END POINTS SPECIFICATION METHODS

End Points Specification Methods

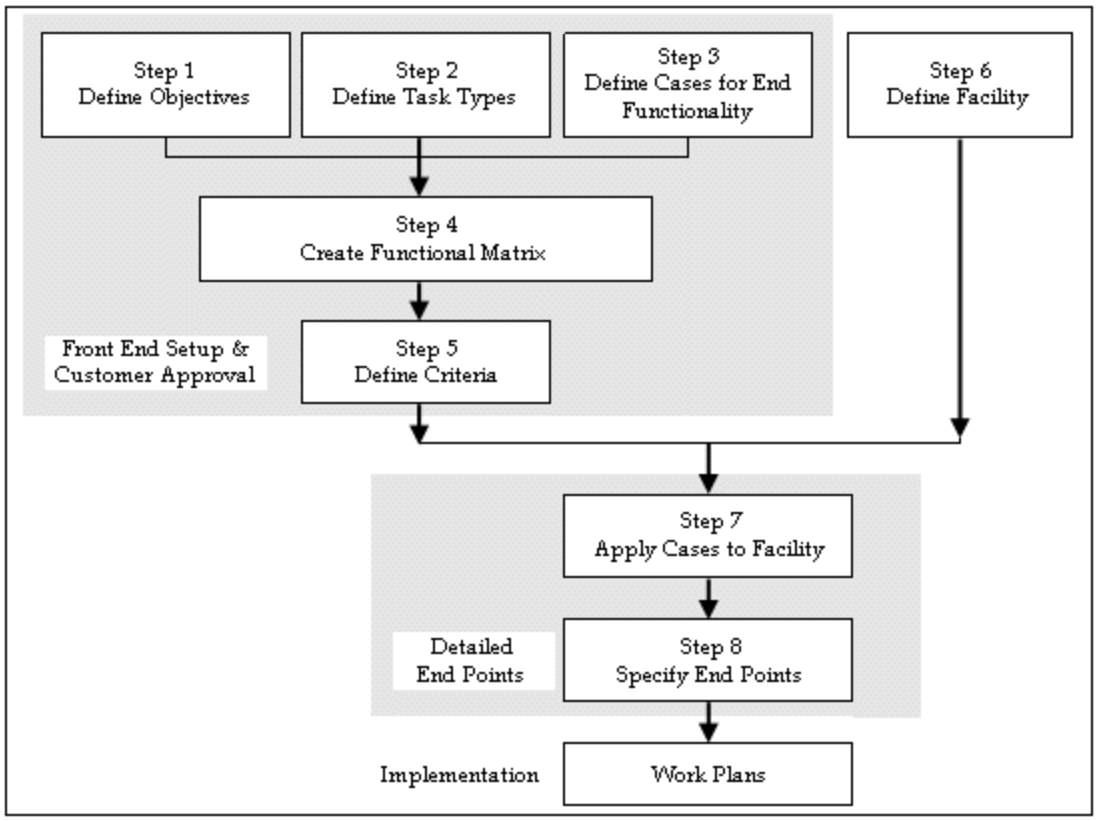
Two methods to develop end point specifications are presented. These have evolved from use in the field for deactivation projects.

- The hierarchical method is systematic, comprehensive, and completely defensible as to the basis for each specification. This method may appear complex to the uninitiated, but it is a straightforward application of a systematic engineering approach. It is labor intensive only during the final stage. This method is appropriate to the type of project involving a complex facility that contains process systems and a variety of contaminated areas or other hazards.
- The checklist method is an approach that is more appropriate to facilities which require less detailed planning, such as for industrial type buildings which are relatively uncontaminated, without or with only a few process systems, and without or with minimal chemical hazards. The checklist method is consistent with a tailored approach to planning, in which the level of detail is appropriate to the complexity and risks of the project.

Hierarchical End-Points Method

The hierarchical method is a top-down, logical process of determining final conditions for each of the facility's systems, equipment, and spaces based on stated objectives, likely task types, and expected future uses for that system or space. End-Points are developed in a hierarchical way, in successively more detailed levels, to the point of quantitative or otherwise explicit item-by-item end-point specifications suitable for developing engineering work plans and performing field work packages.

The set of guiding principles described in **End Points Management** have been used at several facilities to develop and apply this method. The method has been revised several times, moving toward simplification as it has been applied at several DOE facilities and sites. The method is illustrated in brief in the following figure.



Overview of Hierarchical End-Points Method

Of the eight steps shown in this figure, Steps 1 through 5 are conducted to establish and set up the method as it would apply to the facility. This setup process assesses the entire deactivation project by examining its three dimensions — objectives, tasks, and end functions for the physical plant — in a logical, top down manner.

It is important to realize that this *setup is only done once in the beginning.* While the setup will probably require some degree of iteration and fine-tuning as end-points are developed, conducting the setup will progress relatively rapidly once one decides to follow the model presented here. Modification would occur, for example, if additional definition were required for Step 3. The bulk of the end-points specification effort is in the subsequent steps.

Setup Phase

The first three steps in the setup establish definitions of objectives, task types, and classifications.

Step 1 - Define Top Tier Objectives

Facility end-points are derived from top-tier objectives that reflect the mission, goals, and objectives of of deactivation (and/or stabilization) as well as conditions for turnover to the receiving organization. By proceeding from a common set of top-tier objectives, a consistent and systematic approach can be implemented at all facilities undergoing deactivation.

Every end-point is driven by an objective; therefore, the first step is to define the top-level deactivation objectives that will then form the basic criteria for the end-points. This method uses a set of five top-tier objectives as stated in DOE G 430.1-3, *DEACTIVATION IMPLEMENTATION GUIDE*, Section 3.1, that apply to all deactivation projects. They are:

1) Protecting workers, the public, and the environment by establishing a low-risk facility.
2) Facilitating low-cost S&M after the facility is deactivated.
3) Facilitating ultimate decommissioning work.
4) Complying with regulations and requirements; including administrative requirements.
5) Following through on commitments to stakeholders.

These five top tier objectives are used to further describe the method. Each is elaborated in the boxed text that follows.

Objective 1: Protecting the Workers, the Public, and the Environment by Establishing a Low-Risk Facility

The facility must be placed in a condition that provides long term protection to the workers, the public, and the environment from potentially harmful materials contained within the facility. Following a defense-in-depth* approach, measures to achieve these conditions include: a) removal of RCRA regulated wastes or obtaining a RCRA permit, b) effective containment of that which remains, and c) providing for long term, cost effective monitoring and control. There must be effective monitoring and control for facility security and access, boundary integrity, effluents, and the surrounding environment. Both radiological and non-radiological hazards must be addressed. Examples include steps to preclude nuclear criticality and removal or stabilization of hazardous nuclear and chemical materials.

* "Defense-in-depth" means that for achieving required levels of safety and protection there is more than one layer of protection between the hazard and that which is being protected.

Objective 2: Facilitating Low-Cost S&M after the Facility is Deactivated

The facility must be placed in a condition that provides adequate on-site protection to workers engaged in surveillance and maintenance activities throughout the period of deactivation prior to final disposition. Further, conditions should not be left that will lead to rapid degradation detrimental to S&M activities.

