system identifies the system being isolated.

When the system in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly a PWR personnel penetration has a system of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for a process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effect TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SH).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	I	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	1	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	FM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak On a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

G.2.3 Rule 72 — Systems and interface systems for circuit breakers

Focus:

The interface system for circuit breakers should be coded when available and is the system receiving power or EH for diesel generator output breakers.

Rule:

All ac circuit breakers (component 52) must be placed in one of the following systems:

EA — High Voltage ac,
EB — Medium Voltage ac,
EC — Low Voltage ac, or
ED — Vital Instrument, Control, and Computer ac.

All dc circuit breakers (component 72) must be placed in system EE — dc. The interface system is the system receiving power or EH for diesel generator output breakers.

G.2.4 Rule 18 — System and interface system for building atmospheric condition monitors

Focus:

The interface system for building atmospheric condition monitors should be the building structural system (system with the first digit S) whose ambient conditions are being monitored rather than the building's HVAC system (system with the first digit H).

Rule:

Building atmospheric condition monitors (temperature, pressure, humidity, etc.) must be placed in an appropriate instrument system:

IF — Fire Detection,
IJ — Plant Monitoring,
IL — Leak Monitoring,
IN — Radiation Monitoring,
IU — Reactor Protection,
IW — Engineered Safety Features Actuation,
IX — Solid State Protection/Control, or
IZ — Nonnuclear Instrumentation,

The interface system should be the building structural system (system with the first digit S) whose ambient conditions are being monitored rather than the building's HVAC system (system with the first digit H).

G.2.5 Rule 6 — Reactor trip breakers.

Focus:

Reactor trip breakers and their associated undervoltage relays should be coded with an interface system of AB — Control Rod Drive.

Rule:

Bistables have adjustable setpoints and are provided to interrupt power supplies to the logic cabinet input relays in system IU — Reactor Protection. When these input relays are energized (i.e., the bistable is not tripped), they provide circuit continuity to the reactor trip breaker's undervoltage coils. When a protection bistable is tripped, circuit continuity is broken, deenergizing the undervoltage coils and causing the reactor trip breaker to open. For PWRs, this deenergizes the control rod drives and the control rods drop into the core. For

BWRs, solenoid-operated air valves open when the trip breakers open and insert the control rods into the core. Bypass breakers in parallel with reactor trip breakers allow online testing of the trip breakers. The reactor trip breakers (and bypass breakers) can be ac or dc breakers. Therefore, these circuit breakers are to be coded in system EC — Low Voltage ac or system EE — dc. If neither ac nor dc is specified, code system EC — Low Voltage ac. An interface system (ISYS) of AB — Control Rod Drive should be used in all cases.

Example I: Reactor Trip Breaker Transfers Open

A logic input relay (system IU — Reactor Protection, ISYS AB — Control Rod Drive, component LOR — Lockout/Tripping Relay) was chattering (effect LF — Erratic Operation) and caused a reactor trip breaker (system EC — Low Voltage ac, ISYS AB — Control Rod Drive, component 52 — Circuit Breaker, ac) to transfer open (effect AK — Transfer Open).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	IU	AB	LOR		1	1	1	1	*	*	*	LF
2	1		RC	EC	AB	52		1	1		1	*	*	*	AK

Example II: Reactor Trip Breaker Fails to Open

An undervoltage relay (system EE — dc, ISYS AB — Control Rod Drive, component 27 — Relay, Undervoltage) fails to sense an undervoltage condition (effect AL — Failure to Open) and a dc reactor trip breaker (system EE — DC, ISYS AB — Control Rod Drive, component 72 — Circuit Breaker, dc) fails to trip (effect AL — Failure to Open).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	EE	AB	27		1	1		1	*	TR	*	AL
2	1		RC	EE	AB	72		1	1		1	*	TR	*	AL

G.2.6 Rule 46 — Systems and interface systems for fire protection equipment.

Focus:

The interface system for structural fire protection equipment must be the structural system (system with the first digit S) of which it is a part. If a structural component divides two structural areas, use the system code that has alphabetic priority. For example, a fire door dividing the turbine building (system SL) and the auxiliary building (system SF) will have an interface system SF because SF is alphabetically before SL.

The interface system for non-structural fire protection equipment must be the system being protected if specified in the LER or ZZ — Unknown.

Rule:

Fire protection equipment is divided into two categories: structural and non-structural. The system for both categories must be KF — Fire Protection. For structural components, such as doors (component DR) and seals (component SEAL) around penetrations, and ventilation components, such as dampers (component DMP), the interface system (ISYS) must be the structural system (system with a first digit S) of which it is a part (see Example below). If a structural component divides two structural areas, use the system code that has alphabetic priority. For example, a fire door dividing the turbine building (system SL) and the auxiliary building (system SF) will have an interface system code SF because SF is alphabetically before SL.

For non-structural components, such as fire hoses (component HOSE), the interface system must be the system being protected if specified in the LER or ZZ — Unknown.

Example: Control Building Fire Door Left Open

A fire door (system KF, component DR) between the control building (system SH) and the environment (system SY) was found left open (effect AI) by some unknown person (system code PZ, component PZ).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SZ	PZ		PZ		1			1	M	T	I	TA
2	1		RC	KF	SH	DR		1	1		1	M	T	I	AI

Appendix H: COMPONENTS

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Appendix H

COMPONENTS

H.1 Introduction

H.1.1 General Considerations

There is an extensive list of components in the SCSS because of the numerous hardware in a nuclear power plant. In addition to hardware, a technical processor may code the docket number of other affected units, specify the type of the personnel involved in the step, or indicate that one train or an entire system failed in the component field. To make searching easier, component codes are grouped generically and identified by a three-digit number called an Icomp number. Rules have been arranged according to these Icomp numbers.

H.1.2 General rules for components

H.1.2.1 Rule 92 — Piece parts of a component. When coding piece parts of a component, the piece parts and the component should be linked in sequence and not separated from one another by other components. For example, if a pump bearing causes a breaker to trip which causes the pump to cease operation, then code as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	**		BRG		1	1		1	A	T	*	DC
2	1	A	**	**	**	52		1	1		1	A	T	*	AK
3	A		**	**		PMPB		1	1		1	A	T	*	KC

H.2 Icomp 010: Accumulators/Reservoirs

H.2.1 Description

Icomp 010 contains all tanks, accumulators, and reservoirs containing gases and liquids except reactor pressure vessels and pressurizers in Icomp 370. Specifically, Icomp 010 includes the following components:

ACC	Accumulator
GBM	Gas bottles and manifold
RVR	Reservoir
TK	Tank

H.2.2 Rules for components with Icomp 010

None to date.

010

H.3 Icomp 020: Air Dryers

H.3.1 Description

Icomp 020 contains all moisture removing equipment on air and waste systems. Icomp 020 contains only one component:

ADRY Air dryer, absorption/adsorption

H.3.2 Rules for the component with Icomp 020

None to date.

H.4 Icomp 030: Annunciators

H.4.1 Description

Icomp 030 contains all bells, alarms, whistles, sirens, lamps, lights, and annunciators that indicate an abnormal process condition. Specifically, Icomp 030 includes the following components:

AA	Alarm/annunciator, analyzer
CA	Alarm/annunciator, conductivity
EA	Alarm/annunciator, voltage
FA	Alarm/annunciator, flow
FRA	Alarm/annunciator, fire/smoke
IA	Alarm/annunciator, current
INA	Alarm/annunciator, intrusion
JA	Alarm/annunciator, power
LA	Alarm/annunciator, level
MA	Alarm/annunciator, moisture/humidity
NA	Alarm/annunciator, flux/neutron
PA	Alarm/annunciator, pressure
RA	Alarm/annunciator, radiation
SA	Alarm/annunciator, speed/frequency
TA	Alarm/annunciator, temperature
TGA	Alarm/annunciator, toxic gas
VA	Alarm/annunciator, vibration
XA	Alarm/annunciator, other type
ZA	Alarm/annunciator, position
ZZA	Alarm/annunciator, unknown type

H.4.2 Rules for components with Icomp 030

H.4.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The

030

explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT CODE DX — COLLAPSE

H.5 Icomp 040: Batteries/Chargers

H.5.1 Description

Icomp 040 contains all dc current generating equipment. Specifically, Icomp 040 includes the following components:

BY	Battery
BYC	Charger, battery

H.5.2 Rules for components with Icomp 040

H.5.2.1 Rule 77 — Battery cells. Do not code individual battery cell occurrences. Code only the battery that contains the affected cells.

H.5.2.2 Rule 78 — Battery cause/effect codes. For a battery with a failure mode of "low specific gravity," "low voltage," or "out of tolerance on voltage or specific gravity," use cause/effect EE — Low Concentration/pH. Exception: If the low voltage is due to a shorted battery cell, use cause/effect code ID — Undervoltage.

H.6 Icomp 050: Blowers/Compressors

H.6.1 Description

Icomp 050 contains air moving and compressing equipment. Specifically, Icomp 050 includes the following components:

CMP	Compressor
EDR	Eductor
EJR	Ejector
FAN	Fan/blower
TCHG	Turbocharger

H.6.2 Rules for components with Icomp 050

None to date.

H.7 Icomp 060: Chemical Function Items

H.7.1 Description

Icomp 060 contains chemical treatment equipment for adding chemicals to and removing impurities from process water. Specifically, Icomp 060 includes the following components:

CAI Chemical addition injector
DM Demineralizer

H.7.2 Rules for components with Icomp 060

None to date.

060

H.8 Icomp 070: Cleaning Equipment, Miscellaneous

H.8.1 Description

Icomp 070 contains all equipment used in waste cleanup that is not included elsewhere. Only one component is included in ICOMP 070:

CUE Cleanup equipment, miscellaneous

H.8.2 Rules for component with Icomp 070

H.8.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system code SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

070

COMMENTS
1ᶠ 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.9 Icomp 080: Communications Equipment

H.9.1 Description

Icomp 080 contains all equipment used for verbal communication. Only one component is included in Icomp 080:

COM Communications equipment

H.9.2 Rules for the component with Icomp 080

None to date.

H.10 Icomp 090: Control Rods

H.10.1 Description

Icomp 090 contains the neutron absorbing control rods. Specifically, Icomp 090 includes the following components:

CRA	Control rod assembly
CRE	Control rod

H.10.2 Rules for components with Icomp 090

H.10.2.1 Rule 96 — Rod drop accidents. Cause/effect code CD — Dropped should be used to describe a "rod drop" event.

090

H.11 Icomp 100: Control Rod Drives

H.11.1 Description

Icomp 100 contains the mechanisms for moving the control rods into and out of the reactor core. Only one component is included in Icomp 100:

CRD Control rod drive

H.11.2 Rules for the component with Icomp 100

None to date.

H.12 Icomp 110: Electrical Conductors

H.12.1 Description

Icomp 110 contains buses, wires, motor windings, and cables that conduct electric current. Specifically, Icomp 110 includes the following components:

BUS	Bus
CBL	Cable/wire

H.12.2 Rules for components with Icomp 110

H.12.2.1 Rule 97 — Loose wires. Use the component CON — Connector for loose wires, leads, cables, etc. The connector is the component which has failed, not the wire itself. Do not code the component FAS — Fastener. It is not necessary to consider the piece parts of a connector which has failed.

H.13 Icomp 120: Electrical/I&C Function Items

H.13.1 Description

Icomp 120 contains power supplies, synchroscopes, typewriters, cable trays, potential devices, and other miscellaneous equipment that facilitate the conduction of electric current. Specifically, Icomp 120 includes the following components:

CCD	Card, circuit
CL	Coil
CND	Conduit
CNTR	Contactor/contacts
INL	Interlock
JX	Power supply, electric
OSL	Oscillator
PD	Potential device
RECT	Rectifier
SOL	Solenoid
SPP	Surge protection package
SYN	Synchroscope
TW	Typewriter/printer/plotter
TY	Tray, cable
UJX	Power supply, uninterruptable

H.13.2 Rules for components with Icomp 120

H.13.2.1 Rule 21 — Rod block monitors. Rod block monitors must be coded with system IK — In-core and Ex-core Neutron Monitoring, interface system AB — Control Rod Drive, and component INL — Interlock.

H.14 Icomp 130: Engines, Internal Combustion

H.14.1 Description

Icomp 130 contains all internal combustion engines. Specifically, Icomp 130 includes the following components:

DSL Engine, diesel
ENG Engine, other type

H.14.2 Rules for components with Icomp 130

H.14.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC - Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

130

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.15 Icomp 140: Equipment Interface Items

H.15.1 Description

Icomp 140 contains the junction boxes, control boards, cabinets, and office equipment that are interfaces between the electric power conductors and the equipment using the electric power. Specifically, Icomp 140 includes the following components:

BD	Board/panel
BX	Box, other type
CON	Connector
JBX	Box, junction
RCU	Control unit, remote
RK	Rack/cabinet
SSTN	Station, sample
TB	Terminal block

H.15.2 Rules for components with Icomp 140

H.15.2.1 Rule 97 — Loose wires. Use the component CON — Connector for loose wires, leads, cables, etc. The connector is the component which has failed, not the wire itself. Do not code the component FAS — Fastener. It is not necessary to consider the piece-parts of a connector which has failed.

H.15.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments fields when using an "other" code [cause/effect KX — Other (Functional), system ZX — Other, etc.] or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.16 Icomp 150: Filters, Non I&C

H.16.1 Description

Icomp 150 contains the equipment such as screens, filters, and strainers that filter impurities from process liquids and gases. Specifically, Icomp 150 includes the following components:

PFLT	Filter (process)
SCN	Screen
SEP	Separator
STNR	Strainer

H.16.2 Rules for components with Icomp 150

None to date.

H.17 Icomp 160: Fuel Elements

H.17.1 Description

Icomp 160 contains the reactor fuel elements and assemblies. The following components are included:

FLA	Fuel assembly
FLE	Fuel element/rod

H.17.2 Rules for components with Icomp 160

None to date.

H.18 Icomp 170: Generators

H.18.1 Description

Icomp 170 contains all ac power producing equipment such as generators, converters, and inverters. Specifically, Icomp 170 includes the following components:

CNV	Converter
GEN	Generator
INV	Inverter
MG	Generator, motor

H.18.2 Rules for components with Icomp 170

None to date.

H.19 Icomp 180: Handling Equipment

H.19.1 Description

Icomp 180 contains all cranes, lifting fixtures, hoists, and other equipment used to move heavy objects. Specifically, Icomp 180 includes the following components:

CRN Crane
FHE Fuel handling equipment
MHE Handling equipment, miscellaneous

H.19.2 Rules for components with Icomp 180

H.19.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

180

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.20 Icomp 190: Heaters, Electric

H.20.1 Description

Icomp 190 contains all equipment used to raise the temperature of process gases and liquids by resistive heating. Specifically, Icomp 190 includes the following components:

HTRE	Heater, electric
HTTR	Heat tracing

H.20.2 Rules for components with Icomp 190

H.20.2.1 Rule 79 — Heat tracing. The component HTTR — Heat Tracing is only coded when the system is EF — Electrical Heat Tracing. The ISYS is the process system being heat traced.

H.21 Icomp 200: Heat Exchangers

H.21.1 Description

Icomp 200 contains heat exchangers, air conditioners, coolers, condensers, heaters, and other equipment in which there is an exchange of heat between two fluids at different temperatures. Specifically, Icomp 200 includes the following components:

AHU	Air handling/conditioning unit (heating and ventilation)
BLR	Boiler
CCL	Coil, cooling
CLR	Cooler
COND	Condenser
CTW	Cooling tower
FCU	Fan cooler unit
HCL	Coil, heating
HTR	Heater, other type
HX	Heat exchanger
ICON	Condenser, ice
SG	Steam generator

H.21.2 Rules for components with Icomp 200

H.21.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.21.2.2 Rule 121 — Steam generator as a component over system. When coding occurrences involving steam generators use component SG. Do not use component XXX — Entire system nor AXB — Number of Total Subsystems Affected with system AH — Steam Generator.

H.22 Icomp 210: I&C/General

H.22.1 Description

Icomp 210 contains the following miscellaneous instrument subcomponents:

CAP	Capacitor
DIO	Diode
RSSR	Resistor
TD	Transducer

H.22.2 Rules for components with Icomp 210

None to date.

210

H.23 Icomp 211: I&C/Circuit Breakers

H.23.1 Description

Icomp 211 contains ac circuit breakers, dc circuit breakers, fuses, and other types of current interrupters except relays and switches. Specifically, Icomp 211 includes the following components:

52	Circuit breaker, AC
72	Circuit breaker, DC
MCC	Control center, motor
FU	Fuse

H.23.2 Rules for components with Icomp 211

H.23.2.1 Rule 72 — Systems and interface systems for circuit breakers.

All ac circuit breakers (component 52) must be placed in one of the following systems:

EA — High Voltage AC,
EB — Medium Voltage AC,
EC — Low Voltage AC, or
ED — Vital Instrument, Control, and Computer AC.

All dc circuit breakers (component 72) must be placed in system EE — DC. The interface system is the system receiving power or EH for diesel generator output breakers.

H.23.2.2 Rule 94 — Effect codes for circuit breaker trips. When a breaker trips, use the effect AK — Transferred Open. When a breaker fails to trip, use effect AL — Fails to Transfer Open.

H.23.2.3 Rule 6 — Reactor Trip Breakers. Bistables have adjustable setpoints and are provided to interrupt power supplies to the logic cabinet input relays in system IU — Reactor Protection. When these input relays are energized (i.e., the bistable is not tripped), they provide circuit continuity to the reactor trip breaker's undervoltage coils. When a protection bistable is tripped, circuit continuity is broken, deenergizing the undervoltage coils and causing the reactor trip breaker to open. For PWRs, this deenergizes the control rod drives and the control rods drop into the core. For BWRs, solenoid-operated air valves open when the trip breakers open and insert the control rods into the core. Bypass breakers in parallel with reactor trip breakers allow online testing of the trip breakers. The reactor trip breakers (and bypass breakers) can be ac or dc breakers. Therefore, these circuit breakers are to be coded in system EC — Low Voltage AC or System EE — DC. If neither ac nor dc is specified, code system EC — Low Voltage AC. An interface system of AB — Control Rod Drive should be used in all cases.

Example I: Reactor Trip Breaker Transfers Open

A logic input relay (system IU — Reactor Protection, ISYS AB — Control Rod Drive, component LOR — Lockout/Tripping Relay) was chattering (effect LF — Erratic Operation) and caused a reactor trip breaker (system EC — Low Voltage AC, ISYS AB — Control Rod Drive, component 52 — Circuit Breaker, AC) to transfer open (effect AK — Transfer Open).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	IU	AB	LOR		1	1	1	1	*	*	*	LF
2	1		RC	EC	AB	52		1	1		1	*	*	*	AK

Example II: Reactor Trip Breaker Fails to Open

An undervoltage relay (system EE — DC, ISYS AB — Control Rod Drive, component 27 — Relay, Undervoltage) fails to sense an undervoltage condition effect AL — Failure to Open) and a dc reactor trip breaker (system EE — DC, ISYS AB — Control Rod Drive, component 72 — Circuit Breaker, DC) fails to trip (effect AL — Failure to Open).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	EE	AB	27		1	1		1	*	TR	*	AL
2	1		RC	EE	AB	52		1	1		1	*	TR	*	AL

H.24 Icomp 212 I&C/Computation Modules

H.24.1 Description

Icomp 212 contains modifiers such as computers, amplifiers, differentiators and other modules that alter process signals. Specifically, Icomp 212 includes the following components:

AMP	Amplifier
CPU	Computer
MDF	Modifier
SUM	Summer
TOT	Totalizer/integrator

H.24.2 Rules for components with Icomp 212

H.24.2.1 Rule 3 — Core protection calculator. The Core Protection Calculator (CPC) calculates DNBR and core local power densities in Combustion Engineering plants. It serves a protective function and initiates a reactor trip. The CPC must be coded as follows:

Component CPU — Computer,
System IU — Reactor Protection, and
Interface System AA — Reactor Core.

H.24.2.2 Rule 4 — Core operating limit supervisory system. The Core Operating Limit Supervisory System (COLSS) provides operating data (including core power, core linear heat rate generation, DNBR, flux tile, and others) for operators in Combustion Engineering plants. This system does not perform a protective function and must be coded as follows:

Component CPU — Computer,
System IB — Computer, and
Interface System AA — Reactor Core.

H.24.2.3 Rule 7 — Control element assembly calculator. The Control Element Assembly Calculator (CEAC) receives input from the rod position reed switches. (The CEAC appears only in Combustion Engineering plants.) Its output feeds the core protection calculator (see Sect. F.8.15.2.3). The CEAC must be coded as follows:

Component CPU — Computer,
System IP — Reactor Power Control (PWR), and
Interface System AB — Control Rod Drive.

