

Safety Equipment List White Paper

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Brief Description: safety Equipment Lists are used to document safety equipment components for safety class and safety significant hardware at the Department of Energy Category II nuclear facilities. These lists, known as SELs can be hard copy (reports) or databases. The DOE guidance that discusses SELs does not provide specific guidance such as level of detail, who should maintain the list, etc. The Configuration Management subgroup of the Engineering practices group developed the following white paper to define the recommended elements to develop and maintain SELs.

Why the best practice was used: SELs, when developed and controlled in an appropriate manner, can provide a rapid, effective way for operating staff, particularly cognizant system engineers assigned to the Category II nuclear facility to better understand and manage key equipment.

Elements of a good Safety Equipment List

- SELs, whether controlled by document or database, should be strictly controlled. Changes should be made by a limited number of qualified engineers who understand the controlling safety analysis (documented safety analysis), particularly the controlling accidents and how the safety class or safety significant component will focus.
- Sites should have a procedure that defines how to develop, control and change the SEL.
- SELs are useful in supporting procurement actions, particularly in establishing quality level and critical attributes to be confirmed as part of procurement. To support this end, the SEL should break safety class and safety significant components into the smallest practical unit, to best align with the procurement activity. As an example, if a ventilation system is safety class/safety significant, the SEL should break it into meaningful (from a procurement, maintenance and testing aspect) lowest level elements. These would include fan, fan motor, duct work, filter, filter housing, fan belts, etc.
- Unique numbers (e.g. equipment identification numbers) would be beneficial for an SEL. This makes the tool more valuable for maintenance.
- Hard copy (documents) can provide a traceable record and make the process for delivering a listing to the customer (normally DOE field office). A controlled database has the added advantage of being quickly sorted, and linked. The most effective databases are controlled (development, changes and version controlled by limited number of trained staff) while at the same time, linked or part of a larger system that is used by multiple groups, particularly Cognizant system engineers, maintenance and operations staff. For example, Hanford Tank farms have built their SEL as part of their work control software with the added control on those fields to control who can add or change the safety designation.
- Several sites have successfully maintained both a hard copy (formal document) and the same information on a searchable web-accessed database. This can be done effectively if the procedure links the update of one to the other (e.g. assures both the document and database are maintained to the same level). With new information technology, it is possible to have the system set up such that updating the record in one master system can automatically update the document and web-accessed system.
- Whether in document or database, the SEL should provide summarized information regarding the safety function each component must meet.
- Normally the SEL would be a subset of the Maintenance Equipment List. Where to separate lists are maintained, there is always the risk of disconnects (inconsistencies) between the two).

- Safety equipment lists can and should cover hazards beyond nuclear, if those other hazards present a co-located worker or off site public hazard.

Additional Details:

The following summarizes the results from a survey of EFCOG member sites regarding Safety Equipment lists. This data was gathered via a questionnaire issued first quarter calendar year 2007.

Consolidated Responses

Date: 4/13/07

1. What conditions drive the need for a Safety Equipment List (SEL) at your site?

<p>LANL: The list is driven by 420.1 as a way to quickly show that the VSS have CSEs assigned.</p>
<p>INL: a safety equipment list is managed at the system level and is developed from the INLs nuclear facility Documented Safety Analyses (DSA). It is developed as a best management practice. Procedure NS-18302 “Vital Safety Systems at INL Nuclear Facilities” (attached) is the SEL.</p>
<p>WIPP: SS and SC equipment are outlined in the RH & CH Documented Safety Analysis to help prevent radiological material exposure to public and to worker safety.</p>
<p>ORNL: Hazard category 1, 2 and 3 nuclear facilities are subject to regulatory requirement exceeding those for the balance of the laboratory. DOE Order 433.1, Maintenance Management of DOE Nuclear Facilities <i>I.g. A configuration management process to ensure the integrity of the identified nuclear facility safety SSCs using a graded approach.</i> A configuration management process, to ensure the integrity of the identified nuclear facility safety SSC using a graded approach, has been implemented for all ORNL facilities with Safety Related SSC. To ensure the integrity of the identified nuclear facility safety SSC, using a graded approach, configuration management processes are implemented by NNFD-002, Change Control of Safety Structures, Systems or Components and for HFIR with SEP-0100, Configuration Management , SEP-0200 Modification Process and SEP-0220, Temporary Modifications The Configuration Management Subject Area and the Configuration Management Program Description subordinate to the Engineering Management System Description, describes how the integration of configuration management concepts and requirements are accomplished. Configuration Management. Additionally the Nuclear and Facility Safety Management System and the subordinate System Engineering, Procedure, Identifying Systems require Safety-class systems, structures and components (SSCs) as defined in facility Safety Basis documents which perform an active function within the context of the Safety Basis. Safety-significant SSCs as defined in facility Safety Basis documents which perform an active function within the context of the Safety Basis. Important defense in depth systems necessary for safe operation of ORNL facilities that perform an active function within the context of the Safety Basis, and/or in the judgment of line management, perform an important role to protect the public, the worker, or the environment. The procedure also considers systems essential for preserving environmental, safety or health controls and systems critical to the facility's capability to support research work.</p>