Further, some end-points are established to permit or facilitate deactivated facility surveillance and maintenance activities. Specifying these end-points must consciously consider risk versus benefits in deciding between: a) minimizing the near term cost of establishing conditions to support surveillance and maintenance, and b) minimizing the cost of post-deactivation surveillance and maintenance activities. As an example, substantial deactivation cost may be justified to re-configure a system which will be routinely required to support surveillance and maintenance, while conversely, it would not be cost justifiable to decontaminate areas which need not be entered for surveillance and maintenance.

Objective 3: Facilitating the Ultimate Decommissioning Work.

End-Point conditions can include those that ease future work during final decontamination and/or dismantlement of the facility. Similarly, end-points that are likely to increase the difficulty of these activities must be avoided. Conditions conducive to this purpose may be specified as end-points when the effort to achieve them is reasonable and the benefit is clear.

Factors to consider for this objective include: a) reduction of high hazards, b) closing out systems and equipment where operational knowledge is necessary, and c) not leaving chemically active materials. Examples include flushing of caustic and acid tanks, preserving equipment such as large cranes and elevators, labeling plant equipment, and archiving information to facilitate future work.

End-Point decisions in this category must be tempered by the very high uncertainty regarding timing, technology, and regulatory requirements that will apply to decontaminating and dismantling the facility at some indefinite future time.

Objective 4: Complying with Regulations and Requirements; Including Administrative Requirements

Some end-point conditions result from legal or administrative requirements. Discussions should be initiated early so these can be identified, understood and included in the established set of facility end-points. A review to identify open non-compliances and pending legal liabilities is prudent. Examples are compliance with requirements for nuclear materials accountability and removal of classified equipment and documents. State and Federal regulations dictate permits and closure requirements. RCRA regulated wastes should be removed where feasible. If they are not removed, a RCRA permit is required.

This objective can include reducing the hazard classification of a nuclear facility. Doing so can reduce the amount of safety documentation and procedure as well as post-deactivation S&M requirements (and costs).

Administrative requirements can also address asset disposition. Valuable excess material should be removed, accounted for, and properly dispositioned. However, "value" should be assessed in terms of net

income from sale or net avoided cost when used for other projects*.

* Value must be evaluated judiciously so as to not spend more disposing of equipment and material than it is worth. For example, the value of contaminated material plus avoided cost of disposing should exceed the cost of decontaminating for reuse by a substantial margin before it can be considered worth doing. While this statement is not intended to discourage recycling, from the standpoint of achieving an efficient deactivation project, there are practical implications of "recycle regardless." Recycling for scrap or reuse that impacts work schedule and budget must be directly addressed by management and not left to de-facto practice at the working level.

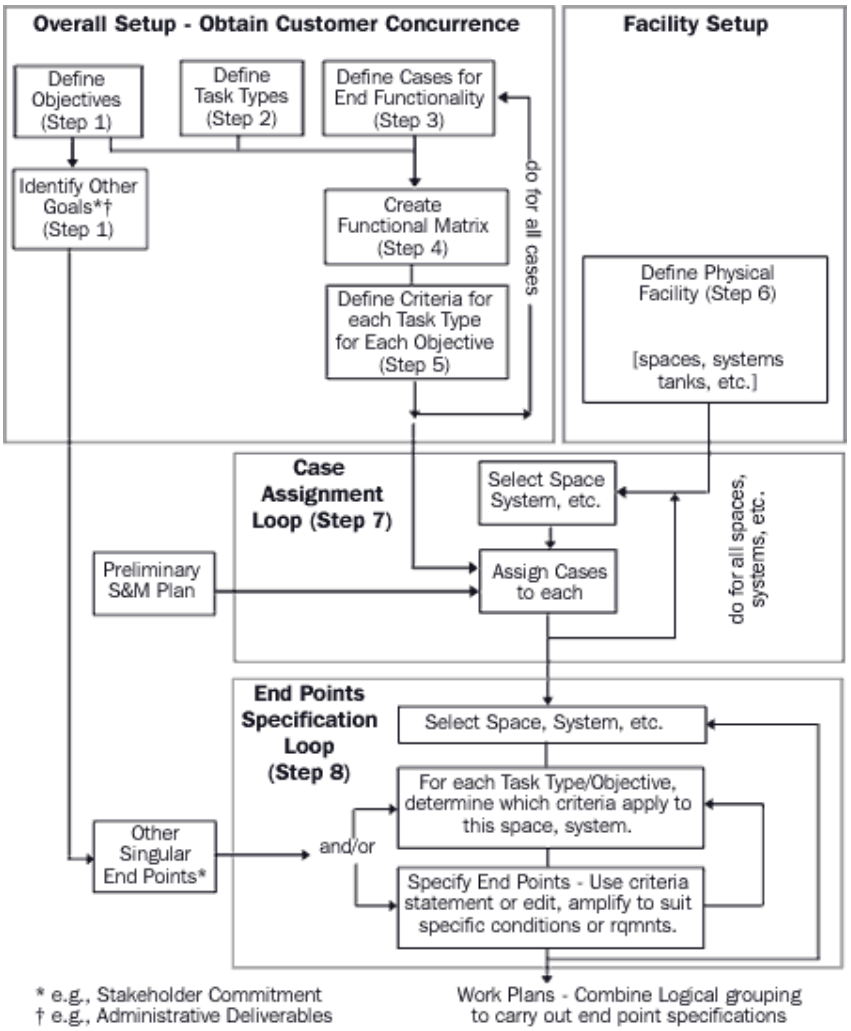
Objective 5: Following Through on Commitments to Stakeholders

As a condition of deactivation, commitments will be made to stakeholders related to issues such as NEPA, potential for economic development, safety bases, and work force re-deployment. Commitments that affect deactivation activities must be identified, carried out, and documented as part of the end-points. While many of these will be inherent in the establishment of other end-points, unambiguous identification of the requirements and documentation of compliance with such commitments is necessary.

In accordance with constraints stated in the guiding principles, these five objectives above must be achieved:

- in a cost effective, economically feasible manner;
- with no research to be required; and
- with development, where appropriate, constrained by schedule to adapting existing technology.

The following figure expands the detail shown previously.



Expanded Detail of the Hierarchical Method

An important simplifying aspect (in terms of reducing paper) gained from experience is shown in this figure as "Identify Other Goals" which leads to "Other Singular End-Points." Experience has shown that the first four objectives above have an effect on specified end conditions for much of the physical facility's spaces and systems, while the fifth (Following Through on Commitments to Stakeholders) only directly affects a few. In the case of PUREX, for example, the fifth objective mostly affected chemicals in tanks. Therefore, while this fifth objective is equally important, since it affects very few of the detailed end-points, it is applied at a lower level of the process, as explained later. This avoids substantial non-useful paperwork.

Other facilities may have additional top-level objectives in addition to these. For example, turning the facility over for economic development could very well result in an objective of "Prepare Facility for Unrestricted Use" (for example, at Mound) or "Restricted Use" (for example, the Beryllium shop at Rocky Flats). When the method is set up, additional objectives should be defined early. In addition, if any one objective is anticipated to only affect a very limited portion of the facility, then for reasons of efficiency in specifying end-points it should be treated as an "Other Goal" as opposed to a general objective. It would be important at that time to identify which parts of the facility are directly affected by these other goals and in what manner.

Step 2 - Task Types

Since carrying out of the end-point specifications results in work plans to achieve those conditions, the method supports the development of work plans by providing a task focus. Defining a series of tasks that take the facility from its existing condition to its deactivated condition supports work plan definitions.