H.25 Icomp 213: I&C/Controllers

H.25.1 Description

Icomp 213 contains the equipment necessary to regulate certain process variables. Specifically, Icomp 213 includes the following components:

65	Governor
AC	Control, analyzer
CC	Control, conductivity
CO	Control operator
EC	Control, voltage
FC	Control, flow
IC	Control, current
JC	Control, power
LC	Control, level
MC	Control, moisture/humidity
MUC	Control, multi-variable
PC	Control, pressure
SC	Control, speed/frequency
TC	Control, temperature
WC	Control, torque/force
XC	Control, other type
ZC	Control, position
ZZC	Control, unknown type

H.25.2 Rules for components with Icomp 213

H.25.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/ Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/ Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

213

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.25.2.2 Rule 103 — Governors. A governor is an attachment to a machine that automatically controls or limits speed. Governors must be in an instrument system (system beginning with I) with an interface system equal to the system in which the machine belongs.

H.26 Icomp 214: I&C/Filters and Isolators

H.26.1 Description

Icomp 214 contains instrumentation to condition process signals and isolate any unwanted signals. Specifically, Icomp 214 includes the following components:

IFLT	Filter (I&C)
ISOL	Isolator/buffer
LAR	Arrestor, lightning

H.26.2 Rules for components with Icomp 214

None to date.

214

H.27 Icomp 215: I&C/Indicators

H.27.1 Description

Icomp 215 contains the instrumentation to monitor process variables including the following components:

45	Monitor, atmospheric condition
AI	Indicator, analyzer
APD	Air particulate radiation detector
BI	Indicator, battery charger
CI	Indicator, conductivity
EI	Indicator, voltage
FI	Indicator, flow
GI	Indicator, ground
II	Indicator, current
JI	Indicator, power
KI	Indicator, time
LI	Indicator, level
MI	Indicator, moisture/humidity
MUI	Indicator, multi-variable
NI	Indicator, flux/neutron
PI	Indicator, pressure
RI	Indicator, radiation
SI	Indicator, speed/frequency
TI	Indicator, temperature
TGI	Indicator, toxic gas
VI	Indicator, vibration
WI	Indicator, torque/force
XI	Indicator, other type
ZI	Indicator, position
ZZI	Indicator, unknown type

H.27.2 Rules for components with Icomp 215

H.27.2.1 Rule 5 — Control rod position indicators. Control rod position indicators (component ZI) must have IP — Reactor Power Control in the system column and AB — Control Rod Drive in the interface system column.

H.27.2.2 Rule 95 — Traveling incore probes. A traveling incore probe (TIP) must be coded as component NI — Neutron Indicator in system IK — Neutron Monitoring.

H.27.2.3 Rule 99 — Accelerometers. Accelerometers (component VI — Indicator, Vibration) must be in system IG — Environmental Monitoring with an interface system of SY — Environment.

H.27.2.4 Rule 100 — H_2 and O_2 Analyzers. H_2 and O_2 analyzers must be coded as component AI — Indicator, Analyzer in system IZ — Nonnuclear Instrumentation with interface system DH — Containment Combustible Gas Control.

H.27.2.5 Rule 18 — System and interface system for building atmospheric condition monitors.

Focus

Building atmospheric condition monitors must be placed in an appropriate instrument system:

IF — Fire Detection,
IJ — Plant Monitoring
IL — Leak Monitoring
IN — Radiation Monitoring
IU — Reactor Protection,
IW — Engineered Safety Features Actuation,
IX — Solid State Protection/Control, or
IZ — Nonnuclear Instrumentation.

Rule

Building atmosphere condition monitors (temperature, pressure, humidity, etc.) must be placed in an appropriate instrument system:

IF — Fire Detection,
IJ — Plant Monitoring
IL — Leak Monitoring
IN — Radiation Monitoring
IU — Reactor Protection,
IW — Engineered Safety Features Actuation,
IX — Solid State Protection/Control, or
IZ — Nonnuclear Instrumentation.

The interface system should be the building structural system (system with the first digit S) whose ambient conditions are being monitored rather than the building's HVAC system (system with the first digit H).

H.27.2.6 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments fields in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.28 Icomp 216: I&C/Recorders

H.28.1 Description

Icomp 216 contains the instrumentation to record process variables including the following components:

AR	Recorder, analyzer
CR	Recorder, conductivity
DAL	Data logger
ER	Recorder, voltage
FR	Recorder, flow
IR	Recorder, current
JR	Recorder, power
LR	Recorder, level
MR	Recorder, moisture/humidity
MUR	Recorder, multi-variable
NR	Recorder, flux/neutron
PR	Recorder, pressure
RR	Recorder, radiation
SR	Recorder, speed/frequency
TGR	Recorder, toxic gas
TR	Recorder, temperature
VR	Recorder, vibration
WR	Recorder, torque/force
XR	Recorder, other type
ZR	Recorder, position
ZZR	Recorder, unknown type

H.28.2 Rules for components with Icomp 216

H.28.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation
216 of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.29 Icomp 217: I&C/Relays

I.29.1 Description

Icomp 217 contains all relays, specifically:

12	Relay, overspeed
14	Relay, underspeed (device)
27	Relay, undervoltage
37	Relay, undercurrent/underpower
49	Relay, thermal overload
59	Relay, overvoltage
81	Relay, frequency
ARLY	Relay, alarm/annunciator
DRLY	Relay, directional/balance
FRLY	Relay, field/exciter
LOR	Relay, lockout/tripping
OCR	Relay, overcurrent
PRLY	Relay, phase
RLY	Relay, other/unknown type
SEQ	Sequencer
SYNR	Relay, synchronization
TDR	Relay, time delay

H.29.2 Rules for components with Icomp 217

H.29.2.1 Rule 75 — Load shedding and sequencing relays. For load shedding relays, use component 27 — Relay, Undervoltage with system EB — Medium Voltage AC. ISYS code is ZZ — Unknown, unless a specific system is given. Do not use system EH — Emergency Power Generation for either system or ISYS in this case. These relays sense a degraded voltage on the feeder bus and drop the loads. For load sequencing relays, use component SEQ — Sequencer with system code EB. ISYS code is ZZ or the ESF system given. Do not use system EH for either. System EH feeds the buses; the ESF systems receive the power. Note: These relays cause circuit breakers to operate.

H.29.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — other (mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.30 Icomp 218:I&C/Sensors

H.30.1 Description

Icomp 218 contains the instrumentation, such as thermocouples and pressure sensors used to detect process variables including the following components:

AE	Primary element, analyzer
CE	Primary element, conductivity
EE	Primary element, voltage
FE	Primary element, flow
FRE	Primary element, fire/smoke
GE	Primary element, ground
IE	Primary element, current
INE	Primary element, intrusion
LE	Primary element, level
ME	Primary element, moisture/humidity
NE	Primary element, flux/neutron
PE	Primary element, pressure
RE	Primary element, radiation
SE	Primary element, speed/frequency
TE	Primary element, temperature
TGE	Primary element, toxic gas
VE	Primary element, vibration
WE	Primary element, torque/force
XE	Primary element, other type
ZE	Primary element, position
ZZE	Primary element, unknown type

H.30.2 Rules for components with Icomp 218

H.30.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures,

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etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.31 Icomp 219:I&C/Switches

H.31.1 Description

Icomp 219 contains all switches, specifically:

AS	Switch, analyzer
BIS	Bistable
CS	Switch, conductivity
CSW	Switch, control
DSW	Switch, disconnect
ES	Switch, voltage
FS	Switch, flow
HS	Switch, hand
IS	Switch, current
JS	Switch, power
KS	Switch, time
LS	Switch, level
MS	Switch, moisture/humidity
MUS	Switch, multi-variable
NS	Switch, flux/neutron
PB	Push button
PS	Switch, pressure
RS	Switch, radiation
SS	Switch, speed/frequency
TS	Switch, temperature
TSW	Switch, test
VS	Switch, vibration
WS	Switch, torque/force
XS	Switch, other type
ZS	Switch, position
ZZS	Switch, unknown type

H.31.2 Rules for components with Icomp 219

H.31.2.1 Rule 101 — Trip units. For the component "trip unit," use component code BIS — Bistable.

H.31.2.2 Rule 102 — Instrument subcomponents in valve operators. Instruments such as torque switches (component WS) and limit switches (component ZS) which are part of a valve operator should have the same system as the valve operator. They are considered subcomponents of the valve operators.

H.31.2.3 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

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Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system code ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.32 Icomp 220 I&C/Transmitters

H.32.1 Description

Icomp 220 contains the instrumentation to transmit signals from process variables including the following components:

AT	Transmitter, analyzer
CT	Transmitter, conductivity
ET	Transmitter, voltage
FT	Transmitter, flow
IT	Transmitter, current
JT	Transmitter, power
KT	Transmitter, time
LT	Transmitter, level
MT	Transmitter, moisture/humidity
MUT	Transmitter, multi-variable
NT	Transmitter, flux/neutron
PT	Transmitter, pressure
RT	Transmitter, radiation
ST	Transmitter, speed/frequency
TT	Transmitter, temperature
VT	Transmitter, vibration
WT	Transmitter, torque/force
XT	Transmitter, other type
ZT	Transmitter, position
ZZT	Transmitter, unknown type

H.32.2 Rules for components with Icomp 220

H.32.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

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STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.33 Icomp 230: Lighting Equipment

H.33.1 Description

Icomp 230 contains all normal and emergency room lighting. The only component under Icomp 230 is:

LIT Lighting equipment

H.33.2 Rules for the component with Icomp 230

None to date.

H.34 Icomp 240: Mechanical Function Items

H.34.I Description

Icomp 240 is a listing of miscellaneous mechanical equipment and contains belts, brakes, ice condenser baskets, hoses, stems, shafts, valve seats and many others. Specifically, Icomp 240 includes the following components:

BLT	Belt
BRG	Bearing/bushing
BRK	Brake
BSKT	Basket
CLU	Clutch
CPLG	Coupling
DFM	Diaphram
DUCT	Duct
FAS	Fastener
GR	Gear
HOSE	Hose
HYD	Hydrant
ISL	Insulation
SEAL	Seal
SHFT	Shaft/stem
VLVS	Valve seat

H.34.2 Rules for components with Icomp 240

H.34.2.1 Rule 97 — Loose wires. Use the component CON — Connector for loose wires, leads, cables, etc. The connector is the component which has failed, not the wire itself. Do not code the component FAS — Fastener. It is not necessary to consider the piece parts of a connector which has failed.

H.35 Icomp 250: Motors

H.35.1 Description

Icomp 250 contains motors and motor starters. The components are

EXC	Exciter
MOT	Motor
MSTR	Motor starter

H.35.2 Rules for components with Icomp 250

None to date.

H.36 Icomp 260: Penetrations

H.36.1 Description

Icomp 260 contains the sealed passageways or penetrations throughout the plant for equipment and personnel access, instrumentation, electric wiring, and other process equipment. Specifically, Icomp 260 includes the following components:

PEN	Penetration, other/unknown type
PNA	Penetration, personnel access
PNB	Penetration, fuel handling
PNC	Penetration, equipment access
PND	Penetration, electrical
PNE	Penetration, instrument line
PNF	Penetration, process piping

H.36.2 Rules for components with Icomp 260

H.36.2.1 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

A violation of containment integrity must be coded as an open penetration.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly, a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effect codes TA and PL) a containment isolation valve (system DB, component code ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause code SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1		1	M	T	R	TA	
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect code BP) during a routine inspection (D-code I) in the auxiliary building (ISYS code SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect KA) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

H.36.2.2 <u>Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.</u>

<u>Focus:</u>

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP <u>(STEP NUMBER)</u> : <u>(ATTRIBUTE)</u> <u>(CODE)</u> — <u>(EXPLANATION)</u>

<u>Rule:</u>

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP <u>(STEP NUMBER)</u> : <u>(ATTRIBUTE)</u> <u>(CODE)</u> — <u>(EXPLANATION)</u>

<u>Example: An Administrative Building Wall Collapsed</u>

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

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H.37 Icomp 270: Personnel

H.37.1 Description

Icomp 270 contains the title (utility licensed operator, contractor, etc.) of the personnel involved in the step. The valid component codes for codifying personnel are as follows:

PCP	Contractor personnel
PLO	Licensed operator personnel
PNO	Non-licensed operator personnel
PUX	Other utility personnel
PX	Other personnel
PZ	Unknown personnel

H.37.2 Rules for personnel

See Appendix K: Personnel.

H.38 Icomp 280/Pipes/Fittings

H.38.1 Description

Icomp 280 contains pipes, pipe fittings, tubing, sleeves, nozzles and other water conducting vessels. Specifically, Icomp 280 includes the following components:

NZL	Nozzle
PIAC	Pipe, less than 4 in. diameter, carbon steel
PIAL	Pipe, less than 4 in. diameter, lined/clad
PIAS	Pipe, less than 4 in. diameter, stainless steel
PIAX	Pipe, less than 4 in. diameter, other material
PIAZ	Pipe, less than 4 in. diameter, unknown material
PIBC	Pipe, 4 to 6 in. diameter, carbon steel
PIBL	Pipe, 4 to 6 in. diameter, lined/clad
PIBS	Pipe, 4 to 6 in. diameter, stainless steel
PIBX	Pipe, 4 to 6 in. diameter, other material
PIBZ	Pipe, 4 to 6 in. diameter, unknown material
PICC	Pipe, 6 to 10 in. diameter, carbon steel
PICL	Pipe, 6 to 10 in. diameter, lined/clad
PICS	Pipe, 6 to 10 in. diameter, stainless steel
PICX	Pipe, 6 to 10 in. diameter, other material
PICZ	Pipe, 6 to 10 in. diameter, unknown material
PIDC	Pipe, 10 to 16 in. diameter, carbon steel
PIDL	Pipe, 10 to 16 in. diameter, lined/clad
PIDS	Pipe, 10 to 16 in. diameter, stainless steel
PIDX	Pipe, 10 to 16 in. diameter, other material
PIDZ	Pipe, 10 to 16 in. diameter, unknown material
PIEC	Pipe, 16 in. and larger diameter, carbon steel
PIEL	Pipe, 16 in. and larger diameter, lined/clad
PIES	Pipe, 16 in. and larger diameter, stainless steel
PIEX	Pipe, 16 in. and larger diameter, other material
PIEZ	Pipe, 16 in. and larger diameter, unknown material
PIZC	Pipe, unknown diameter, carbon steel
PIZL	Pipe, unknown diameter, lined/clad
PIZS	Pipe, unknown diameter, stainless steel
PIZX	Pipe, unknown diameter, other material
PIZZ	Pipe, unknown diameter, unknown material
PLG	Plug
RPD	Rupture disc
SL	Sensing line
SLV	Sleeve
TBG	Tubing
XW	Well, special process monitor

H.38.2 Rules for components with Icomp 280

H.38.2.1 Rule 104 — Pipe breaks. Pipe breaks resulting in a loss of a pressure boundary are coded with a leak effect code (code beginning with B), not DA — Break/Shear.

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H.38.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.39 Icomp 290: Pumps

H.39.1 Description

Icomp 290 contains several types of pumps including the following:

PMPA	Pump, axial
PMPB	Pump, centrifugal
PMPC	Pump, diaphragm
PMPD	Pump, gear
PMPE	Pump, reciprocating
PMFP	Pump, radial
PMPG	Pump, rotary
PMPH	Pump, vane type
PMPK	Pump, jet
PMPX	Pump, other type
PMPZ	Pump, unknown type

H.39.2 Rules for components with Icomp 290

H.39.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.40 Icomp 300: Recombiners

H.40.1 Description

Icomp 300 contains the equipment that recombines oxygen and hydrogen into water. The only component included is:

RCB Recombiner

H.40.2 Rules for component with Icomp 300

None to date.

H.41 Icomp 310: Shock Suppressors and Supports

H.41.1 Description

Icomp 310 contains the devices that anchor or hold components in place and suppress mechanical vibration. Specifically, Icomp 310 includes the following components:

ANK	Anchor
HANG	Hanger
SNB	Snubber
SPT	Support

H.41.2 Rules for components with Icomp 310

H.41.2.1 Rule 105 — Hydraulic fluid for snubbers. Loss of snubber hydraulic fluid should not be considered a lubrication related failure since the fluid is for dampening.

H.42 Icomp 320: Structural Function Items

H.42.1 Description

Icomp 320 contains stairs, platforms, doors, walls, fire barriers, prestressed concrete, and many other structural features. Specifically, Icomp 320 includes the following components:

CSTR	Concrete structure/shield
DR	Door/cover/hatch
DRN	Drain
FAR	Flame arrestor
FBR	Fire barrier
MSF	Miscellaneous structural features
PIT	Pit
POOL	Pool
PSC	Prestressed concrete/tendon and anchorage
SFR	Structural framing and foundation
SMP	Sump
WALL	Wall/bulkhead

H.42.2 Rules for components with Icomp 320

H.42.2.1. Rule 46 — Systems and interface systems for fire protection equipment.

Focus:

For structural fire protection equipment, such as doors (component DR) and seals (component SEAL) around penetrations, the system must be KF — Fire Protection. The interface system must be the structural system (system with a first digit S) of which the component is a part. If a structural component divides two structural areas, use the system code that has alphabetic priority. For example, a fire door dividing the turbine building (system SL) and the auxiliary building (system SF) will have an interface system SF because SF is alphabetically before SL.

Rule:

Fire protection equipment is divided into two categories: structural and nonstructural. The system for both categories must be KF-Fire Protection. For structural components, such as doors (component DR) and seals (component SEAL) around penetrations, and ventilation components, such as dampers (component DMP), the interface system must be the structural system (system with a first digit S) of which it is a part (see Example below). If a structural component divides two structural areas, use the system code that has alphabetic priority. For example, a fire door dividing the turbine building (system SL) and the auxiliary building (system SF) will have an interface system code SF because SF is alphabetically before SL.

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For nonstructural components, such as fire hoses (component HOSE), the interface system must be the system being protected if specified in the LER or ZZ — Unknown.

Example: Control Building Fire Door Left Open

A fire door (system KF, component DR) between the control building (system SH) and the environment (system SY) was found left open (effect AI) by some unknown person (system PZ, component PZ).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SZ	PZ		PZ		1		1	M	T	I		TA
2	1		RC	KF	SH	DR		1	1	1	M	T	I		AI

H.42.2.2. Rule 106 — Use of component FAR — Flame Arrester.

A flame arrester (component FAR) is an assembly of screens, perforated plates, or metal-gauze packing that mitigates the propagation of fire from room-to-room, in vent lines from flammable-product storage tanks, or in the exhaust lines of internal combustion engines. Code FAR is not to be used as the physical boundary including walls, doors, ceilings, floors, seals, etc. The system for component FAR must be KF — Fire Protection. The interface system must be system of which the flame arrester is a part.

H.42.2.3. Rule 107 — Use of component FBR — Fire Barrier.

A fire barrier (component FBR) is a collection of structural components (including walls, doors, ceilings, floors, seals, etc.) that define a physical boundary in which a fire may spread without obstruction. Component code FBR is coded only when no other structural component is specified (for example, three fire barriers were declared inoperable). If other components were specified, only those components are coded. For example, if a fire door was left open and the fire barrier declared inoperable, only the fire door would be coded.

The system for the fire barrier must be KF — Fire Protection. The interface system must be the structural system (system with a first digit S), of which the barrier is a part. If the fire barrier divides two structural areas, use the system code that has alphabetic priority. For example, a fire barrier dividing the turbine building (system SL) and the auxiliary building (system SF) will have an interface system code SF because SF is alphabetically before SL.

H.42.2.4 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

The interface system in an information step distinguishes between inner and outer structural components when there is an external leak of the Containment Isolation System [DB].

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly, a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

- SA — indicates an inner door (Primary Reactor Containment),
- SF — indicates an outer door (Reactor Auxiliary Building), and
- SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effects TB and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

<u>Example 3: Sample Line Containment Isolation Valve Leak</u>

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

<u>Example 4: Violation of Containment Integrity Due to Component Failure</u>

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which allowed a maintenance personnel to open (effect KA) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AH). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

H.42.2.5 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL - Wall/Bulkhead) nearest the sink holc collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

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H.43 Icomp 330: Transformers

H.43.1 Description

Icomp 330 contains several types of electric transformers including the following:

XCT	Transformer, current
XET	Transformer, excitation
XFMR	Transformer, other type
XIT	Transformer, isolation
XLT	Transformer, lighting
XPWT	Transformer, power
XTZ	Transformer, unknown type
XVCT	Transformer, voltage regulator/current
XVPT	Transformer, voltage/voltage potential

H.43.2 Rules for components with Icomp 330

H.43.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.44 Icomp 340: Turbines

H.44.1 Description

Icomp 340 contains only one component:

TRB Turbine

H.44.2 Rules for the component with Icomp 340

None to date.