<p>In accordance with implementation of Systems Engineering a baseline set of "system schematic" drawings have been developed for each active system deemed important to safety, to serve as the field verified drawings for the operations of these systems.</p>
<p>Fluor Hanford: Safety Functions to be performed by systems are identified by Nuclear Safety and documented in a Facilities Documented Safety Analysis (DSA) or Safety Evaluation Report (SER). Systems performing Safety Class (SC) or Safety Significant (SS) functions are assigned an SC or SS classification.</p> <p>Engineering then performs an evaluation of the system and its components in relation to the safety functions required to be performed. Components performing/affecting a safety function are assigned the same safety classification (SC or SS) as the safety function. All other components are assigned a General Service (GS) classification. SC or SS components are then identified on an SEL.</p>
<p>Hanford Tank Farms: The Tank Farms Safety Equipment List is driven by nuclear safety. The Safety Significant and Safety Class systems are designated in the Documented Safety Analysis as controls to prevent or mitigate the accidents analyzed in the DSA.</p>
<p>Y-12: There is no specific driver identified. G 420.1-1 identifies the need for an SEL with respect to QA requirements (akin to Q-List in NRC world). However, no specific expectations are provided. Like many of the respondents, we do maintain a list of VSS with assigned CSEs. O 433.1 maintains a Master Equipment List (MEL) but with specific requirements. We have established MELs at component level with unique identifier, noun name, and SSC classification (i.e., SC, SS, mission essential, etc.) primarily.</p>
<p>SRS: We maintain a list of Vital Safety Systems with assigned CSEs to meet requirements of DOE Order 420.1B and DNFSB Recommendation 2000-2.</p>

1.a. Do you identify safety equipment/controls for hazards other than nuclear safety hazards identified through a Documented Safety Analysis (DSA), e.g. bio hazards, chemical hazards, industrial hazards?

<p>LANL: No, although we have some unusual hazards (e.g., beryllium).</p>
<p>INL: NS-18302 contains only the vital safety systems (VSS) designated in the Applicable DSAs as safety significant, safety class, safety related, important to safety, or defense-in-depth. However, some of the systems analyzed in the DSAs are designated as safety significant based on toxicological consequences rather than radiological consequences.</p>
<p>WIPP: Some equipment that is listed as SS in the WIPP Master Equipment List is industrial hazards.</p>

<p>ORNL: Requirement are being implemented as resources permit for non-nuclear facilities using a graded approach guided by internal operating procedure, Change Control of Structures, Systems and Components, that, in part, requires “The Complex Facility Manager (CFM) or his designee identifies facility structures, systems and components which are important to the safety of facilities and personnel and will assure these items are documented as “configuration items” and will assure the documentation is available for personnel managing work within the complex.”</p>
<p>Fluor Hanford: Some equipment have safety controls identified which are not nuclear related. Examples include Backflow Preventers installed on Sanitary Water lines (required to be inspected annually), GS classified HEPA filters, fire systems in non-nuclear facilities, etc.</p>
<p>Hanford Tank Farms: The Tank Farms SEL contains only the vital safety systems designated in the Applicable DSA as Safety Significant or Safety Class. However, some of the systems analyzed in the DSA are designated as Safety Significant based on toxicological consequences rather than radiological consequences.</p>
<p>Y-12: Yes. We treat chemically hazardous facilities with DSA-like documents.</p>
<p>SRS: Yes we have controls mandated through other programs such as Consolidated Hazards Analysis, Automated Hazards Analysis, IH, Rad Tech, Programs, etc.</p>