The task areas used at several facilities for deactivation include:

1) Elimination or reduction of hazards
2) Dealing with radiation fields (elimination, shielding or isolation)
3) Reducing contamination and preventing its spread
4) Removal and disposing of waste
5) Isolation and containment of residual, potentially hazardous materials or conditions
6) Providing capability for ongoing monitoring and control of the facility
7) Additional facility modification or refurbishment to support future work (during S&M or decommissioning)
8) Documentation and labeling

While this list is fairly generic and covers a wide range of activities, other facilities may find it convenient to define additional tasks. For example, if a manufacturing type facility has a large number of machine tools to be disposed of, this activity could be added as a type of task.

Referring to **Deactivation Management** and the discussion of "Early Decisions," any facility is likely to have major activities that must be conducted as part of the overall preparation for deactivation. These should be treated as separate sub-projects and *should not be included in the generic task list for end-point specification* because they each have an importance that should not be submerged in the end-point procedures. An example here would be a campaign to process any remaining highly radioactive liquid waste; or, removal of the remaining special nuclear material, or nuclear fuel after transition activities have been completed by the operating program as required by DOE O 430.1A, *LIFE CYCLE ASSET MANAGEMENT*

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Step 3 - Cases for Equipment and Space End Use and Access

End-Points deal primarily with the final deactivation end state of the physical facility. Many different types of facilities exist in the DOE complex including nuclear reactors, chemical processing plants, fuel and waste storage systems and holding areas, treatment plants, and administration buildings. This step in end-points development distinguishes the facility by combinations of physical characteristics *and* the end functionality; that is, what the use and access requirements are to be.

The six (6) cases generally utilized include:

1) Internal spaces for which routine access will be required - These are spaces inside buildings where access will be required for periodic surveillance and maintenance or for operation of equipment needed to preserve the deactivated condition.
2) Internal spaces for which access is not expected - These are spaces inside buildings that will almost never be entered; or entry will be sufficiently infrequent that to do so will require appropriate precautions (for example,

radiation survey, noxious gas sampling, portable lights, ventilation, protective clothing, breathing apparatus).

3) External spaces including building exterior envelopes - These are the directly surrounding areas and outbuildings that are associated with the facility that have a direct interface with the environment. It also includes building envelope integrity items such as roof, seals/covers on roof and walls, fences, etc.
4) Systems/equipment that must be kept operational - Equipment and systems that must remain operational to support ongoing surveillance and maintenance. These can be existing systems in the facility as well as ones added for the S&M period. Examples include portions of:
   - Electrical for lighting and support of other equipment that remains operational, possibly also for monitoring instruments.
   - Ventilation exhaust systems for purposes of purging spaces before personnel entry, and also possibly for contamination control. Maintaining operating capability does not necessarily mean continuously operating.
   - Fire detection and alarm, possibly fire extinguishers. Depends on the hazard and burnable materials presence.
   - Flood control - for removal of rain or ground water in leakage. Could include sump pumps, sump level alarms, and flood doors.
5) Systems/equipment to be mothballed (i.e., suitable for later refurbishment and operation) - Equipment and systems for which it has been decided there is a potential or actual use for future decommissioning activities. Examples include cranes, ventilation, radioactive waste processing systems, and tanks for staging radioactive waste.
6) Systems/equipment to be abandoned in place - Equipment and systems that no longer have any use. This would generally be the majority of the systems in the facility.

These six cases are used to further describe the method.

Examples of other types of classification that might be part of another deactivation are:

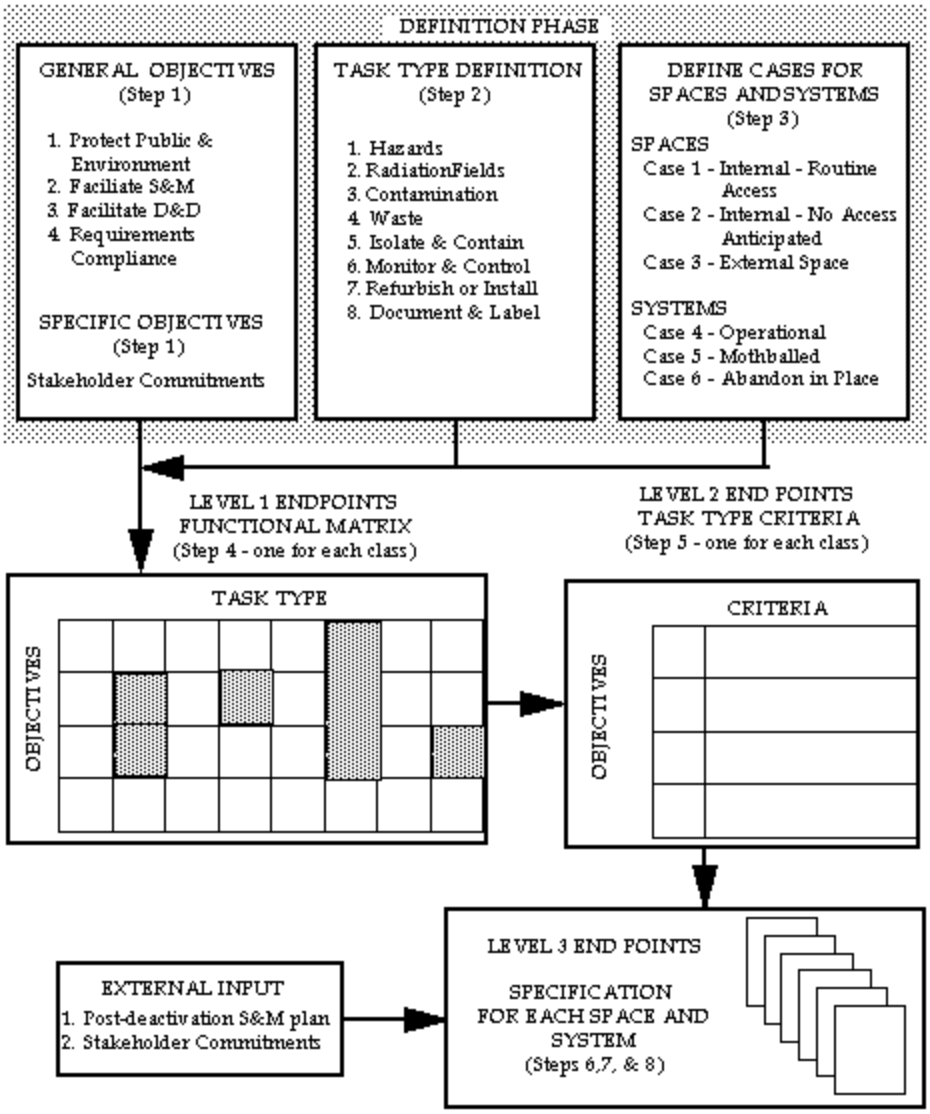
- Portions of facilities to remain operational - Could address situations where a room or area within a facility remains operational for support of some program. Note that this should be subject to an early decision as it can have a major influence on what is done with the rest of the facility.
- Re-use of buildings - Buildings which may have economic value and for which it has been decided that some activity should be spent to realize the value. Note: this should be subject of early decisions.

Development of the method initially considered a classification of "systems/equipment to be removed." However, this proved to be illogical because after removal it would not be part of the facility and thus not relevant to end-points. Therefore, removal where appropriate merely becomes part of the work plan. (Unless removal is a major project, in which case it is likely to be one of the "early decisions" referred to above and would be a stand-alone project separate from end-points work.)