H.45 Icomp 350: Valves

H.45.1 Description

Icomp 350 contains equipment that regulates the flow of fluids through piping. Valves are classified by function (flow control, check, drain, etc.) rather than valve type (ball, butterfly, needle, etc.). Specifically, Icomp 350 includes the following components:

BAVC	Valve, balancing, carbon steel
BAVS	Valve, balancing, stainless steel
BAVX	Valve, balancing, other material
BAVZ	Valve, balancing, unknown material
BYVC	Valve, bypass, carbon steel
BYVS	Valve, bypass, stainless steel
BYVX	Valve, bypass, other material
BYVZ	Valve, bypass, unknown material
CVC	Valve, check, carbon steel
CVS	Valve, check, stainless steel
CVX	Valve, check, other material
CVZ	Valve, check, unknown material
DMP	Damper/louver
DRVC	Valve, drain, carbon steel
DRVS	Valve, drain, stainless steel
DRVX	Valve, drain, other material
DRVZ	Valve, drain, unknown material
FCVC	Valve, control, flow, carbon steel
FCVS	Valve, control, flow, stainless steel
FCVX	Valve, control, flow, other material
FCVZ	Valve, control, flow, unknown material
FLVC	Valve, flush/purge, carbon steel
FLVS	Valve, flush/purge, stainless steel
FLVX	Valve, flush/purge, other material
FLVZ	Valve, flush/purge, unknown material
INVC	Valve, injection, carbon steel
INVS	Valve, injection, stainless steel
INVX	Valve, injection, other material
INVZ	Valve, injection, unknown material
ISVC	Valve, isolation/shutoff, carbon steel
ISVS	Valve, isolation/shutoff, stainless steel
ISVX	Valve, isolation/shutoff, other material
ISVZ	Valve, isolation/shutoff, unknown material
LCVC	Valve, control, level, carbon steel
LCVS	Valve, control, level, stainless steel
LCVX	Valve, control, level, other material
LCVZ	Valve, control, level, unknown material
LOVC	Valve, leakoff, carbon steel
LOVS	Valve, leakoff, stainless steel
LOVX	Valve, leakoff, other material
LOVZ	Valve, leakoff, unknown material
ORVC	Valve, relief w/operator, carbon steel

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ORVS	Valve, relief w/operator, stainless steel
ORVX	Valve, relief w/operator, other material
ORVZ	Valve, relief w/operator, unknown material
PCVC	Valve, control, pressure, carbon steel
PCVS	Valve, control, pressure, stainless steel
PCVX	Valve, control, pressure, other material
PCVZ	Valve, control, pressure, unknown material
PRVC	Valve, pressure reducing, carbon steel
PRVS	Valve, pressure reducing, stainless steel
PRVX	Valve, pressure reducing, other material
PRVZ	Valve, pressure reducing, unknown material
RMVC	Valve, recirculation, carbon steel
RMVS	Valve, recirculation, stainless steel
RMVX	Valve, recirculation, other material
RMVZ	Valve, recirculation, unknown material
RTVC	Valve, root, carbon steel
RTVS	Valve, root, stainless steel
RTVX	Valve, root, other material
RTVZ	Valve, root, unknown material
RVC	Valve, relief, self-acting, carbon steel
RCS	Valve, relief, self-acting, stainless steel
RCX	Valve, relief, self-acting, other material
RCZ	Valve, relief, self-acting, unknown material
SCVC	Valve, control, speed/frequency, carbon steel
SCVS	Valve, control, speed/frequency, stainless steel
SCVX	Valve, control, speed/frequency, other material
SCVZ	Valve, control, speed/frequency, unknown material
SMVC	Valve, sample, carbon steel
SMVS	Valve, sample, stainless steel
SMVX	Valve, sample, other material
SMVZ	Valve, sample, unknown material
TCVC	Valve, control, temperature, carbon steel
TCVS	Valve, control, temperature, stainless steel
TCVX	Valve, control, temperature, other material
TCVZ	Valve, control, temperature, unknown material
SV	Valve, solenoid
TVC	Valve, test, carbon steel
TVS	Valve, test, stainless steel
TVX	Valve, test, other material
TVZ	Valve, test, unknown material
VACB	Breaker, vacuum
VTVC	Valve, vent, carbon steel
VTVS	Valve, vent, stainless steel
VTVX	Valve, vent, other material
VTVZ	Valve, vent, unknown material
XVC	Valve, other type, carbon steel
XVS	Valve, other type, stainless steel
XVX	Valve, other type, other material
XVZ	Valve, other type, unknown material

ZVC	Valve, unknown type, carbon steel
ZVS	Valve, unknown type, stainless steel
ZVX	Valve, unknown type, other material
ZVZ	Valve, unknown type, unknown material

H.45.2 Rules for components with Icomp 350

H.45.2.1 Rule 108 — System for main steam pressure relief valves. Main steam pressure relief valves are in system BP — Main Steam Pressure Relief for PWRs and system BR — Nuclear Boiler Overpressure Protection for BWRs.

H.45.2.2 Rule 109 — Coding valve operator as a major component. Valve operators are considered separate components from valves. Code the valve operator each time it is necessary for the logical progression of events whether or not the LER specifies it.

H.45.2.3 Rule 89 — Systems for BWR vacuum breakers. Vacuum breakers help protect containment from overpressure. Vacuum breakers exist between the torus and drywell and between the reactor building and suppression chamber. Code the torus/drywell vacuum breakers with system HC — Primary Containment Vacuum Relief. Code the reactor building/suppression chamber vacuum breakers with system DB — Containment Isolation and ISYS HC — Primary Containment Vacuum Relief.

H.45.2.4 Rule 110 — P-code for containment isolation valves. Containment isolation valves that fail to fully close should be coded as total failures in the P-column.

H.45.2.5 Rule 111 — Solenoid valves. Solenoid valves (component SV) control the position of other valves. These valves regulate the flow of fluid (hydraulic fluid or control air) to the process valves. Do not use SV for solenoid-operated process valves.

H.45.2.6 Rule 112 — Relief valves. Components RVC, RVS, RVX, and RVZ — Relief Valves are self-actuated valves. These valves are generally spring loaded (Figure H.1) and cannot be operated manually. Do not code valve operator with these valves. These codes should be used when an LER specifies a "safety valve."

Components ORVC, ORVS, ORVX, and ORVZ — Relief Valves w/operator are self-actuated valves that also have valve operators for remote operation (Figure H.2). These codes should be used when an LER specifies "safety/relief valve" or "power operated relief valve (PORV)." The valve operators are part of the valve; therefore do not code a valve operator.

H.45.2.7 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

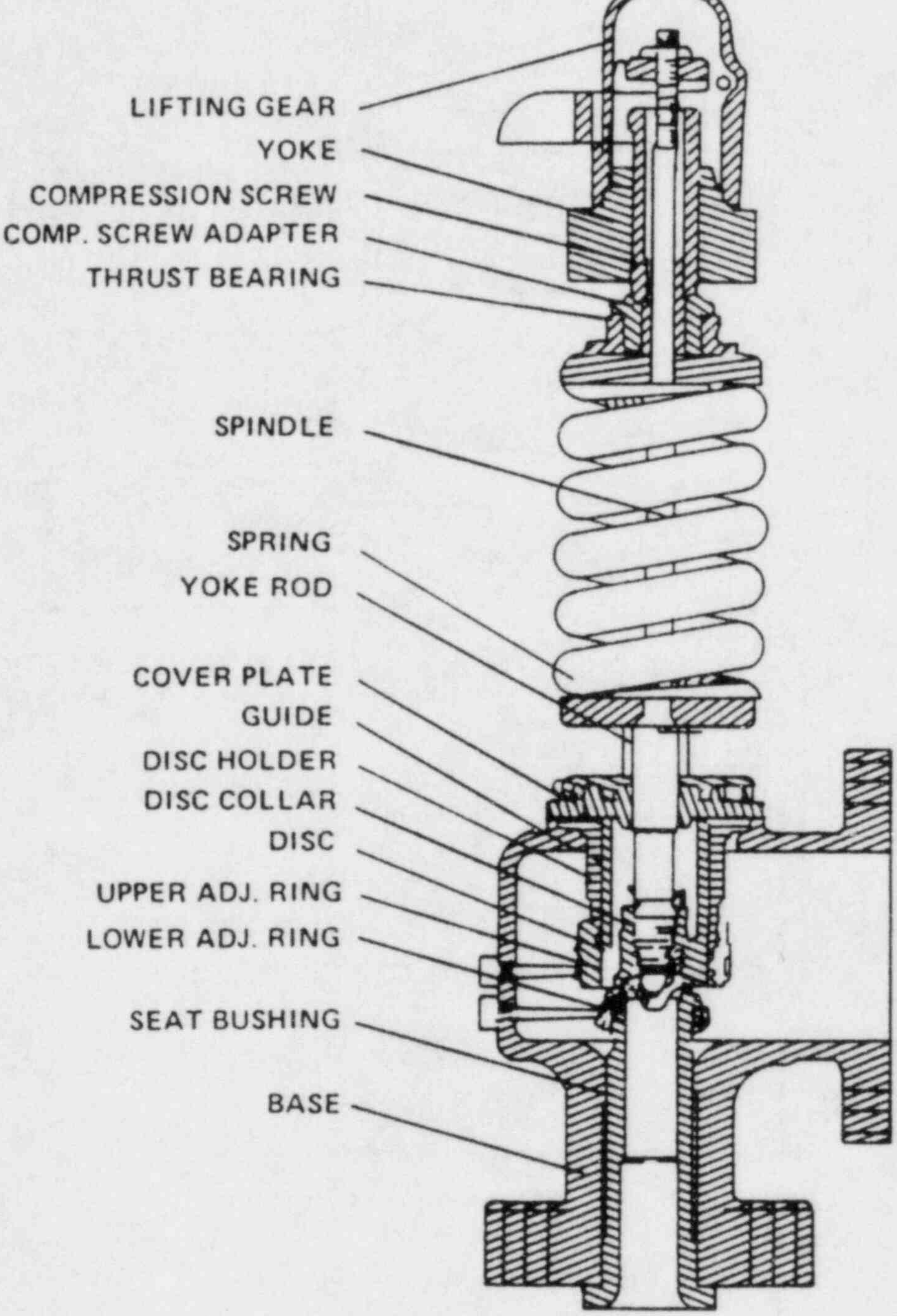

Figure H.1 Safety valve

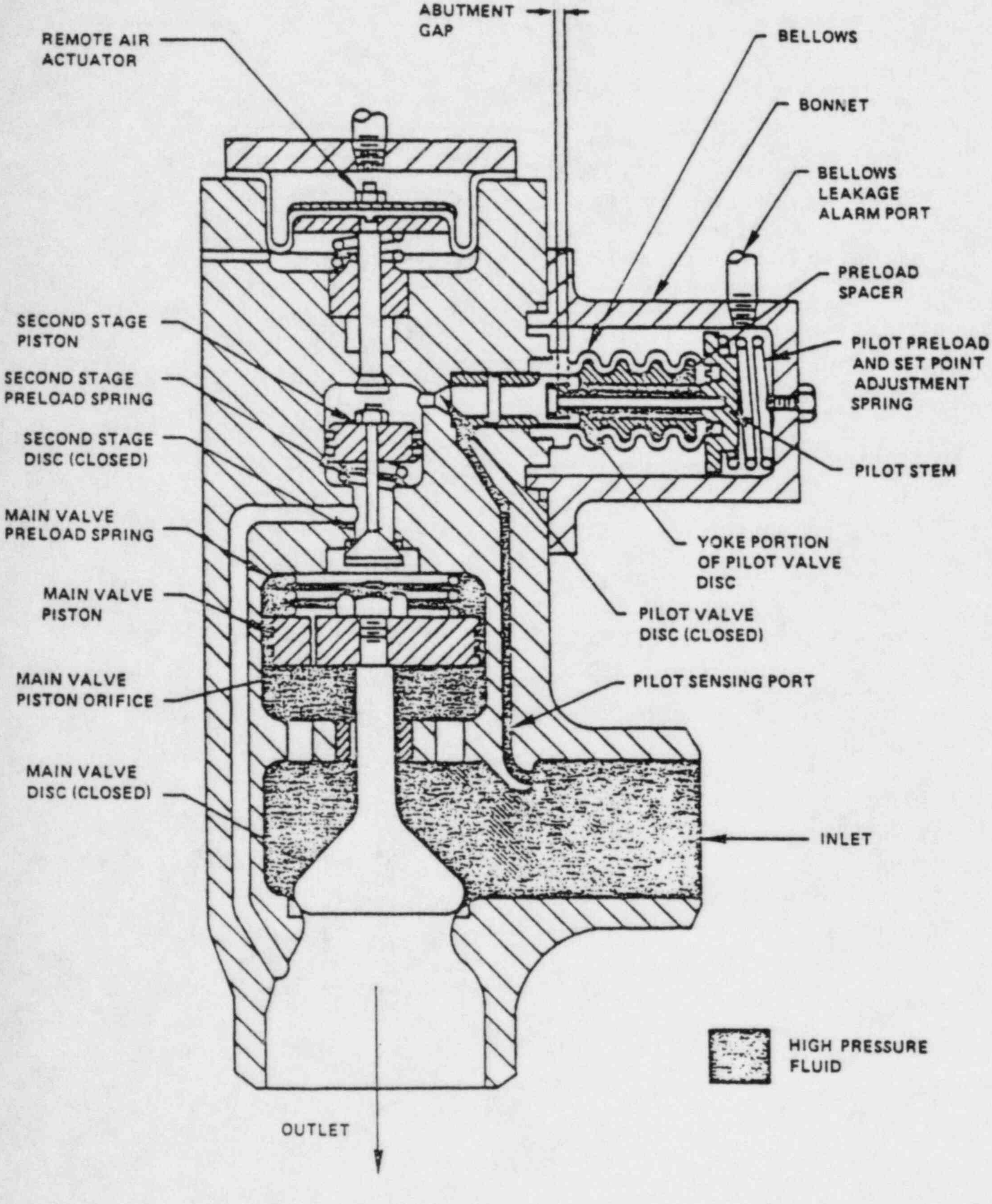

Figure H.2 Three stage target rock safety/relief valve

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.46 Icomp 360: Valve Operators

H.46.1 Description

Icomp 360 contains the operating mechanisms for opening and closing valves. Specifically, Icomp 360 includes the following components:

VOA	Valve operator, manual
VOB	Valve operator, electric/servo
VOC	Valve operator, hydraulic
VOD	Valve operator, pneumatic
VOE	Valve operator, solenoid
VOF	Valve operator, float
VOG	Valve operator, explosive/squib
VOH	Valve operator, mechanical
VOK	Valve operator, piston
VOL	Valve operator, balance
VOM	Valve operator, ball
VOX	Valve operator, other type
VOZ	Valve operator, unknown type

H.46.2 Rules for components with Icomp 360

H.46.2.1 Rule 109 — Coding valve operator as a major component. Valve operators are considered separate components from valves. Code the valve operator each time it is necessary for the logical progression of events whether or not the LER specifies it.

H.46.2.2 Rule 113 — Solenoid valve operators. Use component VOE — Valve Operator, Solenoid for solenoid valve operators rather than SOL — Solenoid.

H.46.2.3 Rule 114 — Valve operator effects. Effect codes KA — Operate or KB — Fail to Operate are appropriate for valve operator actions rather than AK — Transfer Open or AL — Fail to Transfer Open. A valve operator "operates" rather than "opens" or "closes," etc.

H.46.2.4 Rule 102 — Instrument subcomponents in valve operators. Instruments such as torque switches (component WS) and limit switches (component ZS) which are part of a valve operator should have the same system as the valve operator. They are considered subcomponents of the valve operators.

H.46.2.5 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using a "miscellaneous" code, an explanation of the code must appear in the comments field in the following form:

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STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (for example, cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS
15 16 (FREE FORM)

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.47 Icomp 370: Vessels

H.47.1 Description

Icomp 330 contains the major fluid receptacles such as the reactor pressure vessels and pressurizers. Specifically, Icomp 370 contains the following components:

PZR	Pressurizer
RPV	Vessel, reactor
VSL	Vessel

H.47.2 Rules for components with Icomp 370

H.47.2.1 Rule 115 — Pressurizer as a component over system. When coding occurrences involving pressurizers, use the component code PZR. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AF — Pressurizer.

H.47.2.2 Rule 116 — Reactor pressure vessel as a component over system. When coding occurrences involving reactor pressure vessels use component RPV. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AD — Reactor Vessel.

H.48 Icomp 500: Miscellaneous

H.48.1 Description

Icomp 500 contains the general codes for codifying components for which there are no other codes. Specifically, the general codes in Icomp 500 are as follows:

MEI	Miscellaneous equipment item
MSC	Miscellaneous subcomponent
ZZZ	Unknown component

H.48.2 Rules for components with Icomp 500

H.48.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) — (EXPLANA'ION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — Other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

500

COMMENTS
15 16 (FREE FORM)

C   STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C   ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

H.49 Icomp 900: Unit Effects Step Except for Steps Concerning Other Units

H.49.1 Description

Information concerning the unit initial conditions and the effects of the sequence on the unit is captured in steps with a pseudo system code, XX, called unit effects steps. These unit information steps are usually not part of a sequence, but appear at the end of a sequence. However, they can occur during a sequence to indicate, for example, that a previous occurrence(s) caused a significant unit effect, such as a shutdown. Icomp 900 contains all unit information steps except those in which the P-column is HA — Affected Other Unit(s).

The only valid component code for Icomp 900 is a blank field.

H.49.2 Rules for unit effects steps — See Appendix J, Sect. J.4.

H.49.2.1 Rule 117 — Component field for unit effects steps. If the system is XX and P-column is not HA — Affected Other Unit(s), the component field should be blank. For system XX and P-column HA, place the docket number of the affected unit in the component field.

H.49.2.2 Rule 93 — Effect YC with components. The only sets of component codes that can have effect YC — Additional Information are Icomp 900, 901, and 910. This includes only unit effect steps and environmental effect steps.

H.50 Icomp 901: Unit Effects Step Concerning Other Units

H.50.1 Description

Information concerning the unit initial conditions and the effects of the sequence on the unit is captured in steps with a pseudo system code, XX, called unit information steps. These unit information steps are usually not part of a sequence, but appear at the end of a sequence to indicate, for example that a previous occurrence(s) caused a reactor shutdown. Icomp 901 contains unit information steps in which the P-column is HA — Affected Other Unit(s). All docket numbers are valid component codes for Icomp 901.

H.50.2 Rules for unit effects steps where another unit is affected

H.50.2.1 Rule 117 — Component field for unit effects steps. If the system is XX and P-column is not HA — Affected Other Unit(s), the component field should be blank. For system XX and P-column HA, place the docket number of the affected unit in the component field.

H.50.2.2 Rule 118 — Nonnuclear units. For occurrences in nonnuclear units that affect or are affected by occurrences in a nuclear unit, use docket number 998 or 999 in the component field of the system XX step as follows:

998 — Nonnuclear Unit Involving Nonnuclear Equipment, or
999 — Nonnuclear Unit Involving Nuclear Equipment.

H.50.2.3 Rule 93 — Effect YC with components. The only sets of component codes that can have effect YC — Additional Information are Icomp 900, 901, and 910. This includes only unit effect steps and environmental effect steps.

H.51 Icomp 910: Environmental Effects Step

H.51.1 Description

Information concerning the effects of the sequence on the environment is captured in steps with a pseudo system code, YY, called environmental effects steps. Icomp 910 contains these environmental effects steps.

H.51.2 Rules for environmental effects steps

H.51.2.1 Rule 119 — Component field for environmental effects steps. If the system is YY — Environmental Effects, the component field should be blank.

H.51.2.2 Rule 93 — Effect YC with components. The only sets of component codes that can have effect YC — Additional Information are Icomp 900, 901, and 910. This includes only unit effect steps and environmental effect steps.

H.52 Icomp 920: Total System Occurrence

H.52.1 Description

Icomp 920 indicates that the entire system is involved in the occurrence. The only component code contained in Icomp 920 is as follows:

XXX Total system occurrence

H.52.2 Rules for total system occurrences

H.52.2.1 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. A violation of containment integrity must be coded as an open containment isolation penetration.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly, a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the sublink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system

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boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

- SA — indicates an inner door (Primary Reactor Containment),
- SF — indicates an outer door (Reactor Auxiliary Building), and
- SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effect TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	TR	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	TR	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	TR	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component PNA] which

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allowed a maintenance personnel to open (effect AI) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

H.52.2.2 Rule 115 — Pressurizer as a component over system. When coding occurrences involving pressurizers, use the component code PZR. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AF — Pressurizer.

H.52.2.3 Rule 116 — Reactor pressure vessel as a component over system. When coding occurrences involving reactor pressure vessels use component RPV. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AD — Reactor Vessel.

H.52.2.4 Rule 121 — Steam generator as a component over system. When coding occurrences involving steam generators use component SG. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AH — Steam Generator.

H.53 Icomp 930: Subsystem Occurrence

H.53.1 Description

Icomp 930 indicates that a distinct part of the system that has 100% capability of performing the system function is involved in the occurrence. The components in Icomp 930 have the form:

AXB Subsystem occurrence

where A indicates the number of subsystems involved and B indicates the total number of subsystems in the system. The values of A are 1, 2, ..., 9, M (multiple), Z (unknown). The values for B are 2, ..., 99, or Z.

H.53.2 Rules

H.53.2.1 Rule 120 — Quantity with subsystem occurrence. When coding subsystem occurrences in the form AXB where A indicates the number of subsystems involved in the occurrence, the quantity must also be A.

H.53.2.2 Rule 40 — Use of interface system and information step with containment isolation events.

Focus:

Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. A violation of containment integrity must be coded as an open containment isolation penetration.

Rule:

I. Interface system identifies the system being isolated.

When the primary system (PSYS) in the first step of an occurrence description is Containment Isolation [DB], the interface system (ISYS) must be the system being isolated. For example, a main steam isolation valve is in the containment isolation system and would be coded with an ISYS of FA — Main Steam. Similarly, a PWR personnel penetration has a PSYS of DB — Containment Isolation and an ISYS of SA — Primary Reactor Containment (PWR). See Example 1.