2. If you have an SEL, what format do you use and what information is captured in the SEL?

<p>LANL: Simple webposted document listing VSS Name, Boundary Definition Document, Active/Passive, Primary and Secondary CSE Name/No and qual status. VSSs are separated by facility. Component-specific information is also maintained in a database (CMMS/MEL).</p>
<p>INL: NS-18302 (attached) provides this information.</p>
<p>WIPP: Within the Master Equipment List there are fields for SC and SS and VSS.</p>
<p>ORNL: Safety Equipment List are maintained in both hard copy approved documents and within accessible databases.</p>
<p>Fluor Hanford: The typical SEL is an engineering document released into the Hanford Document Control System (HDCS).</p>
<p>Hanford Tank Farms: The SEL is maintained in a document (i.e. technical report format) that is categorized by safety system and broken down by subsystem and component for each of the safety systems. Component-specific information is also maintained in a database.</p>
<p>Y-12: A Master Equipment List contains the UNID, SSC Grade, and associated drawing number(s) for a system or piece of equipment. For some systems the MEL data is embedded into the drawings and the MELs are created using this information.</p>
<p>SRS: We maintain the VSS List in an Excel Spreadsheet and make it available on our Conduct of Engineering web page. It includes Facility, System/Component, and CSE.</p>

2.a. How are items identified and tracked?

LANL: Within facility, by SSC name. Components in MEL have a unique number.
INL: VSS are listed as they appear in the DSAs.
WIPP: Equipment is given a unique number and tracked using the “CHAMPS” database (Master Equipment List).
<p>ORNL: For the Hazard Category 2 and 3 nuclear facilities, the procedure, NNFD-002, Change Control of Safety Structures, Systems or Components, provides assurance of the configuration management of the Safety Related SSC. Nonreactor Nuclear Facilities - The complete and approved listings of Configuration Items, including Safety Class, Safety Significant, Defense-in-Depth and other Vital Safety Systems are maintained in configuration controlled documentation managed by the Nonreactor Nuclear Facilities Division.</p> <p>The Category 1 nuclear facility, HFIR - The list of Safety Class, Safety Significant, and Defense-in-Depth equipment for HFIR is contained within ORNL/RRD/INT-70, HFIR Safety-Related Systems and Equipment Definition Report and Safety Related Equipment List. The HFIR Master Equipment List, which included SC, SS, DID, and other non-safety related equipment is available from the RRD Computerized Maintenance Management System (CMMS) found on the RRD home page . A maintenance history of each piece of equipment is linked to the Equip ID column. Additional maintenance history for HFIR instrumentation can be found on the ORNL Maintenance Information Data Acquisition System (MIDAS). Instrumentation identification, description, specifications, and safety classification is available in ORNL/RRD/INT-37, Volume 6, which is the HFIR Instrument Index.</p>
Fluor Hanford: SEL items are identified and tracked by Engineering in accordance with HNF-PRO-20050 “PHMC Engineering Configuration Management”. Changes to the SEL are made in accordance with HNF-PRO-2001 “Facility Modification Package Process” and/or HNF-PRO-440 “Engineering Document Change”.
Hanford Tank Farms: Items in the SEL are tracked by a unique Equipment Identification Number (EIN).
Y-12: UNIDs are tracked in SAP using Functional Locations, which are unique numbers that can be structured in a hierarchical fashion. A Functional Location pertains only to the conceptual entity referenced in a design drawing. Individual, serialized equipment items are tracked by SAP Equipment Numbers. These Equipment numbers are attached to functional locations and can be used to track history on individual pieces of equipment.
SRS: Within facility, by SSC name. Components in MEL have a unique Component Location Identifier (CLI).

2.b. What critical attributes of the safety system or component are included in the SEL, e.g. failure modes analysis, QA level, item’s contribution to safety function?

LANL: None, but QA level is in MEL.
INL: None.

<p>WIPP: Fields inside the Master Equipment List include Criticality, Class, Safety Indicators, and System.</p>
<p>ORNL: The attributes include Safety Class, Safety Significant and Defense-in-Depth based upon safety analysis. Frequently, the hazard categorization are based on analysis at the “system” level as apposed to the “component” level.</p>
<p>Fluor Hanford: The minimum attributes required for identifying an SEL item are:</p> <ul style="list-style-type: none"> • System Identification Number • Safety Classification • Component Number • Component Name
<p>Hanford Tank Farms: The Tank Farms SEL includes a functional analysis of all safety systems and identification of system boundaries/interfaces. A component by component analysis of each of the system and subsystem component includes the component’s contribution to the safety function (i.e. if the component does not contribute to the safety function is it classified as “general service”), failure analysis, and an evaluation of the ability to replace failed components before hazardous conditions are reached. This information is used to set the minimum Quality Assurance level for each component. QA level is included in the SEL.</p>
<p>Y-12: Only Safety Classification.</p>
<p>SRS: The VSS List only contains Facility, System/Component, and CSE. The MEL, where all SSCs are maintained, includes at a minimum, Facility, Building, Area, System Code, Equipment/Component Type and Number, Document Number, Functional Class, Name, Status, Mfg Code, Model Number, Equip Tag, Tech Spec. Additional attributes maintained include UTC, PM Frequency, parameters, etc.</p>

2.c. What level of detail is carried in the SEL, e.g. safety system level, system broken into components, or broken down into separately obtainable parts?