Classification is one area of setup that may be modified as the end-points team proceeds into the process. They may find that additional classifications are needed, or that two can be combined. It is recommended that the number of classes be limited in order to keep the process straightforward. Six have worked well. More than 10 would be unwieldy.

Specification Phase

After the definition phase (Steps 1, 2, 3) is complete, it is followed by the steps to specify end-points. Results of the first three steps are shown in the following figure.



Proceeding from the Definition Phase

This is followed by three levels for specifying detailed end-points, of which the first two are still part of the setup. The sequence is as follows:

- Level 1 (Step 4) - Functional Matrix
- Level 2 (Step 5) - End-Point Criteria
- Level 3 (Steps 6, 7, 8) - End-Points

Step 4 - Level 1 - Functional Matrix

For each of the spaces/systems classifications of end functionality, a simple functional matrix is used to designate the types of tasks necessary to achieve the facility objectives and in that way, specifies in general where end-points are needed at a first level. Since the example here has six classifications, six matrices are needed. These are shown in Case 1 through Case 6 Functional Matrices below.

The following legend for the matrix cells is general and should be useful for many facilities. Adding any number of additional symbols and explanations can accommodate special variations for a facility.

Legend for Functional Matrices

Shaded	Not Applicable: Those tasks that do not directly support a particular end-point objective.
*	Primary Considerations: Those tasks, which due to the objectives they support, will likely be the controlling factor in setting the end-point.

X Secondary Considerations: Those tasks, which due to the objectives they support, will not likely be the controlling factor in setting the end-point, but must be considered.

A As Applicable: Indicates that when an established regulation or requirement applies to a particular task area, an end-point shall be specified to conform (and the reference requirement will be cited).

† Commitment to Stakeholder: Indicates a specific end-point results from a commitment that is specified by agreement.

The end-points for each unshaded cell of a matrix are applicable to every instance of occurrence in the facility for that case. For example, if there are 12 rooms in the facility designated Case 1 (internal spaces, routine access required); the criteria that are subsequently derived for that cell in the matrix would apply to all 12.

Variations from these matrices for other facilities will depend on the degree of similarity of the definitions of objectives, task types, and cases for end functionality. Many facilities should be able to use these functional matrices as a starting point.

Case 1 Functional Matrix: Internal Spaces, Routine Access Required

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment	*				*	*		
Facilitate S&M - Protect Workers - Reduce Cost	*	*	*			*	*	*
Facilitate Decommissioning	X	X	X	X				*
Comply with Regulations & Requirements	A	A	A	†*				†A

Case 2 Functional Matrix: Internal Spaces, No Access Expected

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment	*				*	*		
Facilitate S&M - Protect Workers - Reduce Cost	*				*	*		
Facilitate Decommissioning	X	X	X	X				*
Comply with Regulations & Requirements	A	A	A	*				A

Case 3 Functional Matrix: External Spaces, Including Building Exterior Envelope

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment	*		*		*	*		
Facilitate S&M - Protect Workers - Reduce Cost	*	*	*		*		*	*
Facilitate Decommissioning	X	X	X	X				*
Comply with Regulations & Requirements	A	A	A	*	A	*		A

Case 4 Functional Matrix: System, Operational

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment	*					*	*	
Facilitate S&M - Protect Workers - Reduce Cost	*	*	*		*	*	*	*
Facilitate Decommissioning								
Comply with Regulations & Requirements	A	A	A	*		*	A	A

Case 5 Functional Matrix: System, Mothballed

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment					*			
Facilitate S&M - Protect Workers - Reduce Cost		*	*					
Facilitate Decommissioning	*				*		*	*

Comply with Regulations & Requirements	**A**	**A**	**A**	*****				**A**

Case 6 Functional Matrix: System, Abandoned in Place

Objectives	Task Types							
	1	2	3	4	5	6	7	8
	HAZARDS - Nuclear and Non-Nuclear - Eliminate or Reduce	RADIATION FIELDS - Reduce, Shield, or Isolate	CONTAMINATION - Reduce or Mitigate - Prevent Future Spread	WASTE - Remove & Dispose - Permit	ISOLATE & CONTAIN	MONITOR & CONTROL - Provide Capability	REFURBISH or INSTALL - Required S&M Capabilities	DOCUMENT & LABEL - Equipment - Facilities
Protect Public & Environment	*****				*****			
Facilitate S&M - Protect Workers - Reduce Cost	*****	*****	*****		*****			*****
Facilitate Decommissioning								*****
Comply with Regulations & Requirements	**A**	**A**	**A**	*****				**A**

Step 5 - Level 2 - End-Point Criteria

From the results of Step 4, end-point criteria are written or listed in more specific terms. These can be explicit quantitative requirements, functional work activities, or references to standard requirements.

Examples of Detailed End-Point Criteria contains a complete set of example criteria applicable to the six matrices.

Note also that the criteria statements *can* become the end-point statements when Steps 6, 7, and 8 are conducted. Thus, except when there are special considerations for specific spaces, systems, or equipment, what the end-point should be is inherently specified.

Also, as part of the end-point development process, when facility generic deactivation issues were identified (for example, appropriate radiation or contamination posting requirements), their resolutions were documented in the form of End-Point Technical Information (EPTIs) for later reference and consistent application throughout the project.

End-Point specifications for other facilities will also need to provide a record of the generic technical bases that have been used for deriving end-points, regardless of whether they are called "EPTIs."

Steps 6 & 7 - Level 3 - Facility Definition and Case Assignment

Having determined the facility end points in six cases in Step 3, Steps 6, and 7, assign the physical areas and equipment to these cases. The following table is a fictitious example of how this might be done.