II. An information step adds description to leak events.

It is necessary to include a second step, or information step, in the occurrence description when there is a containment isolation system leak and it involves more than one additional system. The ISYS field in the information step identifies the system (other than system DB and the system being isolated) from which or to which the leak occurs. An X in the suplink column denotes that this step is an information step and that it is adding information to the first step. The information step must be linked to the first step of the occurrence. It must repeat all the information in the first step except the ISYS. See Example 2.

There are two types of leaks that involve more than one system and must have an information step: (1) external system leaks, and (2) between systems leaks when the containment isolation system is the system boundary for two different systems. For external system leaks, the ISYS of the information step identifies the structural system to or from which the leak occurs. If the system to which or from which the leak occurs is unknown, code SW — Miscellaneous/Unknown Structure (see Sect. F.10.17.2.3) in the ISYS field of the information step. In some cases, the inboard system is different from the outboard system for process piping, instrument piping, or electrical penetration. When through-valve leakage exists in these cases, the inboard system is the ISYS for the first step of the occurrence and the outboard system is the ISYS of the information step. Do not use an information step for between systems leakage when the inboard and outboard systems are the same or when it is not known that they are different.

When occurrences involve more than two interfacing systems (such as leaks involving sampling or instrument sensing lines), a new information step should be added for each additional system involved. See Example 3.

III. Open penetrations indicate a violation of containment.

A violation of containment integrity must be coded as an open penetration(s). The failure of one or more penetrations does not indicate a failure of the entire Containment Isolation System [DB] nor does a penetration constitute a train of the Containment Isolation System [DB]. Therefore, do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with the Containment Isolation System [DB]. See Examples 4 and 5.

Coding should not attempt to distinguish between inner and outer components in the Containment Isolation System [DB] except for external leaks where the information step's ISYS makes the distinction between inner and outer. For example, in the ISYS field of the information step for a leaking PWR penetration door,

SA — indicates an inner door (Primary Reactor Containment),
SF — indicates an outer door (Reactor Auxiliary Building), and
SW — indicates the door was unspecified (Miscellaneous/Unknown Structures).

All personnel and equipment penetration component leaks should be coded as external system leaks (effect codes BK, BL, BN, and BP). See Example 6.

Example 1: Containment Isolation Valve Not Tested

During a review of test results (D-code R), it was noted that a non-licensed operator (component PNO) of a PWR failed to test (effect TA and PL) a containment isolation valve (system DB, component ISVZ) in the RHR system (ISYS BF) because of an error in a procedure (cause SB).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		SB	PT		PNO		1			1	M	T	R	TA
2	1		RC	DB	BF	ISVZ		1	1		1	M	M	R	PL

Example 2: A Main Steam Isolation Valve Leak to the Auxiliary Building

The packing (component SEAL) on a main steam isolation valve (system DB — Containment Isolation, ISYS FA — Main Steam, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) was found to be leaking (effect BP) during a routine inspection (D-code I) in the auxiliary building (ISYS SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	FA	SEAL		1	1		1	M	TR	I	BP
2	1	X	**	DB	SF	SEAL		1	1		1	M	TR	I	BP
3	1		RC	DB	FA	ISVZ		1	1		1	M	TR	I	BP
4	3	X	RC	DB	SF	ISVZ		1	1		1	M	TR	I	BP

Example 3: Sample Line Containment Isolation Valve Leak

A containment isolation valve (system DB — Containment Isolation, component ISVZ — Valve, Isolation/Shutoff, Unknown Material) on a sample line (system KB — Sampling) from the main coolant system (system AE) leaked to the auxiliary building (system SF).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	KB	ISVZ		1	1		1	*	T	*	BP
2	1	X	**	DB	SF	ISVZ		1	1		1	*	T	*	BP
3	1	X	**	DB	AE	ISVZ		1	1		1	*	T	*	BP

Example 4: Violation of Containment Integrity Due to Component Failure

An interlock (component INL) broke (effect DA) on a containment isolation personnel penetration [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component code PNA] which allowed a maintenance personnel to open (effect AK) the outer containment isolation door (ISYS SF — Auxiliary Building, component DR) while the inner containment isolation door was open (effect AI). Note that an open penetration defines a violation of containment integrity.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0		**	DB	SA	INL		1	1		1	*	*	*	DA
3	2	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
4	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 5: Violation of Containment Integrity Due to a Personnel Error

After the event in Example 4, signs were posted requiring all who used the penetration to verify that the opposite door was closed. However, a maintenance personnel (component PUX) in route to a maintenance job location (system PM) failed to verify that the inner containment isolation door was closed before opening the outer containment isolation door. Thus, containment integrity was again violated.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	DB	SA	DR		1	1		1	*	*	*	AI
2	0	B	**	DB	SA	INL		1	1		1	*	*	*	DA
3	0	B	**	PM		PUX		1			1	*	*	*	UA
4	B	A	RC	DB	SF	DR		1	1		2	*	*	*	AK
5	A		RC	DB	SA	PNA		1	1		1	*	*	*	AI

Example 6: Inner Door Seal Leak on a PWR Containment Penetration

A seal (component SEAL) leaked (effect BP) on a containment penetration inner door [system DB — Containment Isolation, ISYS SA — Primary Reactor Containment (PWR), component DR — Door] during a leak test (D-code I).

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	DB	SA	SEAL		1	1		1	*	*	I	BP
2	1	X	**	DB	SA	SEAL		1	1		1	*	*	I	BP
3	1		RC	DB	SA	DR		1	1		1	*	*	I	BP
4	3	X	RC	DB	SA	DR		1	1		1	*	*	I	BP

H.53.2.3 Rule 115 — Pressurizer as a component over system. When coding occurrences involving pressurizers, use the component code PZR. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AF — Pressurizer.

H.53.2.4 Rule 116 — Reactor pressure vessel as a component over system. When coding occurrences involving reactor pressure vessels, use component RPV. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AD — Reactor Vessel.

H.53.2.5 Rule 121 — Steam generator as a component over system. When coding occurrences involving steam generators use component SG. Do not use component XXX — Entire System nor AXB — Number of Total Subsystems Affected with system AH — Steam Generator.

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Appendix I: COMPONENT SPECIFICATION

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Appendix I: COMPONENT SPECIFICATION

I.1 Vendor

I.1.1 Description

Vendor is the manufacturer of the component described in the step. The vendor codes presented in the Code Listing volume of the Sequence Coding and Search System Coder's Manual are those used by the Nuclear Plant Reliability Data System (NPRDS). The first character of a vendor code is alphabetic. The last three are numeric.

I.1.2 Rules for the vendor column

I.1.2.1 Rule 123 — Appropriate use of vendor codes. Vendor codes may only be included for steps involving hardware or equipment. They must not be used for personnel, train, system, unit effects, or environmental effects steps.

I.1.2.2 Rule 124 — Vendor codes for subcomponents. Unless an LER specifically states, do not code the vendor code for a major equipment item in the vendor column for subcomponents. The subcomponents may be manufactured, installed, and/or maintained by a company completely different from the main component manufacturer.

I.2 Quantity

I.2.1 Description

The quantity column shows the number of components, channels, trains, or personnel involved in that step. Valid values are either (1) numeric; (2) M — Multiple: (3) A — All components in the system/subsystem (exact quantity unspecified); or (4) Z — Unknown.

I.2.2 Rules for the quantity column.

I.2.2.1 Rule 125 — Quantity for total system, unit, and environmental steps. The quantity column must be blank for total system failures, unit effects steps, and environmental effects steps.

I.2.2.2 Rule 126 — Unknown quantity for plural components. Use quantity of Z when LER reports a component description that could be either singular or plural, such as pump bearings fail, personnel error, relay contacts stick, etc.

I.2.2.3 Rule 120 — Quantity with subsystem occurrence. When coding subsystem occurrences in the form AXB where A indicates the number of subsystems involved in the occurrence, the quantity must also be A.

I.2.2.4 Rule 127 — Train/channel with multiple subsystem occurrences. If the quantity in a train or channel step is greater than 1, a value of M — Multiple must be used in the corresponding train or channel column.

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I.3 Train

I.3.1 Description

The train column identifies the functional train of a system involved in the event. This is not the actual train designation used in the unit, but is an identifier to indicate if different trains of the same system are involved.

Values used in the train include: (1) numeric values which are used when distinct trains are identified (i.e., use 1 for the first train of a system and 2 for the second train, etc.) (2) M, which indicates that multiple trains of the same system are involved, or (3) Z, which indicates that an unknown train or number of trains is involved.

I.3.2 Rules for the train column

I.3.2.1 Rule 127 — Train/channel with multiple subsystem occurrences. If the quantity in a train or channel step is greater than 1, a value of M — Multiple must be used in the corresponding train or channel column.

I.3.2.2 Rule 128 — Train for personnel, unit, and environmental effects steps. The train must be left blank for personnel, unit effects, and environmental effects steps.

I.3.2.3 Rule 129 — Train column with instrument systems. If a component is part of an instrument system, the train column refers to the interface system which is the system being measured.

I.3.2.4 Rule 43 — Multiple sequences in the same LER.

Focus:

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER.

Rule:

An LER contains multiple sequences when the occurrences reported are separated in time by more than 24 hours and the occurrences have no common link. Occurrences within 24 hours of each other have the potential to worsen the consequences of both occurrences by affecting common systems or by requiring the same resources for repair. Because of these potential effects, occurrences within 24 hours of each other must be coded as one sequence (Example 1).

In addition, any time a common link exists between occurrences, they must be coded as a single sequence (Example 2). Examples of common links are direct causal relationships among occurrences, occurrences having the same cause or common effect, redundant equipment out of service at the same time, independent occurrences revealed by a common test, and occurrences caused by a generic design error.

Each sequence must have at least one unit effects step (system XX) and only one environmental effects step (system YY). The last two steps of each sequence must be a unit effects step followed by an environmental effects step (Example 3). These steps must be linked to other steps in the sequence only when the occurrences have had adverse effects on the unit or the environment, or when there are no direct causal relationships among occurrences in the same sequence as described below.

The step, link, and sublink columns must designate each sequence within an LER as a distinct group. All steps within one sequence, except unit and environmental effects steps, must be connected to each other through a system of links and sublinks (for example, step 3 linked to step 2, step 2 linked to step 1, and step 1 an initiator with link 0). If no direct causal relationships exist, the steps must be sublinked to the unit effects step (see Example 1). A new sequence must begin with the step number immediately following the environmental effects step of the previous sequence.

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER. For example, if a component in train A of a system fails in the first sequence and a component in train B of the same system fails in the second sequence, the train column in the second sequence must be 2 (Example 4).

Example 1: Two Diesel Generators Fail to Start

Diesel generator A (system EH — Emergency Power Generation, component DSL — Engine, Diesel) failed to start (effect KB — Failure To Operate) on March 17 at 6:15 p.m. On March 18, diesel generator B failed to start at 12:01 p.m.

Train

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	EH		DSL		1	1		1	*	*	*	KB
2	0	A	**	EH		DSL		1	2		2	*	*	*	KB
3	A		**	EH		2XZ		2	M		1	*	*	*	**
4				XX								*	**		**
5				YY								*	*		**

Example 2: Snubbers Found Inoperable

On March 17, two snubbers (component SNB) in the Chemical Volume and Control System (CVCS) (system BK) were found inoperable. On March 24, one snubber in the CVCS and two snubbers in the Fire Protection System (system KF) were found inoperable. These failures were found during the annual inspection of piping supports.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	BK		SNB		3	*		*	*	*	I	**
2	0	A	**	KF		SNB		2	*		*	*	*	I	**
3	A			XX								*	**		YC
4				YY								*	*		YC

Example 3: Multiple Unrelated Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12, December 28, and March 24. Each time the pump was repaired and returned to service.

Train

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		PMPZ		1	1		1	*	*	*	**
2	1		**	BA		1XZ		1	1		1	*	*	*	**
3				XX								*	**		**
4				YY								*	*		**
5	0		**	BA		PMPZ		1	1		1	*	*	*	**
6	5		**	BA		1XZ		1	1		1	*	*	*	**
7				XX								*	**		**
8				YY								*	*		**
9	0		**	BA		PMPZ		1	1		1	*	*	*	**
10	9		**	BA		1XZ		1	1		1	*	*	*	**
11				XX								*	**		**
12				YY								*	*		**

Example 4: Multiple Related Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12 and December 28. After the first occurrence, the pump was tested satisfactorily and returned to service. After the second occurrence, the pump was dismantled and it was found that the impellor (component MSC — Miscellaneous Subcomponent) had been rubbing the casing on both occasions.

Auxiliary feedwater pump B failed on March 24. Its internals were examined but there was no evidence of the impellor rubbing the casing.

Train

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		MSC		1	1		1	*	*	*	**
2	1		**	BA		PMPZ		1	1		1	*	*	*	**
3	2		**	BA		1XZ		1	1		1	*	*	*	**
4	1		**	BA		PMPZ		1	1		1	*	*	*	**
5	4		**	BA		1XZ		1	1		1	*	*	*	**
6				XX								*	**		**
7				YY								*	*		**
8	0		**	BA		PMPZ		1	2		2	*	*	*	**
9	8		**	BA		1XZ		1	2		2	*	*	*	**
10				XX								*	**		**
11				YY								*	*		**

Train

I.4 Channel

I.4.1 Description

The channel column identifies a particular instrument channel or channels involved in the event. This is not the actual channel designation used in the plant, but is an identifier to indicate different channels of the same instrument system.

Values used in the channel column include: (1) numeric values when distinct instrument channels are identified (i.e., use 1 for the first channel coded and 2 for the second channel of that system which is coded, etc.), (2) M, which indicates that multiple channels of the same system are involved, or (3) Z, which indicates that an unknown channel or number of channels is involved.

I.4.2 Rules for the channel column

I.4.2.1 Rule 130 — Required use of channel column. The channel column must be blank unless a system code beginning with I is used. When a system code beginning with I is used, the channel column must not be blank.

I.4.2.2 Rule 127 — Train/channel with multiple subsystem occurences. If the quantity in a train or channel step is greater than 1, a value of M — Multiple must be used in the corresponding train or channel column.

I.4.2.3 Rule 43 — Multiple sequences in the same LER.

Focus:

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER.

Rule:

An LER contains multiple sequences when the occurrences reported are separated in time by more than 24 hours and the occurrences have no common link. Occurrences within 24 hours of each other have the potential to worsen the consequences of both occurrences by affecting common systems or by requiring the same resources for repair. Because of these potential effects, occurrences within 24 hours of each other must be coded as one sequence (Example 1).

In addition, any time a common link exists between occurrences, they must be coded as a single sequence (Example 2). Examples of common

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links are direct causal relationships among occurrences, occurrences having the same cause or common effect, redundant equipment out of service at the same time, independent occurrences revealed by a common test, and occurrences caused by a generic design error.

Each sequence must have at least one unit effects step (system XX) and only one environmental effects step (system YY). The last two steps of each sequence must be a unit effects step followed by an environmental effects step (Example 3). These steps must be linked to other steps in the sequence only when the occurrences have had adverse effects on the unit or the environment, or when there are no direct causal relationships among occurrences in the same sequence as described below.

The step, link, and sublink columns must designate each sequence within an LER as a distinct group. All steps within one sequence, except unit and environmental effects steps, must be connected to each other through a system of links and sublinks (for example, step 3 linked to step 2, step 2 linked to step 1, and step 1 an initiator with link 0). If no direct causal relationships exist, the steps must be sublinked to the unit effects step (see Example 1). A new sequence must begin with the step number immediately following the environmental effects step of the previous sequence.

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER. For example, if a component in train A of a system fails in the first sequence and a component in train B of the same system fails in the second sequence, the train column in the second sequence must be 2 (Example 4).

Example 1: Two Diesel Generators Fail to Start

Diesel generator A (system EH — Emergency Power Generation, component DSL — Engine, Diesel) failed to start (effect KB — Failure To Operate) on March 17 at 6:15 p.m. On March 18, diesel generator B failed to start at 12:01 p.m.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	EH		DSL		1	1		1	*	*	*	KB
2	0	A	**	EH		DSL		1	2		2	*	*	*	KB
3	A		**	EH		2XZ		2	M		1	*	*	*	**
4				XX								*	**		**
5				YY								*	*		**

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Example 2: Snubbers Found Inoperable

On March 17, two snubbers (component SNB) in the Chemical Volume and Control System (CVCS) (system BK) were found inoperable. On March 24, one snubber in the CVCS and two snubbers in the Fire Protection System (system KF) were found inoperable. These failures were found during the annual inspection of piping supports.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	BK		SNB		3	*		*	*	*	I	**
2	0	A	**	KF		SNB		2	*		*	*	*	I	**
3	A			XX								*	**		YC
4				YY								*	*		YC

Example 3: Multiple Unrelated Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12, December 28, and March 24. Each time the pump was repaired and returned to service.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		PMPZ		1	1		1	*	*	*	**
2	1		**	BA		1XZ		1	1		1	*	*	*	**
3				XX								*	**		**
4				YY								*	*		**
5	0		**	BA		PMPZ		1	1		1	*	*	*	**
6	5		**	BA		1XZ		1	1		1	*	*	*	**
7				XX								*	**		**
8				YY								*	*		**
9	0		**	BA		PMPZ		1	1		1	*	*	*	**
10	9		**	BA		1XZ		1	1		1	*	*	*	**
11				XX								*	**		**
12				YY								*	*		**

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Example 4: Multiple Related Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12 and December 28. After the first occurrence, the pump was tested satisfactorily and returned to service. After the second occurrence, the pump was dismantled and it was found that the impellor (component MSC — Miscellaneous Subcomponent) had been rubbing the casing on both occasions.

Auxiliary feedwater pump B failed on March 24. Its internals were examined but there was no evidence of the impellor rubbing the casing.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		MSC		1	1		1	*	*	*	**
2	1		**	BA		PMPZ		1	1		1	*	*	*	**
3	2		**	BA		1XZ		1	1		1	*	*	*	**
4	1		**	BA		PMPZ		1	1		1	*	*	*	**
5	4		**	BA		1XZ		1	1		1	*	*	*	**
6				XX								*	**		**
7				YY								*	*		**
8	0		**	BA		PMPZ		1	2		2	*	*	*	**
9	8		**	BA		1XZ		1	2		2	*	*	*	**
10				XX								*	**		**
11				YY								*	*		**

Chan

I.5 Differ

I.5.1 Description

The differentiator (differ) column identifies different components having the same component code. For instance, if two stainless steel check valves (CVS) fail, they can be distinguished by use of the differ column. Values used for the differ column include (1) numeric values, or (2) Z — Unknown.

I.5.2 Rules for the differ column

I.5.2.1 Rule 131 — Differ for unit and environmental effects. Differ column must be blank for unit effects steps and environmental effects steps.

I.5.2.2 Rule 132 — Differ for multiple, indistinguishable personnel steps. Use a differ of Z when two personnel steps are coded and it is not possible to distinguish whether the same personnel are involved in both steps.

I.5.2.3 Rule 43 — Multiple sequences in the same LER.

Focus:

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER.

Rule:

An LER contains multiple sequences when the occurrences reported are separated in time by more than 24 hours and the occurrences have no common link. Occurrences within 24 hours of each other have the potential to worsen the consequences of both occurrences by affecting common systems or by requiring the same resources for repair. Because of these potential effects, occurrences within 24 hours of each other must be coded as one sequence (Example 1).

In addition, any time a common link exists between occurrences, they must be coded as a single sequence (Example 2). Examples of common links are direct causal relationships among occurrences, occurrences having the same cause or common effect, redundant equipment out of service at the same time, independent occurrences revealed by a common test, and occurrences caused by a generic design error.

Each sequence must have at least one unit effects step (system XX) and only one environmental effects step (system YY). The last two steps of each sequence must be a unit effects step followed by an environmental effects step (Example 3). These steps must be linked to other steps in the sequence only when the occurrences have had adverse effects on the unit or the environment, or when there are no direct causal relationships among occurrences in the same sequence as described below.

The step, link, and sublink columns must designate each sequence within an LER as a distinct group. All steps within one sequence, except unit and environmental effects steps, must be connected to each other through a system of links and sublinks (for example, step 3 linked to step 2, step 2 linked to step 1, and step 1 an initiator with link 0). If no direct causal relationships exist, the steps must be sublinked to the unit effects step (see Example 1). A new sequence must begin with the step number immediately following the environmental effects step of the previous sequence.

Component specification (specifically the train, channel, and differ columns) must continue between sequences. Code the component specification columns as if there were only one sequence when different trains or channels of the same system, or components with the same component code are used in more than one sequence within an LER. For example, if a component in train A of a system fails in the first sequence and a component in train B of the same system fails in the second sequence, the train column in the second sequence must be 2 (Example 4).