<p>LANL: None of this info in SEL, but components in MEL have s/s level.</p>
<p>INL: Active or passive VSS.</p>
<p>WIPP: Each SSC has it own unique component number.</p>
<p>ORNL: Depending on the facility, lists are maintained at the “System Level” and/or “Component Level”. Legacy data in some older facilities does not support complete configuration data without extensive reconstitution. Active facilities with an expected long term mission will have or will develop extensive configuration data, while facilities nearing the end of their life cycle and declining or ending missions will not be provided with resources other than that funded by DOE for hazard assessments and disposition in accordance with the ORNL Ten Year Site Plan.</p>
<p>Fluor Hanford: The SEL is typically carried down to the component level.</p>
<p>Hanford Tank Farms: The SEL is broken down to the component level. The implementation database includes specific EIN numbers for these components.</p>

Y-12: Generally component level.
SRS: VSS list identifies the components of the system that are vital.

2.d. Describe the process for maintenance/configuration control of the SEL. Is this process proceduralized?

LANL: The SEL is controlled by posting on the web. There are procedures for maintenance of the SEL.
INL: NS-18302 is controlled through the INL document management process which is proceduralized.
WIPP: COMPONENT INDICIES and ENGINEERING CHANGE ORDER (ECO) procedures control the processes.
ORNL: The change process is controlled by internal operating procedures specific to ORNL nuclear facilities such as NNFD-002, Change Control of Nuclear Structures, Systems and Components which includes a form and instructions for initiating and approval of changes to the configuration items list. At the HFIR facility configuration management processes are implemented by NNFD-002, Change Control of Safety Structures, Systems or Components and for HFIR with SEP-0100, Configuration Management, SEP-0200 Modification Process and SEP-0220, Temporary Modifications.
Fluor Hanford: Yes. Configuration control of the SEL is performed in accordance with HNF-PRO-2001. Modifications made to an SSC are controlled and documented by the FMP process. If changes are made to a component on the SEL, the SEL change is documented in the FMP or the SEL is identified as an affected document.
Hanford Tank Farms: The SEL is controlled through the Hanford document control process. An Engineering Change Notice is required to be prepared to authorize changes to the SEL and the applicable procedure requires reviews by the Engineering Discipline Lead (e.g. lead electrical engineer review all changes to electrical components), document owner, and engineering director. The process for conducting the component analyses is specified in a separate technical report, also under configuration control. Additionally there are procedures for maintenance of the SEL and for the Engineering Change processes.
Y-12: The process is not yet proceduralized. However, the Master Equipment List is currently maintained by members of the Configuration Management (CM) Program. Once controls are in place and the process has been proceduralized, authorizations will be granted to allow engineers more control of their own data. Members of the CM program will be required to approve changes to fields that are considered configuration controlled.
SRS: How the VSS List is managed/controlled is not proceduralized other than a procedure that says we will identify CSEs for our VSS. The Master Equipment List controls are proceduralized in our Engineering E7 Manual (E7, 1.31).

3. Do you use a database or other electronic media to maintain the SEL information?

3.a. Is a database used in lieu of an SEL document or in addition to an SEL document?

LANL: The SEL document is considered the “official” SEL.

INL: No.
WIPP: The “CHAMPS” database is the Master Equipment List database that track equipment listed in the DSA.
ORNL: Data bases such as Computerized Maintenance Management Systems (CMMS) contain list of equipment items related to the infrastructure of the facility. The official documentation of approved nuclear facility configuration items are maintained in control documentation under documentation controls specified by procedures.
<p>Fluor Hanford: Typically, SELs are prepared in Word or Excel files, are handled as documents, and are released into the Hanford Records Management Information System (RMIS). SELs are also listed in HDCS, and should also be identified as a configuration baseline document for a particular system.</p> <p>The utility of having the SEL in database format is recognized. Some Projects/Facilities have suggested the use of the electronic Job Control System’s (JCS) Component Index as a potential repository of the SEL. Other options for electronic database have also been discussed.</p>
Hanford Tank Farms: The SEL document (technical report) is considered the “official” SEL, however, we also maintain the information in a database.
Y-12: Yes, we have migrated to SAP. Currently working procedures.
SRS: VSS List is an Excel Spreadsheet. MEL is maintained in Passport.