Facility Assignment

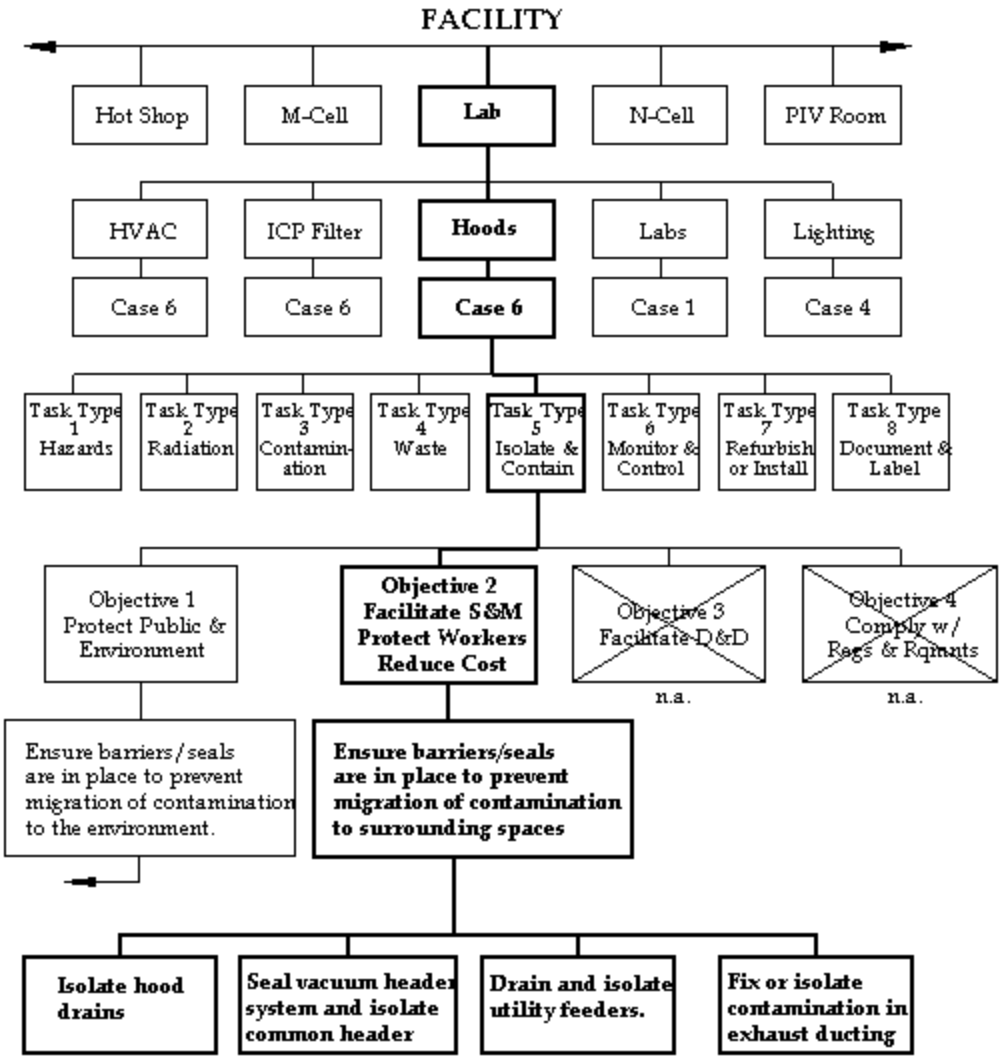
		Case					
		1. Internal Spaces - Routine Access					
			2. Internal Spaces - Access not expected				
				3. External Spaces			
					4. Systems/Equipment Operational		
						5. Systems/Equipment Mothballed	
Facility Area or Equipment (fictitious examples)	**Notes**						6. Systems/Equipment Abandoned
Main Control Room	Process Areas Viewing	X					
Instrument Gallery	Quarterly tour path	X					
Hot Shop			X				
Meteorology Instrument Shed	Remove instruments		X				
Condensate Storage Tank	Drain and vent						X
External Demineralizer Building	Possible use for future decommissioning					X	
Lab Hoods	Contaminated						X
N Cell Glove Boxes	Remove Plutonium to acceptable levels						X
Diesel Generators	Possibly remove						X
Sump Level Detection	Storm water				X		
Sump Pumping	Storm water				X		
Elevator #7	Future Access					X	
HVAC Supply							X
HVAC Main Exhaust	Reduce flow to 25%				X		
HVAC Exhaust HEPA	Verify Need				X		
Local HVAC #1							X

Creating a similar table for other facilities should be straightforward for a large fraction of the facility. Before doing so, some idea of the post-deactivation S&M path for periodic walkthroughs and activities should be decided.

However, for some parts of the facility, a reasoned evaluation may be required before making a case assignment. For example, if ventilation must continue to operate for contamination control during the S&M period, there may be parts of the system that should stay operational, others may require reconfiguration, and the rest abandoned. Another example is that there may be tradeoffs between using existing lighting versus portable lighting, depending on how much of the overall electrical system would have to remain active for the former.

Step 8 - Level 3 - End-Point Specification and Implementation Notes

This step combines the results of Steps 5, 6 and 7 to arrive at the end-points specification for a selected space or system. The following figure shows the complete "vertical" process for laboratory hoods at PUREX that is determined to be a Case 6, "Abandon in Place." In this example, the criteria statement for Task Type 3 is applied as written. If a specific condition within the particular case classification were to warrant additional detail, the criteria statement is expanded accordingly. (This figure is for illustration purposes and is not suggested as part of the end-points method.)



End-Points Specification Path (Example)

The following figure is an example, using the end-points in the bottom row in the path shown above, of an "End Point Completion Format." Forms of this type can be used for generating the end-points document as well as for a record of completion.

Task Type 5 - Isolate & Contain

Objective		End-Point
2. Facilitate S&M, Protect Workers, Reduce Cost	*	Isolate hood drains. Completed: _____ Date: _____ Verified: _____ Date: _____
	*	Seal vacuum header system and isolate common header. Completed: _____ Date: _____ Verified: _____ Date: _____
	*	Drain and isolate utility feeders. Completed: _____ Date: _____

		Verified: _____ Date: _____
	*	Fix or isolate contamination in exhaust ducting. Completed: _____ Date: _____ Verified: _____ Date: _____

End-Points Completion Format

In some cases it may be necessary to determine the cost benefit of certain deactivation activities, and in these cases some type of cost analysis may be performed to determine the most cost-effective end-point. In such cases, the cost analysis should be included in the end-point documentation, as discussed in Chapter 4.

Examples of Detailed End-Point Criteria

Included here are examples used at PUREX for criteria required in the functional matrices described previously. Note in some cases, a task type is not present because the functional matrix indicated no need for a criterion.

Case 1 Criteria - Internal Spaces, Routine Access Required

Case 1, Task Type 1 - Hazards

Objective	Criteria	
Protect Public & Environment	*	Remove unattached combustible materials to reduce the fire hazard.
Facilitate S&M • Protect Workers • Reduce Cost	*	Reduce remaining Special Nuclear Material (SNM) to mitigate criticality concerns and allow termination of SNM accountability. Electrically de-energize equipment and deactivate instrumentation unless otherwise stated. Leave remaining dangerous materials in a state and/or location where they pose no threat to the environment or human health.
Facilitate Decommissioning	X	Resolve serious threats now (That is, an existing situation is a serious hazard during decommissioning work, but mitigation is not strictly required for S&M. It may be a prudent decision to reduce the hazard regardless.).
Comply with Regulations & Requirements	A	Fire protection/detection will be determined in the FHA. Document compliance with the "Hazardous Communication Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 1, TaskType 2 - Radiation Fields

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum general dose rates for Case 1 surveillance corridors are provided (for current contaminated areas) in the End-Point (Level III). These end-points were established based on starting/current dose rates and the use of ALARA, ALEA and reasonable best effort principles. Dose rates outside the surveillance corridor may exceed these levels. Post "Hot Spots" (>5 times general area **and** >100 mRem/hr) as defined in *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2 (Ref. EPTI #4).
Facilitate Decommissioning	X	Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Remove temporary radiological zones. Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 1, TaskType 3 - Contamination

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum removable contamination levels for Case 1 surveillance corridors are provided (for current contaminated areas) in the End-Point (Level III). These end-points were established based on starting/current contamination levels and the use of ALARA, ALEA and reasonable best effort principles. Contamination levels outside the surveillance corridor may exceed these levels. Include survey requirements as part of the turnover package to verify containment of radioactive contamination.
Facilitate Decommissioning	X	Remove/fix/contain source material to mitigate contamination migration using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2 (Ref. EPTI #4).

Case 1, TaskType 4 - Waste

Objective	Criteria	
Facilitate Decommissioning	X	House keep and remove unattached material/equipment using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	*	Remove emergency lantern batteries and fire extinguishers. Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.
Meet Commitments to Stakeholders	**A**	Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.

Case 1, TaskType 5 - Isolate & Contain

Objective	Criteria	
Protect Public & Environment	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment.