Example 1: Two Diesel Generators Fail to Start

Diesel generator A (system EH — Emergency Power Generation, component DSL — Engine, Diesel) failed to start (effect KB — Failure To Operate) on March 17 at 6:15 p.m. On March 18, diesel generator B failed to start at 12:01 p.m.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	EH		DSL		1	1		1	*	*	*	KB
2	0	A	**	EH		DSL		1	2		2	*	*	*	KB
3	A		**	EH		2XZ		2	M		1	*	*	*	**
4				XX								*	**		**
5				YY								*	*		**

Example 2: Snubbers Found Inoperable

On March 17, two snubbers (component SNB) in the Chemical Volume and Control System (CVCS) (system BK) were found inoperable. On March 24, one snubber in the CVCS and two snubbers in the Fire Protection System (system KF) were found inoperable. These failures were found during the annual inspection of piping supports.

Dif

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	**	BK		SNB		3	*		*	*	*	I	**
2	0	A	**	KF		SNB		2	*		*	*	*	I	**
3	A			XX								*	**		YC
4				YY								*	*		YC

Example 3: Multiple Unrelated Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12, December 28, and March 24. Each time the pump was repaired and returned to service.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		PMPZ		1	1		1	*	*	*	**
2	1		**	BA		1XZ		1	1		1	*	*	*	**
3				XX								*	**		**
4				YY								*	*		**
5	0		**	BA		PMPZ		1	1		1	*	*	*	**
6	5		**	BA		1XZ		1	1		1	*	*	*	**
7				XX								*	**		**
8				YY								*	*		**
9	0		**	BA		PMPZ		1	1		1	*	*	*	**
10	9		**	BA		1XZ		1	1		1	*	*	*	**
11				XX								*	**		**
12				YY								*	*		**

Example 4: Multiple Related Pump Failures

Auxiliary feedwater pump A (system BA, component PMPZ) failed on September 12 and December 28. After the first occurrence, the pump was tested satisfactorily and returned to service. After the second occurrence, the pump was dismantled and it was found that the impellor

Dif

(component MSC — Miscellaneous Subcomponent) had been rubbing the casing on both occasions.

Auxiliary feedwater pump B failed on March 24. Its internals were examined but there was no evidence of the impellor rubbing the casing.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	BA		MSC		1	1		1	*	*	*	**
2	1		**	BA		PMPZ		1	1		1	*	*	*	**
3	2		**	BA		1XZ		1	1		1	*	*	*	**
4	1		**	BA		PMPZ		1	1		1	*	*	*	**
5	4		**	BA		1XZ		1	1		1	*	*	*	**
6				XX								*	**		**
7				YY								*	*		**
8	0		**	BA		PMPZ		1	2		2	*	*	*	**
9	8		**	BA		1XZ		1	2		2	*	*	*	**
10				XX								*	**		**
11				YY								*	*		**

Dif

Appendix J: TPD COLUMNS

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Appendix J: TPD COLUMNS

J.1 T-column (Timing)

A	Actual immediate
G	Actual preexisting, detected
M	Actual preexisting, undetected
P	potential

J.1.1 Description

This column is used to indicate when the effect of the step of interest occurred. The following codes are valid except for unit effects steps (see Sect. J.4) and environmental effects steps (see Sect. J.5):

A - Actual, Immediate: This step took place during or immediately preceding the event. For example, if a wrong switch is turned and a pump trips then both the switch and the pump have experienced actual immediate failures.

G - Actual Preexisting, Detected: This step took place prior to the event and was known to plant personnel. For example, a pump that was removed from service for maintenance several days before the event started is an actual preexisting (detected) occurrence.

M - Actual Preexisting, Undetected: This step took place prior to the event but was not known to plant personnel. For example, a valve found out of position would be coded as actual preexisting (undetected).

P - Potential: This step might have or would have occurred at some time in the future, or under conditions specified as part of the event. For example, an instrument that could have failed under the harsh conditions of a LOCA would be coded as a potential failure following a postulated LOCA step.

J.1.2 Rules for T-column

J.1.2.1 Rule 241 — Postulated events. Postulated events must be coded as potential events (T-column P). They must be coded as a total failure (P-column T) and as being detected through a review (D-column R).

J.1.2.2 Rule 234 — Setpoint drift. Setpoint drift for instrumentation must be coded with LA — Drift as the cause and LB — Out of Calibration as the effect. Setpoint drift is considered an actual preexisting, undetected event (T-column M).

J.1.2.3 Rule 87 — Test not performed. A single test not performed requires two steps. The first step describes the personnel error; the second describes the equipment or system that was not tested. Both steps must be actual preexisting, undetected (T-code M).

T

The personnel step must be a total failure (P-code T). The equipment/system step may have any P-code depending on the results of the retest. For example, if a retest shows the equipment/system worked properly, the P-code must be M — No Fault. The effect code of the personnel step must be TC — Omission Within Allotted Time. For the component/system step, the effect must be PL — Test Not performed.

Example: Auxiliary Feedwater pump test not performed

A review of test results (D-code R) revealed that operators had not tested auxiliary feedwater pump 1A (system BA, component PMPZ). Upon retest, the pump operated properly.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	PO		PUX		1			1	M	T	R	TC
2	1		RC	BA		PMPZ		1	1		1	M	M	R	PL

J.2 P-column (Performance)

M	No fault	PR	Partial fault/repair
P	Partial fault	TR	Total fault/repair
T	Total fault	XR	Other/repair
X	Other	ZR	Unknown/repair
Z	Unknown		

J.2.1 Description

This column indicates the degree of a component's or system's failure. It is also used to indicate repair of components which experienced a command (resultant cause code, RC) fault. The following codes are valid except for unit effects (see Sect. J.4) and environmental effects (see Sect. J.5).

M - No Fault: The component or system performed its function as designed. A step such as this is included because it could improve the understanding of an event. For example, BWR main steam isolation valves may close as designed following an isolation signal but may cause pressure to rise. Coding the MSIV closure shows a reason for the pressure rise even though the MSIV's themselves performed as required and with no fault.

P - Partial Fault: The component or system only partially performed its function. For example, a pump supplying 95% of rated flow would be coded as a partial failure.

PR - Partial Fault/Repair: The component only partially performed its function because of a command fault (resultant cause code, RC), but repair was required. For example, a pump has reduced flow because of a binding shaft. The binding shaft is coded followed by resultant pump partial failure coded with PR in the P-column. The R indicates that the pump required repair and that the shaft was a piece-part of the pump.

T — Total Fault: The component or system completely failed to perform its intended function. For example, a pressure indicator that failed to respond during a calibration check would be coded as a total failure of the indicator.

TR — Total Fault/Repair: The component completely failed to perform its function and repair was required. For example, pump flow stopped because of a broken pump shaft. The broken shaft is coded followed by a resultant total pump failure with TR in the P-column. The R indicates that the pump required repair and that the shaft was a piece-part of the pump.

X — Other: The performance of the component or system does not fit any other code.

XR — Other/Repair: The performance of the component or system does not fit any other code but repair was required.

P

Z — Unknown: The performance of the component or system is not indicated in the LER.

ZR — Unknown/Repair: The performance of the component or system is not indicated in the LER but repair was required.

J.2.2 Rules for P-column

J.2.2.1 Rule 245 — Total function failure. If a component or system ceases to perform its intended function as a result of the operation of a protective feature, it is considered to be a total failure of that component. Thus, a pump being supplied with power via a fuse which blows on overload (as it was designed to do) is coded as a total fault since it is no longer receiving power from the fuse.

J.2.2.2 Rule 246 — No partial personnel failures. There can be no partial personnel failures. Personnel either perform a desired role (P-column M — No Fault) or an undesired role (P-column T — Total Fault).

J.2.2.3 Rule 232 — P-column with cause/effect KL — No Failure. The P-column must have M — No Fault when the effect is KL — No Failure.

J.2.2.4 Rule 110 — P-code for containment isolation valves. Containment isolation valves that fail to fully close should be coded as total failures in the P-column.

J.2.2.5 Rule 87 — Test not performed. A single test not performed requires two steps. The first step describes the personnel error; the second describes the equipment or system that was not tested. Both steps must be actual preexisting, undetected (T-code M). The personnel step must be a total failure (P-code T). The equipment/-system step may have any P-code depending on the results of the retest. For example, if a retest shows the equipment/system worked properly, the P-code must be M — No Fault. The effect code of the personnel step must be TC — Omission Within Allotted Time. For the component/system step, the effect must be PL — Test Not Performed.

Example: Auxiliary Feedwater Pump Test Not Performed

A review of test results (D-code R) revealed that operators had not tested auxiliary feedwater pump 1A (system BA, component PMPZ). Upon retest, the pump operated properly.

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		**	PO		PUX		1			1	M	T	R	TC
2	1		RC	BA		PMPZ		1	1		1	M	M	R	PL

J.2.2.6 <u>Rule 241 — Postulated events</u>. Postulated events must be coded as potential events (T-column P). They must be coded as a total failure (P-column T) and as being detected through a review (D-column R).

J.2.2.7 <u>Rule 242 — Repair</u>. When a component requires repair before it can resume operation, the P-column must be one of the following:

PR - Partial Fault/Repair
TR - Total Fault/Repair
XR - Other/Repair
ZR - Unknown/Repair

Do not use these codes with personnel, system, or subsystem occurrences.

J.2.2.8 <u>Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.</u>

<u>Focus</u>:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP <u>(STEP NUMBER)</u> : <u>(ATTRIBUTE)</u> <u>(CODE)</u> - <u>(EXPLANATION)</u>

<u>Rule</u>:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP <u>(STEP NUMBER)</u> : <u>(ATTRIBUTE)</u> <u>(CODE)</u> - <u>(EXPLANATION)</u>

<u>Example: An Administrative Building Wall Collapsed</u>

A drought caused the formation of a sink hole [cause NX -- other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

P

J.3 D-column (Detection)

F	Operational abnormality	P	NRC notification
H	AE/vendor notification	R	Review of procedure/test result
I	Testing/inspection	S	Preventive maintenance
K	Maintenance	X	Other
N	Audio/visual alarm	Z	Unknown

J.3.1 Description

This column indicates how the particular step was detected. It should answer the question "How did the utility first discover that the item indicated in the component field was part of the sequence?" The following definitions describe these codes.

F - Operational Abnormality: The item was identified by means other than audio/visual alarms, written work plans, checkoff sheets, and maintenance because of an interruption of the item's normal or expected operation. For example, a pump fails while in operation.

H - AE/Vendor Notification: Discovery of the item resulted from an AE or vender notification. For example, a vendor notifies a utility of potential material deficiencies in a pump housing.

I - Testing/Inspection: The item was discovered during testing or inspection activities where personnel are following a written work plan or checkoff sheet. For example, a pressure transmitter is found to be out of calibration during routine testing.

K - Maintenance: The item was discovered by maintenance activities where a repair action or repair investigation had already been initiated. This is often applicable to piece-part or subcomponent failures, the nature of which is not evident until repair work is initiated. For example, a scored valve seat would likely be identified during maintenance activities.

N - Audio/Visual Alarm: The item was annunciated by an audio and/or visual alarm. For example, a valve leaks causing low pressure in a core flooding accumulator and sets off an accumulator low pressure alarm annunciated in the control room. Only the accumulator should have D-column N.

P - NRC Notification: Discovery of the item resulted from NRC notification. This includes resident inspector's reports, IE Bulletins, etc. For example, a utility may identify faulty relays in response to directives from NRC in an IE Bulletin.

R - Review of Procedure/Test Results: The item was discovered after a review or audit of plant procedures, test results, or records. For example, a review of records showed that several tests had not been performed on schedule. This code also includes postulated events additional analysis required in evaluating test results.

D

S - Preventive Maintenance: This code includes anticipatory, or preventive, maintenance when there was no prior evidence of failure.

X - Other: The item was discovered by means other than those described by previous codes.

Z - Unknown: The method of detection is not given, is not evident, or is not applicable to this step.

J.3.2 Rules for D-column

J.3.2.1 Detection by audio/visual alarms. Audio/visual alarms (D-column code N) include those alarms and indicators that give positive indication of an abnormal condition whenever they occur. If an indicator or alarm must be coupled with other information to positively identify the condition as abnormal, it is not considered an audio/visual alarm. For example, an MSIV closure indicating light would signal an abnormal condition only if it was known that the unit was not in shutdown conditions. The valve, observed positively out of position because of the valve position indication, would be detected by either routine test/inspection (D-column I) or operational abnormality (D-column F) depending on the specifics of the event.

J.3.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

D

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

J.3.2.3 Rule 241 — Postulated events. Postulated events must be coded as potential events (T-column P). They must be coded as a total failure (P-column T) and as being detected through a review (D-column R).

D

J.4 TPD Codes for Initial Unit Conditions and Unit Effects

J.4.1 T-column (initial unit conditions)

B	Preoperational/start-up/ Power ascension tests	H	Refueling
C	Routine start-up	I	Cold shutdown
D	Routine shutdown	K	Hot shutdown
E	Steady-state operation	X	Other
F	Load change during routine power operation	Z	Unknown/not applicable

J.4.1.1 Description. For steps with a system code of XX (used to give unit effects) the T-column is used to indicate the condition of the unit at the start of the event sequence. There must be at least one unit effects step at the end of each sequence. It may be useful also to use a unit effects step in the middle of the sequence where important additional information can be supplied. For example, during an event a shutdown may have been initiated followed by a scram and then an inadvertent safety features actuation (three unit effects steps). This event would best be described by placing the first two unit effects in their relative chronological order within the sequence than by placing all three unit effects steps at the end of the sequence.

The first time a unit effects step is used, the T-column must be filled in. Subsequent unit effects do not require the T-column to be filled in but frequently additional information can be supplied. For example, after a unit scrammed from full power and while in cold shutdown, an RHR pump failed to start. In this case the coding should indicate the unit was in cold shutdown when the pump failed to start. Thus, two unit effects steps would be desirable: one for the scram, and one to indicate cold shutdown.

For another example, consider a power reduction initiated from full power followed shortly by a scram. In this case the T-column would only need to be filled in for the first unit effects step since the unit condition after the load reduction is unchanged, just at lower power.

The following codes are valid for unit effects steps:

B - Preoperational, Startup, or Power Ascension Tests: The unit has an operating license but is not in commercial operation.

C - Routine Startup Operation: The unit is ascending in power from a zero power state.

D - Routine Shutdown: The unit is descending in power.

E - Steady-State Operation: The unit is operating at any constant power level.

F - Load changes during Routine Power Operation: The unit power level is being changed to accommodate the load.

XX

H - Refueling: The unit is shutdown and the head unbolted or removed from the reactor.

I - Cold Shutdown: The unit is shutdown and is on RHR cooling.

K - Hot Shutdown: The unit is shutdown but is not on RHR cooling.

L - Hot Standby: The unit is at operating pressure and temperature.

X - Other: The unit is in emergency shutdown, temporary suspended license condition, performing special tests, or not in a condition defined by the other codes.

Z - Unknown Unit Condition: The unit condition is not stated, or is not applicable.

J.4.1.2 Rules for T-column (effect on unit).

J.4.1.2.1 Rule 248 — Commercial operation. Do not use B — Preoperational, Startup, or Power Ascension in T-column after the unit is in commercial operation even if the utility codes a B item 28 on the pre-1984 LER form.

J.4.1.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

XX

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

J.4.2 P-column (effect on the Unit)

AA	Manual shutdown	EA	Required ESF Actuation
AB	Manual scram	EB	Unintentional ESF actuation
AD	Unintentional manual scram	FA	Forced long outage / major equipment damage
AC	Automatic scram	FB	Natural circulation
AE	Unintentional automatic scram	HA	Affected other unit(s)
BZ	Power reduction	XX	No significant effect
CZ	Extension of preexisting outage	ZZ	Not stated / Unknown

J.4.2.1 Description. For unit effect steps (system XX) the P-column indicates the effect of the event on the unit. The following P-column codes are valid for unit effects steps:

AA — Manual Shutdown: The unit is manually shutdown in an orderly manner, i.e., unit power is slowly lowered during the event. (Do not use when the unit is already in a scheduled outage).

AB — Manual Scram: The unit is manually scrammed (i.e., control rods are rapidly inserted) during event.

AD — Unintentional Manual Scram: The unit is manually scrammed unintentionally by the operator.

AC — Automatic Scram: The unit is scrammed automatically by the RPS during the event.

AE — Unintentional Automatic Scram: The unit is scrammed unintentionally from an erroneous input to the RPS during the event, e.g., maintenance personnel manually trip sufficient number of channels in RPS to produce an unintentional reactor scram.

XX

BZ — Power Reduction: The unit is forced to reduce power during the event.

CZ — Extension of Preexisting Outage: The unit is in a shutdown condition and the shutdown is extended due to the event.

EA — Required ESF Actuation: Unit conditions exist such that the actuation of the Engineered Safety Features (ESF) is required.

EB — Unintentional ESF Actuation: Unit conditions did not exist such that actuation of the ESF is required: however, the ESF systems did actuate due to erroneous signals, operator error, etc.

FA — Forced Long Outage/Major Equipment Damage: The event produced major equipment damage and/or a long outage.

FB — Natural Circulation: The LER states that natural circulation was established in the main cooling system.

HA — Affected Other Unit(s): The event affected other units. This includes failure of shared equipment, generic failure of equipment used in more than one unit, design problems with identical systems, defective procedures used for more than one unit, or where more than one unit is reported.

XX — No Significant Effect: The event produced an insignificant effect on the unit.

ZZ — Not Stated/Unknown: The effect on the unit cannot be determined from the LER.

J.4.2.2 Rules for P-column (Effect on unit).

J.4.2.2.1 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.),

XX

"unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

J.4.2.2.2 Rule 259 - ESF Actuations. Code an engineered safety feature (ESF) actuation in the unit effects step (system XX, P-code EA - Required ESF Actuation or EB - Unintentional ESF Actuation) when a signal is generated to actuate an ESF system. An ESF actuation must be coded each time a signal is generated but not for each system actuated because a single signal often actuates several systems. The ESF actuation must be coded whether it was required or not and whether the ESF system actuated properly or not. Do not code a system occurrence for successful operation of an ESF system.

Systems that are designated as an ESF vary from plant to plant. However, the following systems are ESFs for most plants and must have an ESF actuation step when they are called upon.

PWR

Combustible Gas Control System [DH]
Containment Cooling system [HA]
Containment Isolation System [DB]
Containment Vacuum Relief System [HC]
Core Flooding system [BS]
Containment Spray System [DE]

XX

Emergency Boration System [BD]
Emergency Power System [EH]
High Pressure Safety Injection System [BK]
Intermediate Pressure Injection System [BL]
Low Pressure Safety Injection System [BF]
Safety Injection System [BK or BL]
Upper Head Injection System [BT]

BWR

Automatic Depressurization System [BR]
Containment Atmosphere Control System [DH]
Containment Isolation System [DB]
Containment Spray System [DE]
Containment Vacuum Relief System [HC]
Core Spary System (high and low pressure) [BW or BX]
Emergency Power System [EH]
High Pressure Coolant Injection System [BN]
Low Pressure Coolant Injection System [BH]
Standby Gas Treatment System [HD]

The Reactor Core Isolation Cooling System (RCIC) [BC] is generally not considered to be an engineered safety feature. Therefore actuation of the RCIC must not be coded as an ESF actuation unless it is specified in the LER text that RCIC is an ESF for that unit.

The Auxiliary Feedwater System [BA] is an ESF in some units and not in others. In addition, some units have both ESF and non-ESF auxiliary feedwater pumps. Use the reportability field and the LER text to determine if actuation of the Auxiliary Feedwater System is an ESF actuation.

J.4.2.2.3 Rule 260 - Reportability 13 - ESF or RPS Actuation. When a licensee indicates that the LER is being submitted under Paragraph 50.73(a)(2)(iv) (reportability field 13), an engineered safety feature actuation and/or a scram actuation must be coded in the unit effects step.

J.4.2.2.4 Rule 261 - Effects on Other Units. The Affected Other Unit(s) step, or HA step, describes that an event in one unit affects other unit(s). It is coded with system XX and P-column HA. The steps that follow it describe occurrences in a second unit until the next HA step refers to a third unit or back to the original unit. The docket of the unit whose occurrences are described in the steps that follow the HA step, must be coded in the component field of the HA step. A unit effects step and an environmental effects step must be coded for each unit immediately before describing events in then next unit.

When a component or system is shared between units, the steps following the HA step should not repeat the same occurrences described for

XX

the first unit. They should describe any additional occurrences unique for the second unit. Do not code an ESF actuation for a second unit when a shared ESF system actuates. If there are no additional occurrences for the second unit, the link of the HA step must be blank and the P-code for the unit effects step must be XX - No significant effect. See Example 1.

When additional occurrences are coded following an HA step, the link of the HA step must be 0. The HA step must be sublinked with the step(s) from the previous unit that lead to subsequent occurrences. See Example 2.

Example 1: Toxic Gas Isolation System Actuation

A spurious signal from a toxic gas indicator (system IW - Engineered Safety Features Actuation, component TGI - Indicator, Toxic Gas) caused an actuation of the toxic gas isolation system in the shared control room of San Onofre 2 and 3. (As reported by San Onofre 2.)

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		ZZ	IW	HH	TGI		1	1	1	1	A	T	F	LE
2	1			XX								*	EB		YC
3				YY								N	N		YC
4				XX		362							HA		YC
5				XX								*	XX		YC
6				YY								N	N		YC

Example 2: MSIV Shaft Defect

During a test at Farley 1, a main steam isolation valve failed to open because the shaft bound. Investigation revealed the shaft was made of the wrong material. During followup tests at Farley 2, a second valve failed and was found to have the same defect.