3.b. If electronic media is being used, what software is used and how is this software controlled?

LANL: N/A
INL: N/A
WIPP: The “CHAMPS” software is used at WIPP for maintaining SEL equipment as well as work control.
ORNL: DataStream is the CMMS of choice at this point for most of the ORNL. The database does not maintain configuration item list so normal software configuration management is adequate for maintenance of the CMMS.
Fluor Hanford: See 3.a
Hanford Tank Farms: The electronic database (CHAMPS) being used to maintain SEL information is the same control in the Tank Farms, e.g. work orders, maintenance tracking. Software is controlled by a database administrator configuration control of the database and controls access to the information in the database.
Y-12: SAP, Y-12 Plant Series 80 procedures which controls software.
SRS: VSS List is an Excel Spreadsheet. MEL is maintained in Passport.

3.c. What personnel have access to the information in the SEL?

LANL: All personnel inside firewall have read-only.
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INL: All INL and DOE personnel.
WIPP: All personnel with the “CHAMPS” database loaded on their computers have viewing capabilities and the software is controlled by Administrators who are responsible for maintaining the database.
ORNL: All personnel with internal access are able to access the documents.
Fluor Hanford: Anyone with access to the Hanford Records Management Information System.
Hanford Tank Farms: All engineering personnel and work planners who have completed an introductory training are allowed access to view and make limited changes to the information in the database.
Y-12: With the exception of security systems, all Y-12 personnel within the Y-12 firewall have read access to SAP. Only those individuals with a “need to know” are granted read access to security systems.
SRS: VSS List is an Excel Spreadsheet maintained by Site Conduct of Engineering Program Lead. MEL is maintained in Passport and is accessed by all who have been granted privileges. E7, 1.31 defines who is responsible (Engineering or Maintenance) for maintaining specific fields in Passport.

3.d. How are changes to the SEL controlled? What personnel are allowed to make changes?

LANL: Each facility Engineering Manager is owner of his list. He makes appropriate changes as necessary and his Facility Ops Director approves. Conduct of Engineering is responsible for putting SEL on Web for access.
INL: NS-18302 is owned by the INL Director of Nuclear Safety Engineering. The INL document management process requires the owner or designee to initiate changes.
WIPP: The Configuration Management Program controls to the Master Equipment List through the Engineering Change Order (ECO) Process or Work Order. The cognizant engineer makes the actual change to the database.
ORNL: Changes are controlled by procedure. Approvals are by the facility manager, the Design Authority and the Safety Basis Engineer.
Fluor Hanford: Changes are made in accordance with HNF-PRO-2001. The System Design Authority or Alternate are the only personnel with authority to approve changes.
Hanford Tank Farms: Changes to the information in the database, related to the SEL information, are controlled by access control to the database. Only a few senior level engineers, designated by an Engineering Director, are allowed access to the database to make changes in the fields that contain SEL information. These same senior level engineers are required to review and approve all changes to the SEL document as well.
Y-12: Procedures are currently under development. Some of the information in SAP will be controlled by the Change Control Process and only a very limited set of Y-12 personnel will

have authority to revise this data.
SRS: VSS List is an Excel Spreadsheet maintained by Site Conduct of Engineering Program Lead. It is routed to Facility Engineering management periodically to ensure it is up to date. MEL is maintained in Passport and is accessed by all who have been granted privileges. E7, 1.31 defines who is responsible (Engineering or Maintenance) for maintaining specific fields in Passport.

3.e. What level of approval is required for changes to the SEL?

LANL: See 3.d.
INL: NS-18302 is owned by the INL Director of Nuclear Safety Engineering. The INL document management process requires the owner’s approval for changes.
WIPP: The level of approval needed is the same for the ECO or Work Order.
ORNL: For Hazard Category 1, 2 and 3 nuclear facilities, the Design Authority and the Safety Basis Engineer approval are required for a change to the configuration items list.
Fluor Hanford: The System Design Authority or Alternate and Engineering Management. Changes to an SEL component typically require a Nuclear Safety review.
Hanford Tank Farms: A qualified Engineering Technical Manager (in most cases an Engineering Director) is required to approve all changes to the SEL document. An Engineering Director also must designate the individuals that are allowed to make changes to SEL information in the implementing database. Access is controlled by a database administrator.
Y-12: TBD through procedure development.
SRS: The VSS List requires buy-in by Facility Engineering Management prior to posting. Specific component information maintained in the MEL requires approval by the CSEs (Design Authority).