Case 1, TaskType 6 - Monitor & Control

Objective	Criteria	
Protect Public & Environment	*	Meet the requirements for Internal facility radiological monitors and air sampling capabilities in WHC-SD-SQA-TA-20004, *Technical Assessment of Compliance with Work Place Air Sampling Requirements at the PUREX Facility*, Rev 1, (Ref. EPTI #5). These requirements will be modified throughout the transition phase. Deactivate sump monitoring since fluid sources (water and steam) will be isolated from the facility.
Facilitate S&M • Protect Workers • Reduce Cost	*	Surveillance lighting and convenience electrical receptacles are addressed in Case 4.

Case 1, Task Type 7 - Refurbish or Install

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	No common criteria.

Case 1, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Document identified space industrial hazards for inclusion in the turnover package.
Facilitate Decommissioning	*	Provide turnover package.
Comply with Regulations & Requirements	A	Document space dose rates and contamination levels in the final radiological survey report and map per *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 5, Rev 2 (Ref. EPTI #6) for inclusion in the turnover package.
Meet Commitments to Stakeholders	A	Document amount and location of remaining hazardous substances/dangerous wastes.

Case 2 Criteria - Internal Spaces for Which Access is Not Expected

Case 2, Task Type 1 - Hazards

Objective	Criteria	
Protect Public & Environment	*	Remove unattached combustible materials to reduce the fire hazard.
Facilitate S&M • Protect Workers • Reduce Cost	*	Reduce remaining Special Nuclear Material (SNM) to mitigate criticality concerns and allow termination of SNM accountability. Electrically de-energize equipment and deactivate instrumentation unless otherwise stated.
Facilitate Decommissioning	**X**	Resolve serious threats now.
Comply with Regulations & Requirements	**A**	Fire protection/detection will be determined in the FHA. Document compliance with the "Hazardous Communication Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 2, Task Type 2 - Radiation Fields

Objective	Criteria	
Facilitate Decommissioning	**X**	Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Remove temporary radiological zones. Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 2, Task Type 3 - Contamination

Objective	Criteria	
Facilitate Decommissioning	**X**	Remove/fix source material to mitigate contamination migration using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2 (Ref. EPTI #4).

Case 2, Task Type 4 - Waste

Objective	Criteria	
Facilitate Decommissioning	**X**	House keep and remove unattached material/equipment using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	*****	Remove emergency lantern batteries and fire extinguishers. Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.
Meet Commitments to Stakeholders	**A**	Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.

Case 2, Task Type 5 - Isolate & Contain

Objective	Criteria	
Protect Public & Environment	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment.
Facilitate S&M • Protect Workers • Reduce Cost	*	Place postings at entrances to prevent unintentional/unauthorized access. Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the surrounding space.

Case 2, Task Type 6 - Monitor & Control

Objective	Criteria	
Protect Public & Environment	*****	Meet the requirements for Internal facility radiological monitors and air sampling capabilities in WHC-SD-SQA-TA-20004, *Technical Assessment of Compliance with Work Place Air Sampling Requirements at the PUREX Facility*, Rev 1, (Ref. EPTI #5). These requirements will be modified throughout the transition phase. Deactivate sump monitoring since fluid sources (water and steam) will be isolated from the facility.
Facilitate S&M • Protect Workers • Reduce Cost	*	Surveillance lighting and convenience electrical receptacles are addressed in Case 4.

Case 2, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate Decommissioning	*	Provide turnover package. Document identified space industrial hazards for inclusion in the turnover package.
Comply with Regulations & Requirements	**A**	Document space dose rates and contamination levels in the final radiological survey report and map per *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 5, Rev 2 (Ref. EPTI #6) for inclusion in the turnover package.

Meet Commitments to Stakeholders	**A**	Document amount and location of remaining hazardous substances/dangerous wastes.

Case 3 Criteria - External Spaces Including Building Exterior Envelopes

Case 3, Task Type 1 - Hazards

Objective	**Criteria**	
Protect Public & Environment	*	Remove unattached combustible materials to reduce the fire hazard.
Facilitate S&M • Protect Workers • Reduce Cost	*	Reduce remaining Special Nuclear Material (SNM) to mitigate criticality concerns and allow termination of SNM accountability. Electrically de-energize equipment and deactivate instrumentation unless otherwise stated. A limited structural analysis will be conducted to verify structural integrity for a minimum of five (5) years.
Facilitate Decommissioning	X	Resolve serious threats now.
Comply with Regulations & Requirements	**A**	Fire protection/detection will be determined in the FHA. Document compliance with the "Hazardous Communication Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 3, Task Type 2 - Radiation Fields

Objective	**Criteria**	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum general dose rates for Case 3 surveillance corridors are provided (for current contaminated areas) in the End-Point (Level III). These end-points were established based on starting/current dose rates and the use of ALARA, ALEA and reasonable best effort principles. Dose rates outside the surveillance corridor may exceed these levels. Post "Hot Spots" (>5 times general area **and** >100 mRem/hr) as defined in *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2.
Facilitate Decommissioning	X	Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Remove temporary radiological zones. Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 3, Task Type 3 - Contamination

Objective	Criteria	
Protect Public & Environment	*	Remove/fix source material using the "Reasonable Best Effort" methodology. Include survey requirements as part of the turnover package to verify containment of radioactive contamination.
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum removable contamination levels for Case 3 surveillance corridors are provided (for current contaminated areas) in the End-Point (Level III). These end-points were established based on starting/current dose rates and the use of ALARA, ALEA and reasonable best effort principles. Contamination levels outside the surveillance corridor may exceed these levels.
Facilitate Decommissioning	X	Remove/fix source material to mitigate contamination migration using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2 (Ref. EPTI #4).

Case 3, Task Type 4 - Waste

Objective	Criteria	
Facilitate Decommissioning	X	House keep and remove unattached material/equipment using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	*	Remove emergency lantern batteries and fire extinguishers. Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.
Meet Commitments to Stakeholders	**A**	Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.

Case 3, Task Type 5 - Isolate & Contain

Objective	Criteria	
Protect Public & Environment	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment. Post space access points to prevent unintentional/unauthorized access.
Facilitate S&M • Protect Workers • Reduce Cost	*	Assess roof integrity for the prevention of in-leakage for a minimum of five (5) years. Include studies in the turnover package. Leave remaining dangerous materials in a state and/or location where they pose no threat to the environment or human health.
Comply with Regulations & Requirements	**A**	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment.
Meet Commitments to Stakeholders	**A**	Same as above.

Case 3, Task Type 6 - Monitor & Control

Objective	Criteria	
Protect Public & Environment	*	The environmental monitoring program (PUREX area dog houses) will continue to comply with defined guidance and requirements. This item is supplied for information only as it is outside the control of the PUREX facility. Deactivate sump monitoring since fluid sources (water and steam) will be isolated from the facility.
Comply with Regulations & Requirements	*	Same as above.

Case 3, Task Type 7 - Refurbish or Install

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Refurbish facility as required by the structural and roof integrity studies. Install physical barrier to prevent unintentional/unauthorized access.

Case 3, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Document identified space industrial hazards for inclusion in the turnover package. Verify ancillary building identifications are clearly posted on the exterior of the building.
Facilitate Decommissioning	*	Provide turnover package.
Comply with Regulations & Requirements	**A**	Document space dose rates and contamination levels in the final radiological survey report and map per *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 5, Rev 2 (Ref. EPTI #6) for inclusion in the turnover package.
Meet Commitments to Stakeholders	**A**	Document amount and location of remaining hazardous substances/dangerous wastes.