XX

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0	A	SA	PF		PCP		1			1	A	T	K	UA
2	1		AH	FA		SHFT		1	1		1	A	TR	K	DC
3	2		RC	FA		ISVZ		1	1		1	A	TR	I	AL
4				XX								I	XX		YC
5				YY								N	N		YC
6	0	A		XX		364							HA		YC
7	A		AH	FA		SHFT		1	2		2	A	TR	K	DC
8	7		RC	FA		ISVZ		1	2		2	A	TR	I	AL
9				XX								I	XX		YC
10				YY								N	N		YC

J.4.3 D-column (effect on unit)

This column should be blank for unit effect steps (i.e., system XX).

XX

J.5 TPD Codes for Environmental Effects and Personnel Exposure

J.5.1 T-column (environmental effect)

N	No release	U	Radiological release to environment >= tech spec limit
R	Radiological Release to containment	W	Radiological Release to environment (quantity unknown)
S	Radiological release within site boundary	Y	Thermal release in excess of tech spec limit
T	radiological release to environment < tech spec limit	X	other

J.5.1.1 Description. The T-column for steps with a system code YY (also called environmental effects steps) is used to indicate the rate or quantity of radioactivity released to the environment. An environmental effects step must follow a unit effects step (system code XX) at the end of every sequence. The following T-column codes are valid for environmental effects steps.

N — No Release

R — Radiological Release to Containment: Radioactive was released to the containment environment.

S — Radiological Release within Site Boundary: Radioactivity was released outside the containment and was confined within the site boundary.

T — Radiological Release to Environment Less Than Tech Spec Instanteous Limit: Release to the environment containing amounts of radioactivity less than the Tech Spec instantaneous limit.

U — Radiological Release To Environment Equal to or Greater Than Tech Spec Instantaneous Limit: Release to the environment containing amounts of radioactivity greater than Tech Spec instantaneous limit.

W — Radiological Release To Environment (Quantity Unknown): A release to the environment containing an unknown or unmeasured amount of radioactivity.

Y — Thermal Release in Excess of Tech Spec Limit.

X — Other.

J.5.1.2 Rules for T-column (environmental effect).

J.5.1.2.1 Rule 249 — High effluent chemical concentration. A T-column code of X (other) should be used to denote a high chemical concentration in the plant's effluent.

YY

J.5.1.2.2 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field.

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C	STEP 1: CAUSE NX — DROUGHT, SYSTEM SW
C	ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

YY

J.5.2 <u>P-column (environmental effect)</u>

I Internal exposure
K External exposure
L Both internal and external exposure
N No exposure

J.5.2.1 Description. The P-column in an environmental effects step (i.e., system YY) is used to indicate whether personnel were exposed to radioactivity as a result of the event. The followng P-column codes are valid for environmental effects steps.

I — Internal Exposure: Personnel ingested/inhaled radioactive contaminants.

K — External Exposure: Personnel exposure to radioactive source or externally contaminated.

L — Both: Personnel exposed to both external and internal radioactivity.

N — No Exposure.

J.5.2.2 Rules for P-column (environmental effect). None to date.

J.5.3 D-column (environmental effect)

This column should be blank for environmental effect steps (i.e., system YY).

YY

Appendix K: PERSONNEL CODES

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Appendix K: PERSONNEL CODES

K.1 Introduction

Sequences containing personnel errors are captured using cause, system, component, differ, and effect codes which are unique to personnel steps. This appendix describes the system and component codes used for personnel steps. Cause/effect codes which are used exclusively for personnel steps are described in Appendix E, Sects. E.14, E.15, and E.16. Differ column codes used for personnel are described in Appendix I., Sect. I.5.

K.2 Personnel System Codes

Personnel system codes indicate the type of activity involved in the step. They are independent of the type of person that performed the activity. For an operator performing maintenance as an example, use PM (Maintenance) not PO (Operation). Personnel system codes are listed below.

PA — Administrative: Shall apply principally to managing or supervising a task, step, or data analysis. For example, a maintenance supervisor who makes a mistake while reviewing test data will be coded as an administrative activity.

PC — Construction: Shall apply principally to civil engineering type of work, such as construction of buildings, foundations, structural members, etc.

PD — Design: Shall apply principally to personnel involved conceiving, planning, or designing systems or components to perform a perceived function.

PF — Fabrication: Shall apply principally to equipment, components, etc., that have been manufactured (fabricated) by a vendor or supplier off the plant site. These are components such as pumps, valves, instruments, etc.

PI — Installation: Shall apply principally the final assembly of manufactured parts or components to create a working mechanism or system. This includes welding pipes, field balancing pumps, installing valves, etc.

PM — Maintenance/Repair: Shall apply principally to activities involving upkeep or maintenance of equipment.

PO - Operation: Shall apply principally to activities involving routine plant operational functions (e.g. startup, operation and shutdown of system and components).

PR - Radiation Protection: Shall apply principally to health physics or radiation protection activities.

PT - Test/Calibration: Shall apply principally to personnel involved in the surveillance, testing, or calibration of instruments or components.

PX - Other: Shall apply when personnel is known, but does not fit any of the defined codes.

PZ - Unknown: Personnel involved, but their activity is neither given nor implied.

K.3 Personnel Component Codes

Personnel component codes indicate the type person involved in the step. They are independent of the activity being performed. For example, a licensed operator performing maintenance should be coded as PLO (licensed operator). Personnel component codes are listed below.

PLO - Licensed Operator: Licensed reactor operator or senior reactor operator.

PNO - Non-Licensed Operator: Non-licensed, auxiliary, or assistant operations personnel.

PUX - Other Unknown Utility Personnel: Personnel known to be a utility employee.

PCP - Plant Contractor Personnel: Consultant and/or contractors hired by the utility.

PX - Other: Personnel type known, but does not fit any of the defined codes.

PZ - Unknown: Personnel type neither given nor implied.

K.4 Rules For Personnel Steps

K.4.1 Rule 240 — Design errors

Do not code a design error unless it is explicitly stated or encoded on the LER form. An LER will often state that a design was changed following a failure. However, a design change does not necessarily indicate a design error. Only code a design error when the LER states that the design was at fault. A design error must be coded as follows:

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
*	*		SA	PD		PZ		1			1	M	T	*	UA

K.4.2 Rule 242 — Repair

When a component requires repair before it can resume operation, the P-column must be one of the following:

PR - Partial Fault/Repair
TR - Total Fault/Repair
XR - ZR - Unknown/Repair

Do not use these codes with personnel, system, or subsystem occurrences.

K.4.3 Rule 244 — Quantity for personnel occurrences

The quantity column for personnel indicates the number of independent personnel actions. Do not code a quantity of greater than 1 to indicate more than one individual involved in a single decision. A quantity greater than 1 is appropriate if more than one individual act independently to take the same action.

K.4.4 Rule 246 — No partial personnel failures

There can be no partial personnel failures. Personnel either perform a desired role (P-column M — No Fault) or an undesired role (P-column T — Total Fault).

K.4.5 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code (cause/effect KX — Other (Functional), system ZX — Other, etc.) or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

A drought caused the formation of a sink hole [cause NX — other (Environmental)] near an administrative building (system SW — Miscellaneous/Unknown Structures). The wall (component WALL — Wall/Bulkhead) nearest the sink hole collapsed [effect DX — Other (Mechanistic)].

STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

Appendix L: COMMENTS

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Appendix L: COMMENTS

L.1 Description

Since it 's impossible to design SCSS to anticipate every peculiarity that arises in the LERs, an area for comments has been provided. Two lines totaling 556 characters are provided for these comments.

L.2 Rules Concerning Comments

L.2.1 Rule 45 — Length of comment field

Comments exceeding 556 characters in length will be truncated. Do not exceed this limit.

L.2.2 Rule 250 — Coding inadequacy

When the coded sequence does not adequately describe the event, use the comments section to provide additional information.

L.2.3 Rule 32 — Similar events referenced but not identified

If the reference LERs listed cannot be identified in the format given in Sect. C.1.2.1, the technical processor should use the comments section to state that similar events have occurred.

L.2.4 Rule 29 — Listing NRC correspondence

Include pertinent information (such as IE Bulletin or order number, NRR letter number, etc.) for watch list codes 931, 932, and 933 in the comments field.

L.2.5 Rule 30 — Reasons for watch list codes 970, 975, and 990

Describe the specific reasons for assigning watch list code numbers 970, 975, and 990 in the comments field of each coding form.

L.2.6 Rule 34 — Specifying other reportability requirements

When code 21 — Other is used in reportability, the specific requirement, voluntary report, or special report must be recorded in the comments field in the following format:

Other Reportability — 10 CFR xx.yy

L.2.7 Rule 83 — Specifying "other" and "miscellaneous" codes using the comment field

Focus:

When using an "other" code, an explanation of the code must appear in the comments field in the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Rule:

An explanation of codes must appear in the comments field when using an "other" code [cause/effect KX — Other (Functional), system ZX — Other, etc.] or a "miscellaneous" code (component MSC — Miscellaneous Subcomponent, system SW — Miscellaneous/Unknown Structures, etc.). When a code has the dual function of "other" or "miscellaneous" and "unknown" (system SW — Miscellaneous/Unknown Structures, etc.), "unknown" must be specified if no other information is available. The explanation of the codes must precede other comments and be of the following form:

STEP (STEP NUMBER) : (ATTRIBUTE) (CODE) - (EXPLANATION)

Example: An Administrative Building Wall Collapsed

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STEP	LINK	SLNK	CAUSE	SYSTEM	ISYS	COMP	VENDOR	QUAN	TRAIN	CHAN	DIF	T	P	D	EFFECT
1	0		NX	SW		WALL		1	1		1	A	T	F	DX

COMMENTS

C STEP 1: CAUSE NX — DROUGHT, SYSTEM SW —

C ADMINISTRATIVE BUILDING, EFFECT DX — COLLAPSE

Appendix M: SUPPLEMENTAL INFORMATION ON CODES FOR LER FORM (NRC FORM 366)

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Appendix M: SUPPLEMENTAL INFORMATION ON CODES FOR LER FORM (NRC FORM 366)

M.1 Introduction

The tables in this appendix contain the codes used by licensees to complete NRC Form 366. Component vendor codes, missing from this list, are listed in the Code Listing volume of the SCSS Coder's Manual. Table M.17 compares SCSS system codes to EIIS system codes. More information concerning these codes and how information is encoded on form 366 is available in NUREG-0161 and NUREG-1022.

Table M.1. System descriptions (pre-1984)

System	Code
Reactor	RX
Reactor vessel internals	RA
Reactivity control systems	RB
Reactor core	RC
Reactor coolant system and connected systems	CX
Reactor vessels and appurtenances	CA
Coolant recirculation systems and controls	CB
Main steam systems and controls	CC
Main steam isolation systems and controls	CD
Reactor core isolation cooling systems and contols	CE
Residual heat removal systems and controls	CF
Reactor coolant cleanup systems and controls	CG
Feedwater systems and controls	CH
Reactor coolant pressure boundary leakage detection systems	CI
Other coolant subsystems and their controls	CJ
Engineered safety features	SX
Reactor containment systems	SA
Containment heat removal systems and controls	SB
Containment air purification and cleanup systems and controls	SC
Containment isolation systems and controls	SD
Containment combustible gas control systems and controls	SE
Emergency core-cooling systems and controls	SF
Control room habitability systems and controls	SG
Other engineered safety feature systems and their controls	SH
Instrumentation and controls	IX
Reactor trip systems	IA
Engineered safety feature instrument systems	IB
Systems required for safe shutdown	IC
Safety-related display instrumentation	ID
Other instrument systems required for safety	IE
Other instrument systems not required for safety	IF
Electric power systems	EX
Offsite power systems and controls	EA
AC onsite power systems and controls	EB
DC onsite power systems and controls	EC
Onsite power systems and controls (composite AC and DC)	ED
Emergency generator systems and controls	EE
Emergency lighting systems and controls	EF
Other electric power systems and controls	EG
Fuel storage and handling systems	FX
New fuel storage facilities	FA
Spent-fuel storage facilities	FB
Spent-fuel-pool cooling and cleanup systems and controls	FC
Fuel handling systems	FD

Table M.1. (Continued)

System	Code
Auxiliary water systems	WX
Station service water systems and controls	WA
Cooling systems for reactor auxiliaries and controls	WB
Demineralized water makeup systems and controls	WC
Potable and sanitary water systems and controls	WD
Ultimate heat sink facilities	WE
Condensate storage facilities	WF
Other auxiliary water systems and their controls	WG
Auxiliary process systems	PX
Compressed air systems and controls	PA
Process sampling systems	PB
Chemical, volume control, and liquid poison systems and controls	PC
Failed-fuel detection systems	PD
Other auxiliary process systems and their controls	PE
Other auxiliary systems	AX
Air conditioning, heating, cooling, and ventilation systems and controls	AA
Fire protection systems and controls	AB
Communication systems	AC
other auxiliary systems and their controls	AD
Steam and power conversion systems	HX
Turbine-generators and controls	HA
Main steam-supply system and controls (other than CC)	HB
Main condenser systems and controls	HC
Turbine-gland-sealing systems and controls	HD
Turbine bypass systems and controls	HE
Circulating water systems and controls	HF
Condensate cleanup systems and controls	HG
Condensate and feedwater systems and controls (other than CH)	HH
Steam generator blowdown systems and controls	HI
Other features of steam and power conversion systems (not included elsewhere)	HJ
Radioactive waste management systems	MX
Liquid radioactive waste management systems	MA
Gaseous radioactive waste management systems	MB
Process and effluent radiological monitoring systems	MC
Solid radioactive waste management system	MD
Radiation protection systems	BX
Area monitoring systems	BA
Airborne radioactivity monitoring systems	BB

Table M.2. Proximate cause descriptions

Proximate cause code	Classification
A	Personnel error
B	Design, manufacturing, construction/ installation
C	External cause
D	Defective procedures
E	Component failure
X	Other

Table M.3. Proximate cause subcategories

Item 12 code	Item 13 subcode	Subcode definition - personnel type
A	A	Licensed operators and senior operators
A	B	Nonlicensed operations personnel
A	C	Maintenance and repair personnel
A	D	Radiation protection personnel
A	E	Construction personnel
A	F	Contractor and consultant personnel
A	X	Other

Item 12 code	Item 13 subcode	Subcode definition - cause
B	A	Design - assigned to occurrences attributed to the nuclear steam supplier's or architect engineer's design of a component, system or structure
B	B	Manufacturing - assigned to occurrences attributed to the manufacturer's design or fabrication activities.
B	C	Construction/installation - assigned to occurrences attributed to field construction and/or installation errors.

Item 12 code	Item 13 subcode	Subcode definition - type of component failure
E	A	Electrical
E	B	Mechanical
E	C	Metallurgical
E	D	Corrosion
E	E	Instrument
E	F	Natural end of life
E	G	Electronic
E	X	Other (explain under cause description - item 27)

Table M.4. Component descriptions (pre-1984)

Component type	Component type includes
Accumulators	Scram accumulators, safety injection tanks, surge tanks, holdup/storage tanks
Air dryers	
Annunciator modules	Alarms, bells, buzzers, claxons, horns, gongs, sirens
Batteries and chargers	Chargers, dry cells, wet cells, storage cells
Blowers	Compressors, gas circulators, fans, ventilators
Circuit closers/interrupters	Circuit breakers, contactors, controllers, starters, switches (other than sensors), switchgear
Control rods	Poison curtains
Control rod drive mechanisms	
Demineralizers	Ion exchangers
Electrical conductors	Buses, cables, wires
Engines, internal combustion	Butane, diesel, gasoline, natural gas, and propane engines
Filters	Strainers, screens
Fuel elements	
Generators	Inverters
Heaters, electric	Heat tracers
Heat exchangers	Condensers, coolers, evaporators regenerative heat exchangers, steam generators, fan coil units
Instrumentation and controls	Controllers, sensors/detectors/elements, indicators, differentials integrators (totalizers), power supplies, recorders, switches, transmitters, computation modules
Mechanical function units	Mechanical controllers, governors, gear boses, varidrives, couplings
Motors	Electric motors, hydraulic motors, pneumatic (air) motors, servomotors

Table M.4. (continued)

Component type	Component type includes
Penetrations, primary containment	Air locks, personnel access, fuel handling, equipment access, elec trical, instrument line, process piping
Pipes and/or fittings	
Pumps	
Recombiners	
Relays	Switchgear
Shock suppressors and supports	Hangers, supports, sway braces/ stabilizers, snubbers, antivibra tion devices
Transformers	
Turbines	Steam turbines, gas turbines, hydro turbines
Valves	Valves, dampers
Valve operators	Explosive, squib
Vessels, pressure	Containment vessels, dry wells, pressure suppression chambers pressurizers, reactor vessels

Table M.5. Component subcategories (pre-1984)

Circuit Closers/Interrupters
(Component Code CKTBRK)

Subcode	Subcategory
A	Circuit breaker
B	Contactor
C	Controller
D	Starter
E	Swtich (other than sensor)
F	Switchgear
X	Other

Generators
(Component Code GENERA)

Subcode	Type
A	Alternator
B	Converter
C	Dynamotor
D	Generator
E	Amplidyne
F	Inverter
X	Other

Heat Exchanger
(Component Code HTEXCH)

Subcode	Subcategory
A	Heater/superheater
B	Boiler
C	Cooler
D	Condenser
E	Evaporator
F	Steam generator
G	Heater/cooler
X	Other

Table M.5 (continued)

Instrumentation and Controls
(Component Code INSTRU)

Subcode	Type (primary function)
C	Controller
E	Sensor/detector/element
I	Indicator
Q	Intergrator (totalizer)
P	Power supply
R	Recorder
S	Switch
T	Transmitter
Y	Computation Module
X	Other

Penetrations, Primary Containment
(Component Code PENETR)

Subcode	Subcategory
A	Personnel access
B	Fuel handling
C	Equipment access
D	Electrical
E	Instrument line
F	Process piping
X	Other

Pipes, Fittings
(Component Code PIPEXX)

Subcode	Size group (Nom. diam.)
A	Less than 4 inches
B	4 to 6 inches
C	6 to 10 inches
D	10 to 16 inches
E	16 inches and larger

Table M.5 (continued)

Pumps
(Component Code (PUMPXX)

Subcode	Type
A	Axial
B	Centrifugal
C	Diaphragm
D	Gear
E	Reciprocating
F	Radial
G	Rotary
H	Vane Type
J	Electromagnetic
K	Jet
X	Other

Relays
(Component Code RELAYX)

Subcode	Type
A	Control, General Purpose
B	Control, Sealed
C	Miniature
D	Switchgear, Protective
E	Switchgear, Protective, Slow Acting
F	Switchgear, Auxiliary
G	Mercury Wetted
H	Time Delay, Pneumatic
J	Time Delay, Solid State
K	Reed
L	Telephone
M	Event Sequencer, Timer, or Time-Sequence Controller
S	Solid State (SCR's)
X	Other

Table M.5 (continued)

Shock Suppressors and Support
(Component Code SUPORT)

Subcode	Function
A	Hangers
B	Supports
C	Spring Loaded Sway Brace/ Stablizers
D	Snubbers
X	Other

Valves
(Component Code VALVEX)

Subcode	Component type
A	Ball
B	Butterfly
C	Check
D	Diaphragm
E	Gate
F	Globe
G	Needle
H	Plug
J	Nozzle
K	Single Blade
L	Parallel Blade
M	Opposed Blade
N	Proportioning Louver
P	Angle
X	Other

Table M.5 (continued)

Valve Operators
(Component Code VALVOP)

Subcode	Component Type
A	Electric Motor - AC
B	Electric Motor - DC
C	Hycraulic
D	Pneumatic/Diaphragm/ Cylinder
E	Solenoid - AC
F	Solenoid - DC
G	Float
H	Explosive, Squib
J	Mechanical (Differential Pressure to Open/Spring Force to Close)
X	Other

Vessels, Pressures
(Component Code VESSEL)

Subcode	Subcategory
A	Reactor Vessel
B	Pressurizer Vessel
D	Containment/Drywell
E	Pressure Suppression
X	Other

Table M.6. Valve subcategories

Subcode	Subcode definition - valve functions/ applications
A	One-way flow
B	Pressure relief
C	Vacuum relief
D	Shutoff, isolation, stop
E	3-way selector
F	4-way selector
G	Flow control
H	Pressure control
L	Vent
N	Sample
P	Drain
Q	Bypass
X	Other

Table M.7. Effect on plant categories

Code	Effect on plant
A	Plant outage
B	Forced power reduction
C	Extension of preexisting shutdown
D	Delay of completion of construction
Z	No significant effect

Table M.8. Shutdown method categories

Item 20 code	Item 23 subcode	Subcode definition - method of shutdown
A	A	Manual
A	B	Manual scram
A	C	Automatic scram

Table M.9. Facility status categories

Code	Status
A	(Under) construction
B	Preoperational, startup or power ascension tests (in progress)
C	Routine startup operations
D	Routine shutdown operations
E	Steady state operation
F	Load changes during routine power operation
G	Shutdown (hot or cold) except refueling
H	Refueling
X	Other (including special tests, emergency shutdown operations, etc.)
Z	Item not applicable

Table M.10. Method of discovery categories

Code	Discovery method
A	Operational event - any event not included in the codes below.
B	Routine test/inspection - surveillance tests, preventive maintenance tests, annual inspections, etc.
C	Special test/inspection - nonroutine tests conducted on an ad hoc basis fall into this class.
D	External source - such as notification from the NRC, sister licensee, vendor, A/E, etc.
Z	Item not applicable.