Case 4 Criteria - Systems/Equipment Which Must be Kept Operational

Case 4, Task Type 1 - Hazards

Objective	Criteria	
Protect Public & Environment	*	Reduce remaining Special Nuclear Material (SNM) to mitigate criticality concerns and allow termination of SNM accountability.
Facilitate S&M • Protect Workers • Reduce Cost	*	Leave remaining dangerous materials in a state and/or location where they pose no threat to the environment or human health.

Comply with Regulations & Requirements	**A**	Document compliance with the "Hazardous Communication Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual*, Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 4, Task Type 2 - Radiation Fields

Objective	**Criteria**	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum general dose rate levels are defined in the Space where the system is located. Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	**A**	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 4, Task Type 3 - Contamination

Objective	**Criteria**	
Facilitate S&M • Protect Workers • Reduce Cost	*****	Remove/fix source material to mitigate contamination migration using the "Reasonable Best Effort" methodology. Maximum removable contamination levels are defined in the Space where the system is located.
Comply with Regulations & Requirements	**A**	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 4, Task Type 4 - Waste

Objective	**Criteria**	
Comply with Regulations & Requirements	*****	Identify accumulation areas for waste generated by operational systems and include in the turnover package (i.e. general waste awaiting characterization and designation).

Case 4, Task Type 5 - Isolate & Contain

Objective	**Criteria**	
Facilitate S&M • Protect Workers	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the surrounding space.

• Reduce Cost		

Case 4, Task Type 6 - Monitor & Control

Objective	Criteria	
Protect Public & Environment	*	No general criteria.
Facilitate S&M • Protect Workers • Reduce Cost	*	Furnish surveillance lighting and convenience electrical receptacles.
Comply with Regulations & Requirements	*	The environmental monitoring program (PUREX area dog houses) will continue to comply with defined guidance and requirements. This item is supplied for information only as it is outside the control of the PUREX facility. Define system calibration and preventive maintenance requirements. Define system discharge monitoring/instrumentation requirements.

Case 4, Task Type 7 - Refurbish or Install

Objective	Criteria	
Protect Public & Environment	*	Consolidate the 202-A exhaust ventilation to a single system for contamination control. Provide system spare parts inventory listing.
Facilitate S&M • Protect Workers • Reduce Cost	*	Same as above
Comply with Regulations & Requirements	A	Newly installed electrical distribution will be in accordance with NEC requirements.

Case 4, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Post-operational system. Provide turnover package.
Comply with Regulations & Requirements	A	Define instrumentation reading frequency for inclusion in the turnover package. Document amount and location of remaining hazardous substances/dangerous wastes.
Meet Commitments to Stakeholders	A	Document amount and location of remaining hazardous substances/dangerous wastes.

Case 5 Criteria - Systems/Equipment to be Mothballed

Case 5, Task Type 1 - Hazards

Objective	Criteria	
Facilitate Decommissioning	*	Electrically de-energize equipment and deactivate instrumentation unless otherwise stated. Drain liquids not required for preservation from accessible equipment using "Good Management Practices."
Comply with Regulations & Requirements	A	Document compliance with the "Hazardous Communication Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual*, Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 5, Task Type 2 - Radiation Fields

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum general dose rate levels are defined in the Space where the system is located. Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	A	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 5, Task Type 3 - Contamination

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum removable contamination levels are defined in the Space where the system is located. Remove/fix source material to mitigate contamination migration using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	A	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 5, Task Type 4 - Waste

Objective	Criteria	
Comply with Regulations & Requirements	*	Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.

Meet Commitments to Stakeholders	**A**	Same as above.

Case 5, Task Type 5 - Isolate & Contain

Objective	Criteria	
Protect Public & Environment	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment.
Facilitate Decommissioning	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the surrounding space.

Case 5, Task Type 7 - Refurbish or Install

Objective	Criteria	
Facilitate Decommissioning	*	Provide protective measures to inhibit further equipment degradation permitting refurbishment for decommissioning.

Case 5, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate Decommissioning	*	Document system lay-up. Include system restart and preventive maintenance procedures as part of the turnover package. Label mothballed equipment. Provide turnover package.
Comply with Regulations & Requirements	A	Document amount and location of remaining hazardous substances/dangerous wastes.
Meet Commitments to Stakeholders	A	Same as above.

Case 6 Criteria - Systems/Equipment to be Abandoned in Place

Case 6, Task Type 1 - Hazards

Objective	Criteria	
Protect Public & Environment	*	Reduce remaining Special Nuclear Material (SNM) to mitigate criticality concerns and allow termination of SNM accountability.
Facilitate S&M • Protect Workers • Reduce Cost	*	Electrically de-energize equipment and deactivate instrumentation unless otherwise stated. Leave remaining dangerous materials in a state and/or location where they pose no threat to the environment or human health. Drain liquids from accessible equipment using "Good Management Practices."
Comply with	A	Document compliance with the "Hazardous Communication Program"

Regulations & Requirements		as defined in WHC-CM-4-40, *Industrial Hygiene Manual*, Section 2.1, Rev. 0 (Ref. EPTI #1) for inclusion in the turnover package. Document compliance with the "Asbestos Control Program" as defined in WHC-CM-4-40, *Industrial Hygiene Manual* , Section 2.3, Rev. 0 (Ref. EPTI #2) for inclusion in the turnover package. Document compliance with "Confined Space Entry" in accordance with WHC-CM-4-40, *Industrial Hygiene Manual* , Section 3.1, Rev. 1 (Ref. EPTI #3) for inclusion in the turnover package.

Case 6, Task Type 2 - Radiation Fields

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum general dose rate levels are defined in the Space where the system is located. Remove/Shield source material to mitigate radiation exposure using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	A	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 6, Task Type 3 - Contamination

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Maximum removable contamination levels are defined in the Space where the system is located. Remove/fix source material to mitigate contamination migration using the "Reasonable Best Effort" methodology.
Comply with Regulations & Requirements	A	Post radiological conditions in accordance with *Hanford Site Radiological Control Manual* (HSRCM-1), Chapter 2, Rev 2, (Ref. EPTI #4).

Case 6, Task Type 4 - Waste

Objective	Criteria	
Comply with Regulations & Requirements	*	Remove/dispose of radioactive, dangerous, and mixed wastes in accordance with approved waste handling procedures.
Meet Commitments to Stakeholders	A	Vessels are broken down into three categories as follows: • TSD, Identified in Part A Permit - Flush until final system flush designates as non-dangerous per RCRA protocol sampling. Empty to minimum heel. • Non TSD, that can be emptied or are empty - Empty • Non-TSD, that can not be emptied - Flush until identified sample analysis requirements are met and empty to minimum heel.

		- Identify, by way of process knowledge, the contents of the vessel and state it in the comment column of the table. Empty to minimum heel. A table listing each tank category with any flush and sampling requirements is attached. Specific tank listings are in Level 3 specific system requirements.

Case 6, Task Type 5 - Isolate & Contain

Objective	Criteria	
Protect Public & Environment	*	Ensure engineered barriers/seals are in place to prevent migration of both hazardous and radioactive contamination to the environment.
Facilitate S&M • Protect Workers • Reduce Cost	*	Same as above.

Case 6, Task Type 8 - Document & Label

Objective	Criteria	
Facilitate S&M • Protect Workers • Reduce Cost	*	Label "Abandoned in Place" system.
Facilitate Decommissioning	*	Provide turnover package.
Comply with Regulations & Requirements	A	Document amount and location of remaining hazardous substances/dangerous wastes.