Table 11. Activity released categories

Code	Activity
L	Liquid
S	Solid
G	Gas
M	Mixture
Z	Item not applicable

Table M.12. Release content categories

Code	Content
N	Noble gas
H	Halogen
P	Particulate
M	Mixture
Z	Item not applicable

Table M.13. Personnel exposure type categories

Code	Exposure type
I	Internal exposure
E	External exposure
B	Both
Z	Item not applicable

Table M.14. Typical PWR operating modes

Mode	Reactivity condition, K_{eff}	% Rated thermal power*	Average coolant temperature
1. Power operation	$\geq$ 0.99	> 5%	$\geq$ 350°F
2. Startup	$\geq$ 0.99	$\leq$ 5%	$\geq$ 350°F
3. Hot standby	< 0.99	0	$\geq$ 350°F
4. Hot shutdown	< 0.99	0	350°F > T_{avg} > 200°F
5. Cold shutdown	< 0.99	0	$\leq$ 200°F
6. Refueling**	$\leq$ 0.99	0	$\leq$ 140°F

*Excluding decay heat.

**Reactor vessel head unbolted or removed and fuel in the vessel.

Table M.15. Typical BWR operating conditions

Conditions	Mode switch position	Average coolant temperature
1. Power operation	Run	Any temperature
2. Startup	Startup/hot standby	Any temperature
3. Hot shutdown	Shutdown	> 212°F
4. Cold shutdown	Shutdown	≤ 212°F
5. Refueling	Refuel	≤ 212°F

Table M.16 10 CFR 50.73 cause codes

Cause code	Meaning
A	Personnel error
B	Design, manufacturing, construction/installation
C	External cause
D	Defective procedure
E	Management/quality assurance deficiency
X	Other

Table M.17. EIIS and SCSS system code comparison

ESSI System	SCSS Code	EIIS System	SCSS Code
AA - Control Rod Drive	AB	BN - Reactor Core Isolation Cooling (BWR)	BC, DB
AB - Primary Coolant	AD, AE, AF, AH	BO - Residual Heat Removal/ Low Pressure Coolant Injection (BWR	BH, DB
AC - Reactor Core	AA	BP - Residual Heat Removal/ Low Pressure Safety Injection (PWR)	BF, BS, CD, DB
AD - Reactor Recirculation Water	AD, AI	BQ - High Pressure Safety Injection (PWR)	BD, BK, BL, BT, DB
BA - Auxiliary/Emergency Feedwater	BA, DB	BR - Standby Liquid Control (BWR)	BE, DB
BB - Containment Combustible Gas Control	DH	BS - Ultimate Heat Sink	FR
BC - Containment Ice Condenser	DI	BT - Suppression Pool Makeup (BWR)	DB, DF
BD - Containment Leakage Control	DC, DD	CA - Boron Recycle (PWR)	KR, DB
BE - Containment Spray	DE	CB - Chemical and Volume Control/Makeup and Purification (PWR)	BK, DB
BF - Containment Vacuum Relief	DB, HC	CC - Closed/Compoment Cooling Water	CA, DB
BG - High Pressure Core Spray	BW, DB	CD - Control Rod Drive Cooling (PWR)	DB, KS
BH - Emergency/Standby Gas Treatment	HD	CE - Reactor Water Cleanup (BWR)	DB, WP
BI - Essential Service Water	CB, DB	CF - Reactor Services	KE
BJ - High Pressure Coolant Injection (BWR)	BN, DB	CG - Suppression Pool Purification	DB, WN
BK - Containment Fan Cooling (PWR)	HA	DA - Fuel Pool Cooling and Purification	DA
BL - Isolation Condenser Cooling (PWR)	BB, DB	DB - Nuclear Fuel Services	KE
BM - Low Pressure Core Spray (BWR)	BX, DB	DC - Diesel Fuel Oil	CI

Table M.17. (continued)

ESSI System	SCSS Code	EIIS System	SCSS Code
DE - Fuel Oil Storage and Transfer	KL	IB - Annunciator	IA
DF - Nuclear Fuel Transfer	KE	IC - Fire Detection	IF
EA - Medium Voltage Power (601V through 35 KV)	EB	ID - Computer	IB
EB - Medium Voltage Power - Class 1E	EB	IG - Incore/Exvore Monitoring	IK
EC - Low Voltage	EC	IH - Core Vibration Monitoring	IJ
ED - Low Voltage Power - Class 1E	EC	II - Loose Parts Monitoring	IJ
EE - Instrument and Uninterruptible Power	ED	IJ - Leak Monitoring	IL
EF - Instrument and Uninterruptible Power - Class 1E	ED	IK - Containment Environmental Monitoring	IL, IU, IW
EI - DC Power	EE	IL - Radiation Monitoring	IN
EJ - DC Power - Class 1E	EE	IM - Temperature Monitoring	IZ
EK - Emergency Onsite Power Supply	EH	IN - Seismic Monitoring	IG
EL - Main Generator Output Power	EA	IO - Performance Monitoring	IZ, IJ
FA - Cable Raceway	EN	IP - Post Accident Monitoring	IJ
FB - Cathodic Protection	EP	IQ - Sequence of Events Monitoring	IJ
FC - Grounding and Lightning Protection	EP	IR - Television	IJ
FD - Heat Tracing	EF	IS - Environmental/Meteorological	IG
FE - Heat Tracing - Class 1E	EF	IT - Main Turbine Instrumentation	II
FF - Normal AC Lighting	EI	IU - Display Control	IC, IF, IG, IH, II, IJ, IK, IL, IN, IP, IS, IT, IU, I2, IZ
FG - Standby AC Lighting	EI	IV - Vibration Monitoring	IJ
FH - Emergency DC Lighting	EI	JA - Integrated Control	II, IP, IS, IT
FI - Communications	EL	JB - Feedwater/Steam Generator Water Level Control	IT
FJ - Station Generation Telemetering	IC, IF, IG, IH, II, IJ, IK, IL, IN, IP, IS, IT, IU, IW, IZ	JC - Plant Protection	IU, IY
FK - Switchyard	EA, ST	JD - Reactor Power Control	IP, IS
IA - Security	EK		

Table M.17. (continued)

ESSI System	SCSS Code	EIIS System	SCSS Code
JE - Engineered Safety Features Actuation	IW	LB - Diesel Cooling Water	CL
JG - Solid State Control System/Auxiliary Logic Control	IX	LC - Diesel Generator Starting Air	CK
JI - Turbine Steam Bypass Control	II	LD - Instrument Air Supply	KC
JJ - Turbine Supervisory Control	II	LE - Essential Air	CC
JK - Feedwater Pump Turbine Instrumentation and Control	IT	LF - Service Air	KC
JL - Panels	IC	LG - Welding Gas	KH
JM - Containment Isolation Control	DB, IW	LH - Breathing Air	KH
KA - Condensate Storage and Transfer	CF, CE	IJ - Hydrogen Supply	KH
KB - Turbine Building Closed Cooling Water	KT	LK - Nitrogen Supply	KH
KC - Demineralized Water Storage and Transfer	KD	LL - Lube Oil	KP
KD - Condensate and Feedwater Chemistry Control	FN	LM - Lube Oil Storage and	KP
KE - Heat Rejection	FR, SR, SS	LN - Insulating Oil	KK
KF - Heat Rejection Chemical	FR, KX	LP - Laboratory Gas	KH
KG - Nonessential Service Water	KW	LQ - Laboratory Equipment	IJ, KB
KH - Water Filtration	FB	LR - Material and Equipment Handling	KE
KI - Raw Water Makeup	KT	LS - Plant Shop	SW
KJ - Makeup Demineralizer	KD	LT - Record Storage	SW
XK - Potable Water	KI	LU - Yard Handling and Maintenance	KE
KL - Removable Chemical Cleaning	WE	LV - Plant Hot Water	KA
KM - Chilled Water	HT	LW - Carbon Dioxide Supply	KH
KN - Sampling and Water Quality	KB	MA - Administration Building	SW
KO - Gland Seal Water	FT	MB - Industrial/Sanitary Waste Treatment Building	SN
KP - Fire Protection (Water)	KF	MC - Maintenance and Warehouse Building	SW
KQ - Fire Protection (Chemical)	KF	MD - Makeup Water Intake Structure	SP
LA - Diesel Lube Oil	CH		

Table M.17. (continued)

ESSI System	SCSS Code	EIIS System	SCSS Code
MF - Service Building	SW	SN - HP Heater and MSR Drains and Vents	FL
MG - Wastewater Outfall Structure	SP	TA - Main Turbine	FB
MH - Water Treatment Building	SP	TB - Main Generator	FB
MJ - Visitors Center	SW	TC - Turbine Steam Seal	FC
MK - Essential Service Water Pump Building	SP	TD - Turbine Lube Oil	KP
NA - Control Building/Control Complex	SH	TE - Miscellaneous Turbine	FL
NB - Emergency Onsite Power Supply Building	SI	TF - Turbine Drains and Miscellaneous Piping	FL
NC - Emergency Operations Facility (Offsite)	SW	TG - Main Turbine Control Fluid	II
ND - Fuel Building	SK	TH - Main Generator Gas Purge	FB
NE - Radwaste Building	SN	TI - Main Generator Seal Oil	FB
NF - Auxiliary Building	DB, SF	TJ - Main Generator Stator Cooling	FB
NG - Reactor Building (BWR)	DB, SE	TK - Main Generator Hydrogen Cooling	FB
NH - Reactor Containment Building	DB, SA, SB, SC, SD	TL - Main Generator Excitation	FB
NM - Turbine Building	SL	UA - Pumping Station Environmental Control	HR
NN - Circulating Water Structures	SP	UB - Water Treatment Building Environmental Control	HP
SA - Auxiliary Steam	KA	UC - Service Building Environmental Control	HS
SB - Main/Reheat Steam	BP, BR, DB, FA, FF, FK	UD - Administration Building Environmental Control	HS
SD - Condensate	FI	UE - Secutiry Building Environmental Control	HS
SE - Steam Extraction	FH	UF - Technical Support Center Environmental Control	HS
SF - Condensate Demineralizer	FP	UG - Emergency Operations Facility Environmental Control	HS
SG - Condenser	FD	UH - Visitors Center Environmental Control	HS
SH - Condenser Vacuum	FE	VA - Reactor Building Environmental Control	DB, HA, HB
SI - Condenser Tube Cleaning	FD	VB - Drywell Environmental Control	DB, HE

Table M.17. (continued)

ESSI System	SCSS Code	EIIS System	SCSS Code
SJ - Feedwater	DB, FI, KN	VC - Shield Annulus Return and Exhaust	HD
SK - Feedwater Pump Injection	FT	VE - Access Corridors Environmental Control	DB, HA, HB, HD, HF, HH, HK, HS
SL - Feedwater Pump Turbine Lube Oil	KP	VF - Auxiliary Building Environmental Control	DB, HF
SM - LP Heater Drains and Vents	FL		
VG - Fuel Building Environmental Control	HK	WD - Liquid Waste Management	WA
VH - Radwaste Building Environmental Control	HP	WE - Gaseous Waste Management (PWR)	WC
VI - Control Building/Control Complex Environmental Control	HH	WF - Offgas (BWR)	WC
VJ - Emergency Onsite Power Supply Building Environmental Control	HI	WG - Sanitary Waste Processing	WE
VK - Turbine Building Environmental Control	HL	WH - Wastewater Disposal	WE, WH, WI, WL
VL - Plant Exhaust	HW	WI - Steam Generator Blowsown (PWR)	WF
WA - Cask Decontamination	WA	WJ - Sludge Waste Dewatering	WE
WB - Solid Waste Management	WB	WK - Equipment and Floor Drain	DB, WK

Appendix N: EXAMPLES OF CODED LERs

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Appendix N: EXAMPLES OF CODED LERs

N.1 Introduction

The purpose of this appendix is to illustrate, with examples, the coding principles introduced in the previous sections and appendices of this report. The examples will cover subject areas including:

1. Multiple component failures in one system,
2. Information steps and sublinks,
3. Personnel success steps,
4. Multiple events reported in a single LER,
5. Link steps,
6. Train failures,
7. Channel failures,
8. Total system failures,
9. Mid-sequence unit effects steps, and
10. Events effecting a second nuclear unit.

Figures N.1 through N.11 present abstracts and coded matrices for example LERs covering the subjects mentioned above. The reader will note that although only an abstract is included in these examples, they were actually coded with full benefit of supplemental material frequently attached to the LER. These examples were selected because their abstract alone included most of the information contained in attached supplemental pages.

N.2 Examples

N.2.1 Coding multiple component failures in the same system

The example illustrated in Fig. N.1 shows how multiple component failures in the same system are coded. The example begins with step 1 showing a flow control valve (FCVZ) which failed to open (effect AL). This caused one train of the auxiliary feedwater system (system BA) to be removed from service. Steps 2 through 4 of the example indicate how a loose lock-nut in flow control valve in a second train caused that train to be removed from service. The reader will note that the two flow control valves are distinguishable because of different values in the differ column. The reader will also note that the train column allows a clear distinction to be made between one auxiliary feedwater train and the other. Notice, too, that the two flow control valve failures combine using the sublink column to show that the total auxiliary feedwater system was effected (step 5). See Sect. I.2.2.3, Rule 120 - Quantity with subsystem occurrence; Sects. I.2.2.4 and I.3.2.1, Rule 127 - Train/Channel with multiple subsystem occurrences.

N.2.2 Coding of information steps and sublinks

The example illustrated in Fig. N.2 demonstrates how information steps and sublinks can be used. Information steps (sublink X) are always required if there are external system leaks in the containment isolation system (system DB). Step 1 of the example shows the system that the containment isolation is isolating, while the information step (step 2) shows the system being communicated with or, in this case, being leaked to. Note that both doors being open simulataneously results in a failure of the penetration (shown by the sublink A). Note that a non-licensed operator misinterpreted the unit's tech specs, and opened the outer door while the inner door was not closed (step 3). See Sect. E.2.12.2.2, Rule 40 - Use of interface systems and information step with containment isolation events.

N.2.3 Coding of personnel success steps

The example illustrated in Fig. N.3 shows how personnel success steps are coded. The success steps indicate instances where personnel performed as desired and are sometimes included because they aid in understanding the sequence. In this example, for instance, one loop of RHR was removed as part of initial plant testing, which caused a tech spec violation. The desired personnel action is noted in step 1 with the M in the P-column.

N.2.4 Coding of multiple sequences in one LER

The example in Fig. N.4 illustrates how multiple sequences reported in one LER are coded. One two separate occassions, sensing lines lost their fill (effect code HF — Low Level) and utimately lead to an RPS system channel failure (steps 3 and 8). These occurrences were coded as two separate events as indicated by separate unit effects (system XX) steps and environmental effects (system YY) steps and the link of 0 for steps 1 and 6.

N.2.5 Coding of link steps

The example illustrated in Fig. N.5 shows how link steps are coded. The door between the reactor building and turbine building (steps 2 and 3) being open in conjunction with an interlock problem caused the inner door of the penetration to be allowed to opened as indicated by a link of A on the inner door. The link step is required to connect the first door failure to the second, resulting in a penetration failure.

N.2.6 Coding of train failures

The example illustrated in Fig. N.6 indicates how train failures are coded. Motor generator problems on a recirculation system (system AI) pump resulted in a recirculation system train failure. (The train failure is not mentioned in the abstract but is implicit in a recirculation pump failure.) Hatch 2 has two recirculation pumps so component 1x2 is used. There have also been train failures in the previous examples listed.

N.2.7 Coding of channel failures

The example in Fig. N.7 illustrates how channel failures are coded. Setpoint drift on a reactor coolant flow transmitter lead to a potential faulty channel reading in an reactor protection system (system IU) channel. The channel failure is indicated by 1XZ in the component field. Another example of a channel failure is shown in Fig. N.4.

N.2.8 Coding of a total system failure

The example illustrated in Fig. N.8 shows the coding of a total system partial failure in the emergency boration system (system BD) (step 5) resulting from low boron concentration in the boron injection tank (step 4). This resulted from the loss of the mini-recirc pump (step 3) in combination with boron precipitation in a pipe cause by a heat tracing failure.

N.2.9 Coding of a mid-sequence change in unit status

The example shown in Fig. N.9 illustrates the coding of a mid-sequence change in unit status. (These steps are sometimes used mid-sequence to aid in understanding the event; that is maintaining the chronological order of the sequence.) Step 4 shows that the unit was reducing power (P-column BZ) following a control rod dropping into the core. Note that the rod drop and a sudden drop in generator load lead to high pressure in the RCS, and ultimately, to an automatic scram (P-column AC in step 7). Refer to Sect. J.4.1.

N.2.10 Coding of an event effecting a second unit

Effects to second unit are coded either of two ways depending on the severity of the event to the second unit. The example illustrated in Fig. N.10 shows the coding of an event where a second unit was affected, but not significantly. The involvement of the second unit in this event resulted when an attempt was made to start the high-head safety injection pump from the second unit's control switch. The coding of the second unit's involvement (steps 5 through 7) follows the complete coding of the sequence for the first unit. The second unit, Turkey Point 4, is noted by using its docket number (251) in the component field.

The example illustrated in Fig. M.11 shows the coding of an event where a second unit is significantly affected. For this type event, it is necessary to code the events and how they affect the second unit. Note that the unit effects step (step 8) shows the transfer to the second unit. Refer to Sect. J.4.2.

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
361	1982	067	0	8208300159	176614	7-20-1982

DOCKET:361 SAN ONOFRE 2 TYPE:PWR
REGION: 5 NSSS:CE
ARCHITECTURAL ENGINEER: BECH
FACILITY OPERATOR: SOUTHERN CALIFORNIA EDISON CO.
SYMBOL: SCE

REFERENCE LERS:
1 361/82-066

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0	A	XX	BA		FCVZ		1	1		1	G	T	X	AL
2	0		ZZ	BA		FAS		1	2		1	A	T	K	AD
3	2		RC	BA		SHFT		1	2		1	A	TR	K	KI
4	3	A	RC	BA		FCVZ	W255	1	2		2	A	TR	F	AL
5	A		RS	BA		2XZ		2	M		1	A	T	F	YC
6				XX								L	XX		YC
7				YY								N	N		YC

ABSTRACT

A SECOND AUXILIARY FEEDWATER SYSTEM TRAIN WAS RENDERED INOPERABLE DUE TO THE INABILITY OF VALVE 2HV4713 TO OPEN FULLY. THERE WAS NO CONSEQUENCE TO THE PUBLIC HEALTH AND SAFETY SINCE AT LEAST ONE 100% AFW TRAIN WAS ALWAYS AVAILABLE TO PERFORM THE DECAY HEAT REMOVAL FUNCTION IF CALLED UPON. SEE LER 82-066. THE CAUSE WAS A LOOSE COUPLING LOCK NUT WHICH ALLOWED THE VALVE ACTUATOR SHAFT TO SEPARATE FROM THE VALVE STEM. CORRECTIVE ACTION INCLUDED INSTALLATION OF A NEW MECHANICAL INDICATOR PLATE AND REASSEMBLY OF THE COUPLING.

Fig. N.1 Coding of multiple components in the same system

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
312	1981	013	0	8103310567	164772	2-23-1981

DOCKET:312 RANCHO SECO TYPE:PWR
REGION: 5 NSSS:BW
ARCHITECTURAL ENGINEFR: BECH
FACILITY OPERATOR: SACRAMENTO MUNICIPAL UTIL. DISTRICT
SYMBOL: SMU

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	OUAN	TR	CH	DI	T	P	D	EFF
1	0	A	ZZ	DB	SA	DR		1	1		1	A	T	I	AR
2	1	X	ZZ	DB	SA	DR		1	1		1	A	T	I	AR
3	0		SB	PO		PNO		1			1	A	T	I	UA
4	3	A	RC	DB	SA	DR		1	1		2	A	T	I	AK
5	4	X	RC	DB	SF	DR		1	1		2	A	T	I	AK
6	A		RC	DB	SA	PNA	C130	1	1		1	A	T	I	AI
7	6	X	RC	DB	SF	PNA	C130	1	1		1	A	T	I	AI
8				XX								H	XX		YC
9				YY								N	N		YC

ABSTRACT
DURING REFUELING OPERATIONS, THE INNER DOOR OF THE REACTOR BUILDING PERSONNEL HATCH FAILED TO CLOSE COMPLETELY. THE REACTOR BUILDING COORDINATOR MOMENTARILY BYPASSED THE INTERLOCKS BETWEEN THE INNER AND OUTER DOORS OF THE HATCH AND OPENED THE OUTER DOOR TO ALLOW PERSONNEL TO EXIT THE BUILDING. ALTHOUGH COGNIZANT OF THE TECH SPEC, THE R.B. COORDINATOR MISINTERPRETED THE REQUIREMENT. THE INDIVIDUAL WAS INFORMED OF THE PROPER INTERPRETATION.

Fig. N.2 Coding of information step and sublink

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
416	1982	087	0	8211150318	179360	10-10-1982

COMMENTS

RHR COOLING NOT IMPLEMENTED IN ORDER FOR PRESSURE TESTING OF SHUTDOWN COOLING LOOP.

DOCKET:416 GRAND GULF 1 TYPE:BWR
REGION: 2 NSSS:GE
ARCHITECTURAL ENGINEER: BECH
FACILITY OPERATOR: MISSISSIPPI POWER & LIGHT CO.
SYMBOL: MPL

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		SE	PO		PLO		1			1	A	M	I	UF
2	1		RT	BH		XXX					1	A	T	I	KC
3				XX								I	XX		YC
4				YY								N	N		YC

ABSTRACT

WHILE CONDUCTING THE NON-NUCLEAR HEATUP PHASE OF INITIAL PLANT TESTING, THE REQUIRED ONE LOOP OF THE RHR SHUTDOWN COOLING (SDC) WAS NOT OPERATING PER TECH SPEC 3.4.9.2. THIS IS REPORTABLE UNDER TECH SPEC 6.9.1.13.B. THE SHUTDOWN COOLING LOOP WAS SECURED WHILE IN CONDITION 4 AFTER THE REACTOR VESSEL WAS PRESSURIZED WITH NITROGEN TO THE DESIGN OPERATING PRESSURE OF THE SDC LOOP PER APPROVED PROCEDURE 03-1-01-TEMP-1. THE CAUSE WAS A PLANNED ENTRY INTO THE LCO ACTION STATEMENT IN ORDER TO CONDUCT INITIAL PLANT TESTING. AN ALTERNATE MODE OF COOLANT CIRCULATION WAS ESTABLISHED AND COOLANT TEMPERATURE AND PRESSURE WERE MONITORED HOURLY. THE PLANT ENTERED CONDITION 3, WHERE THE SDC LOOP WAS NOT REQUIRED TO BE OPERATING, ON OCTOBER 13, 1982.

Fig. N.3 Coding of a personnel success step

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
316	1982	005	0	8202230459	172892	1-17-1982

DOCKET:316 COOK 2 TYPE:PWR
REGION: 3 NSSS:WE
ARCHITECTURAL ENGINEER: AEPS
FACILITY OPERATOR: INDIANA & MICHIGAN ELECTRIC CO.
SYMBOL: IME

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		ZZ	IU	FA	SL		M	Z	1	1	M	T	I	HF
2	1		RC	IU	FA	FT	B080	1	1	1	1	M	T	I	LE
3	2		RS	IU	FA	1XZ		1	1	1	1	M	T	I	LE
4				XX								C	XX		YC
5				YY								N	N		YC
6	0		ZZ	IU	FA	SL		M	Z	1	1	M	T	I	HF
7	6		RC	IU	FA	FT	B080	1	1	1	1	M	T	I	LE
8	7		RS	IU	FA	1XZ		1	1	1	1	M	T	I	LE
9				XX								F	XX		YC
10				YY								N	N		YC

ABSTRACT
ON TWO SEPARATE OCCASIONS, NUMBER 3 STEAM GENERATOR STEAM FLOW CHANNEL 1 (MFC-131) WAS FOUND TO BE INDICATING LOW. THE FIRST OCCURRENCE WAS ON JANUARY 17, 1982, DURING REACTOR STARTUP AND THE SECOND OCCURRENCE WAS JANUARY 29, 1982, DURING POWER REDUCTION. THESE EVENTS ARE NON-CONSERVATIVE WITH RESPECT TO TECH SPEC TABLE 3.3-1 ITEM 15 AND 3.3-3, ITEM 4.D. PREVIOUS SIMILAR OCCURRENCES INCLUDE: 50-316/81-061. IT IS BELIEVED THAT IN BOTH OCCURRENCES THE SENSING LINES LOST THEIR FILL, CAUSING THE TRANSMITTER TO READ INCORRECTLY. THE SENSING LINES WERE FILLED, THE TRANSMITTER (BARTON, MODEL 764) WAS VERIFIED OPERATIONAL AND RETURNED TO SERVICE. IN ADDITION, THE TRANSMITTER HAS BEEN SCHEDULED TO BE CALIBRATED DURING THE NEXT OUTAGE. IF ANY PROBLEMS ARE FOUND AN UPDATED LER WILL BE SUBMITTED.

Fig. N.4 Coding of multiple sequences in one LER

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
259	1982	063	0	8209300141	176816	8-27-1982

DOCKET:259 BROWNS FERRY 1 TYPE:BWR
REGION: 2 NSSS:GE
ARCHITECTURAL ENGINEER: TVAX
FACILITY OPERATOR: TENNESSEE VALLEY AUTHORITY
SYMBOL: TVA

REFERENCE LERS:
1 259/81-008 2 259/81-050 3 260/80-045 4 260/77-015
5 260/81-024 6 260/81-025 7 260/81-032 8 260/81-038

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		SE	PZ		PZ		1			1	A	M	F	UF
2	1	A	RC	DB	SE	DR		1	1		1	A	M	F	AK
3	2	X	RC	DB	SL	DR		1	1		1	A	M	F	AK
4	2	B													YC
5	0	A	ZZ	DB	SE	INL		1	1		1	M	T	K	AB
6	A	B	RC	DB	SE	DR		1	1		2	A	TR	F	AK
7	6	X	RC	DB	SE	DR		1	1		2	A	TR	F	AK
8	B		RC	DB	SE	PNA		1	1		1	A	TR	F	AI
9				XX								E	XX		YC
10				YY								N	N		YC

ABSTRACT

REACTOR BUILDING/TURBINE AIR LOCK DOORS (237-238) WERE BOTH OPENED AT THE SAME TIME, BREAKING SECONDARY CONTAINMENT (TECH SPEC 3.7.C.1). THERE WAS NO EFFECT ON PUBLIC HEALTH AND SAFETY. PRIMARY CONTAINMENT WAS MAINTAINED DURING THE EVENT. THE LOCK ON DOOR 238 WAS OUT OF ADJUSTMENT AND DID NOT LATCH. WHEN DOOR 237 WAS OPENED, DIFFERENTIAL AIR PRESSURE CAUSED DOOR 238 TO OPEN THUS BREAKING SECONDARY CONTAINMENT. A WATCH WAS POSTED AND THE LOCK WAS REPAIRED. NO FURTHER CORRECTIVE ACTION IS REQUIRED. THIS IS FIRST FAILURE FOLLOWING LOCKING MECHANISM MODIFICATIONS AND IS CONSIDERED A RANDOM FAILURE.

Fig. N.5 Coding of a link step

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
366	1981	017	0	8104030485	165499	3- 5-1981

COMMENTS
STEP 1: COMP MSC - COLLECTOR RINGS AND BRUSHES.

DOCKET:366 HATCH 2 TYPE:BWR
REGION: 2 NSSS:GE
ARCHITECTURAL ENGINEER: BESS
FACILITY OPERATOR: GEORGIA POWER CO.
SYMBOL: GPC

REFERENCE LERS:
1 321/78-089

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		CE	AI		MSC		M	1		1	A	T	K	IF
2	1		RC	AI		EXC		1	1		1	A	TR	F	ID
3	2		RC	AI		MG	G080	1	1		1	A	TR	F	ID
4	3		RC	AI		PMPZ		1	1		1	A	T	F	KC
5	4		RS	AI		1X2		1.	1		1	A	T	F	YC
6	5			XX								F	AA		YC
7				YY								N	N		YC

ABSTRACT
WHILE MAKING POWER CHANGES FROM 1343 MWT, THE "B" RECIRCULATION PUMP, 2B31-C001B, FAILED. THE UNIT WAS SHUTDOWN WITHIN 12 HOURS AND WAS PLACED IN COLD SHUTDOWN WITHIN 24 HOURS AFTER THE EVENT. THIS IS A REPETITIVE EVENT: LER 50-321/1978-89. THE CAUSE WAS ATTRIBUTED TO UNDER VOLTAGE FROM THE EXCITER ON THE RECIRC MOTOR GENERATOR. THIS CONDITION WAS CAUSED BY A LOSS OF EXCITATION DUE TO THE MOTOR GENERATOR EXCITER COLLECTOR RINGS AND BRUSH DEGRADATION. THE COLLECTOR RINGS WERE REPAIRED AND NEW BRUSHES INSTALLED.

Fig. N.6 Coding of a train failure

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
338	1981	003	0	8102030428	163657	1- 4-1981

DOCKET:338 NORTH ANNA 1 TYPE:PWR
REGION: 2 NSSS:WE
ARCHITECTURAL ENGINEER: SWXX
FACILITY OPERATOR: VIRGINIA ELECTRIC & POWER CO.
SYMBOL: VEP

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		LA	IU	AE	FT	F180	1	1	1	1	M	T	I	AB
2	1		RS	IU	AE	1XZ		1	1	1	1	P	T	F	LE
3				XX								I	XX		YC
4				YY								N	N		YC

ABSTRACT
LOOP 3 REACTOR COOLANT FLOW PROTECTION CHANNEL II (F-1435) WAS FOUND OUT OF TOLERANCE HIGH DURING THE 18 MONTH PERIODIC CHANNEL CALIBRATION CHECK. THE WORST CASE WOULD HAVE CAUSED BOTH INDICATOR AND COMPUTER POINT TO READ 3.99% HIGHER THAN ACTUAL RESULTING IN A DELAYED REACTOR TRIP SIGNAL ON LOW FLOW FOR THAT CHANNEL. THE CAUSE WAS A VOLTAGE DRIFT IN THE FLOW TRANSMITTER SERVING THE INSTRUMENT LOOP. CORRECTIVE ACTION WAS TO PROPERLY RECALIBRATE THE CHANNEL.

Fig. N.7 Coding of a channel failure

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
251	1982	006	0	8206070458	173905	5- 9-1982

DOCKET:251 TURKEY POINT 4 TYPE:PWR
REGION: 2 NSSS:WE
ARCHITECTURAL ENGINEER: BECH
FACILITY OPERATOR: FLORIDA POWER & LIGHT CO.
SYMBOL: FPL

REFERENCE LERS:
1 251/82-004

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		ZZ	EF	BD	HTTR		M	M		1	M	T	K	KC
2	1	A	RC	BD		PIZZ		[illegible]	1		1	M	T	I	EA
3	0	A	ZZ	BD		PMPZ		1	1		1	A	T	I	HI
4	A		RC	BD		TK		1	1		1	A	T	I	EC
5	4		RT	BD		XXX					1	A	P	I	EC
6				XX								E	XX		YC
7				YY								N	N		YC

ABSTRACT
A SAMPLE WAS TAKEN FROM THE BORON INJECTION TANK FOR ROUTINE CHEMICAL ANALYSIS. THE BORON CONCENTRATION WAS FOUND TO BE LOWER THAN THE MINIMUM ALLOWABLE CONCENTRATION. THIS IS REPORTABLE IN ACCORDANCE WITH TECH SPEC 3.4.1.A.2 AND 6.9.2.A.2. A SIMILAR OCCURRENCE WAS REPORTED AS LER 251-82-004. THE ROOT CAUSE WAS PLUGGING OF THE NORMAL RECIRCULATION SUPPLY LINE COINCIDENT WITH LOSS OF THE MINI-RECIRC. PUMP. THE HEAT TRACING ON THIS LINE IS PRESENTLY UNDER REPAIR. FLOW WAS RE-ESTABLISHED TO THE BIT THROUGH THE ALTERNATE LINE USING A BORIC ACID PUMP. SHORTLY AFTER, AN ACCEPTABLE BORON CONCENTRATION IN THE BIT WAS CONFIRMED.

Fig. N.8 Coding of a total system failure

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
247	1981	020	0	8110020282	168934	8-21-1981

DOCKET:247 INDIAN POINT 2 TYPE:PWR
REGION: 1 NSSS:WE
ARCHITECTURAL ENGINEER: UECX
FACILITY OPERATOR: CONSOLIDATED EDISON CO.
SYMBOL: CEC

REFERENCE LERS:
1 247/77-013

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		ZZ	AB	SA	VTVZ		1	1		1	M	T	L	BK
2	1		NB	AB		CON		1	1		1	A	T	F	IE
3	2		RC	AA		CRE	W120	1	1		1	A	T	N	CD
4	3			XX								E	BZ		YC
5	4		ZZ	II	FB	XXX					1	A	T	F	HL
6	5		RC	FB		GEN		1	1		1	A	T	F	KC
7	6		RT	AE		XXX					1	A	T	F	HK
8	7			XX								E	AC		YC
9				YY								N	N		YC

ABSTRACT

CONTROL ROD G-3 (SHUTDOWN BANK B) DROPPED INTO THE CORE, INITIATING A TURBINE RUNBACK TO APPROXIMATELY 70% POWER. AFTER STEPS WERE TAKEN TO STABILIZE THE PLANT, OPERATOR ATTEMPTS TO RETRIEVE THE ROD WERE UNSUCCESSFUL. QUADRANT POWER TILT CALCULATIONS WERE MADE AND A POWER REDUCTION TO 50% BEGAN. DURING A HOLD IN THE POWER REDUCTION A SUDDEN DROP IN GENERATOR LOAD CAUSED A REACTOR HIGH PRESSURE TRIP. SIMILAR EVENT RO-77-2-13(B). INVESTIGATION REVEALED THAT THE VENT PLUG NEEDLE VALVE ON CONTROL ROD H-2 WAS LEAKING. A SPRAY ON ROD G-3 COIL STACK CONNECTOR CAUSED THE CONNECTOR TO FAULT AND THE ROD TO DROP. THE CONNECTOR WAS REPAIRED AND THE VENT CAP SEAL WELDED. PROBLEMS WITH THE TURBINE HIGH PRESSURE OIL SYSTEM WERE DETERMINED TO HAVE CAUSED THE SECOND DROP IN GENERATOR LOAD; REPAIRS WERE MADE.

Fig. N.9 Coding of a mid-sequence change in unit status

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
250	1982	015	0	8212100220	179722	11- 4-1982

DOCKET:250 TURKEY POINT 3 TYPE:PWR
REGION: 2 NSSS:WE
ARCHITECTURAL ENGINEER: BECH
FACILITY OPERATOR: FLORID POWER & LIGHT CO.
SYMBOL: FPL

REFERENCE LERS:
1 250/82-008

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0		ZZ	EB	BK	52	G080	1	1		1	A	T	F	AR
2	1		RC	BK		PMPB	W120	1	1		1	A	T	F	KF
3				XX								E	XX		YC
4				YY								N	N		YC
5				XX		251							HA		YC
6				XX								H	XX		YC
7				YY								N	N		YC

ABSTRACT
THE 3A HIGH HEAD SAFETY INJECTION PUMP WOULD NOT START FROM MANUAL OPERATION OF EITHER THE UNIT 3 OR UNIT 4 CONTROL SWITCH. THIS IS REPORTABLE IN ACCORDANCE WITH TECH SPEC 6.9.2.B.2. A SIMILAR EVENT WAS REPORTED AS LER 250-82-008. THE 3A HHSI PUMP BREAKER WAS RACKED OUT AND BACK IN. THE PUMP WAS THEN SUCCESSFULLY STARTED. THE BREAKER AND CONTROL CIRCUITRY WERE THOROUGHLY CHECKED, BUT A SPECIFIC FAILURE MODE COULD NOT BE IDENTIFIED. AFTER TWO REPAIRS WERE MADE TO THE BREAKER, A SPECIAL TEST WAS PERFORMED WHICH CYCLED BREAKER 3AA13 FIFTY TIMES. A FAILURE DID NOT OCCUR, AND THE PUMP WAS RETURNED TO SERVICE.

Fig. N.10 Coding of an event affecting second unit

LER SCSS DATA 11-02-84

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DOCKET	YEAR	LER NUMBER	REVISION	DCS NUMBER	NSIC	EVENT DATE
269	1982	013	0	8208120178	175580	7- 6-1982

DOCKET:269 OCONEE 1 TYPE:PWR
REGION: 2 NSSS:BW
ARCHITECTURAL ENGINEER: DKBE
FACILITY OPERATOR: DUKE POWER CO.
SYMBOL: DPC

STEP	LK	SLK	CAUSE	PSYS	ISYS	COMP	VEND	QUAN	TR	CH	DI	T	P	D	EFF
1	0	A	SA	PA		PUX		1			1	M	T	R	TA
2	1		SB	PT		PUX		1			2	M	T	R	TA
3	2		RC	IW	BA	PS	C753	M	M	M	1	M	M	R	PL
4	3		RC	BA		PMPZ		M	M		1	P	T	F	KB
5	4		RT	BA		XXX					1	P	T	F	KB
6	5			XX								E	BZ		YC
7				YY								N	N		YC
8	0	A		XX		270							HA		YC
9	A		SB	PT		PUX		1			3	M	T	R	TA
10	9		RC	IW	BA	PS	C753	M	M	M	2	M	M	R	PL
11	10		RC	BA		PMPZ		1	1		2	P	T	F	KB
12	11		RS	BA		1X3		1	1		1	P	T	F	KB
13				XX								C	XX		YC
14				YY								N	N		YC

ABSTRACT
THE EMERGENCY FEEDWATER PUMPS FOR UNITS 1 AND 2 WERE DECLARED INOPERABLE WHEN IT WAS DETERMINED THAT THE EMERGENCY FEEDWATER INITIATION LOGIC PRESSURE SWITCHES HAD NOT BEEN TESTED AS REQUIRED BY THE TECH SPECS IN TABLE 4.1-1 (ITEM 53(A)). SUBSEQUENT TESTING CONFIRMED OPERABILITY OF THE PUMPS. THE APPARENT CAUSE OF THIS INCIDENT IS PERSONNEL ERROR, IN THAT INADEQUATE REVIEWS WERE PERFORMED BOTH PRIOR TO SUBMITTAL AND DURING IMPLEMENTATION OF A TECH SPECS CHANGE. THE REQUIRED TESTING WAS PERFORMED, AND ADMINISTRATIVE CHANGES TO IMPROVE THE REVIEW PROCESS WILL BE IMPLEMENTED.

Fig. N.11 Coding of an event significantly affecting a second unit

NRC FORM 335 (2-84) NRCM 1102, 3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

SEE INSTRUCTIONS ON THE REVERSE

1. REPORT NUMBER (Assigned by TIDC, add Vol. No., if any)
NUREG/CR-3905, Vol. 3
ORNL/NSIC-223

2. TITLE AND SUBTITLE
Sequence Coding and Search System for Licensee Event Reports - Coder's Manual

3. LEAVE BLANK

4. DATE REPORT COMPLETED
MONTH: November YEAR: 1984

5. AUTHOR(S)
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6. DATE REPORT ISSUED
MONTH: April YEAR: 1985

7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Nuclear Operations Analysis Center
Oak Ridge National Laboratory
Oak Ridge, TN 37831

Subcontractor:
JBF Associates, Inc.
Technology Drive
1000 Technology Park Center
Knoxville, TN 37922

8. PROJECT/TASK/WORK UNIT NUMBER

9. FIN OR GRANT NUMBER
A9451

10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Office for Analysis and Evaluation of Operational Data
U.S. Nuclear Regulatory Commission
Washington, DC 20555

11a. TYPE OF REPORT
Topical

b. PERIOD COVERED (Inclusive dates)

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

Operating experience data from nuclear power plants are essential for safety and reliability analyses, especially analyses of trends and patterns. The licensee event reports (LERs) that are submitted to the Nuclear Regulatory Commission (NRC) by the nuclear power plant utilities contain much of this data. The NRC's Office for Analysis and Evaluation of Operational Data (AEOD) has developed, under contract with NOAC, a system for codifying the events reported in the LERs. The primary objective of the Sequence Coding and Search System (SCSS) is to reduce the descriptive text of the LERs to coded sequences that are both computer-readable and computer-searchable. This system provides a structured format for detailed coding of component, system, and unit effects as well as personnel errors. This four volume report documents and describes SCSS in detail. Volume 1 is a User's Guide for searching the SCSS database. Chapter 2 of this guide is a tutorial on retrieving, displaying, and analyzing LERs and provides hands-on experience in executing basic commands. Volume 2 contains all valid and acceptable codes used for searching and encoding the LER data. Volumes 3 and 4 provide a technical processor, new to SCSS, the information and methodology necessary to capture descriptive data from the LER and to codify that data into a structured format and serve as reference material for the more experienced technical processor, and contains information is essential for the more advanced user who needs to be familiar with the intricate coding techniques in order to retrieve specific details in a sequence.

14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS
Licensee Event Report
Database
Reactor, BWR
Reactor, PWR
Operating Experience

b. IDENTIFIERS/OPEN-ENDED TERMS

15. AVAILABILITY STATEMENT
Unlimited

16. SECURITY CLASSIFICATION
(This page) Unclassified
(This report) Unclassified

17. NUMBER OF PAGES

18. PRICE

U.S. GOVERNMENT PRINTING OFFICE: 1985-461-721:20071

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FOURTH CLASS MAIL
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PERMIT No. G-67