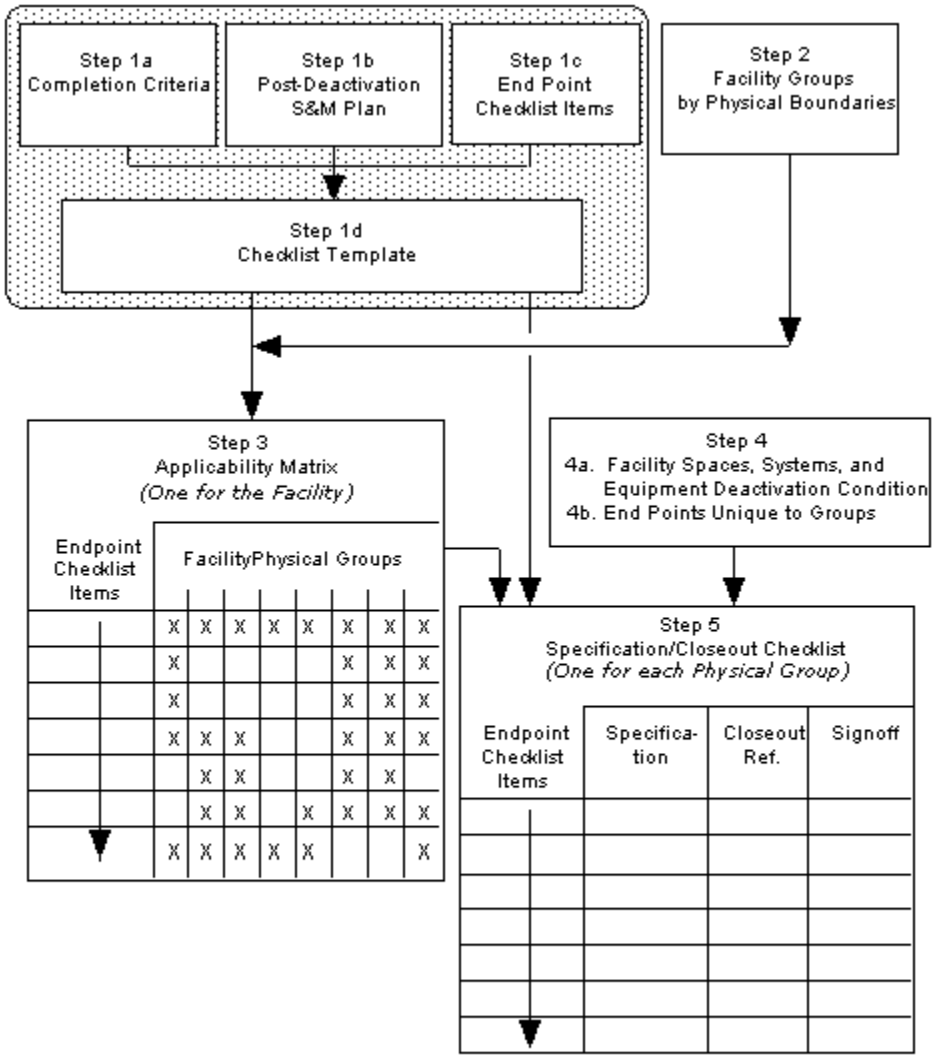
Checklist End-Points Method

Managers of facility deactivation projects can consider use of a checklist method for endpoints. The checklist method is consistent with a tailored approach to planning, in which the level of detail is appropriate to the complexity and risks of the project. This approach is suitable for facilities that are basically industrial buildings, relatively uncontaminated, and without substantive process systems. However, other considerations may favor use of a checklist method (See **End Points Management**).

Each project should create its own checklist, or set of checklists, specific to the facility. The examples in this chapter provide a starting point. In creating checklists for use in the field, when writing specific checklist items, it is *very important to be careful about using absolute statements* which include terms such as "all", or "no remaining", etc. It is much better to have agreement on a reasonable condition and/or some reference criteria that will depend on the use and condition of the facility that will follow deactivation.

Setting up an End-Points Checklist

The steps for setting up an end-points checklist are illustrated in the following figure. Taken together, they create a checklist template and combine it with a physical definition of the facility to develop a specific checklist for each part of the facility that can be logically deactivated as a unit.



Checklist Setup

Step 1 - Checklist Template

The first step in the checklist method is to create a template that will be applied to all the groupings by physical boundaries in the facility.

The template requires three types of input:

- Completion Criteria
- S&M Planning
- Typical Checklist Items

"Physical boundaries" refer to, for example:

- A room, a set of rooms, or a whole building, or an area.
- A system, a collection of systems, a tank, a collection of tanks, or tank(s) and connected systems.
- Anything else convenient for work management.

Step 1a - Completion Criteria

The first step is to reach agreement with the receiving organization regarding the status of the facility when deactivation is complete. Starting with the overall expectations, a more specific set of objectives can be developed such as in the Table 1 below.

Table 1 - Checklist Method Completion Criteria

1. **Post-Deactivation Access and S&M Preparation** - a quarterly routine inspection of the facility is conducted to ensure nothing has changed significantly. Equipment, such as lights and exhaust fans, will be operational to support this S&M routine. (See **Table 2**)
2. **Facility Structure** - Structural integrity will be such that: 1) inspection personnel are safe, and 2) contamination or hazardous materials remaining in the facility are contained or have been stabilized against release. Note; the S&M plan may call for a structural integrity inspection, such as for the roof and bearing walls, much less frequently than quarterly. (See **Table 3**)
3. **Waste and Liquid Effluents** - Loose materials will have been removed to the extent practical. The only liquids remaining are minor quantities that cannot be readily removed with installed equipment. (See **Table 4**)
4. **Personnel Safety** - The safety of inspection personnel are safeguarded by stable conditions, postings, and written procedures. (See **Table 5**)
5. **Process Systems and Equipment** - Process systems and equipment have been abandoned in place, isolated or sealed off for safety of future personnel, or removed where there is a compelling reason to do so. (See **Table 6**)
6. **Service and Utility Systems and Equipment** - Only systems required to support S&M and maintain the stable condition (such as lighting, exhaust ventilation, sump pumps, etc.) are operational. Equipment that has been judged to be valuable for future decommissioning (such as elevators or cranes) in a few limited cases has been mothballed for future use. Other utility systems have been abandoned in place, isolated or sealed off for safety of future personnel, or removed where there is a compelling reason to do so. (See **Table 7**)
7. **Radiation Protection** - Is established in accordance with standard procedures. In particular, the S&M walk-through path will have been subjected to ALARA review. Contamination remaining in the facility is contained in limited areas or has been stabilized against release. (See **Table 8**)
8. **Nuclear Materials** - Special nuclear material and nuclear fuel have been removed. Residual fissile material is reduced to the level such that criticality cannot occur. (See **Table 9**)
9. **Hazardous Materials** - Hazardous materials and chemicals have been removed in accordance with environmental regulations. Where feasible, RCRA closure will have been achieved for listed materials. Hazardous materials remaining in the facility are contained in limited areas or have been stabilized against release. Documentation of the amount and location of remaining hazardous material is complete. (See **Table 10**)
10. **Housekeeping and Miscellaneous Materials** - Classified and valuable materials are removed. Trash, furniture, and other loose equipment will have been removed. (See **Table 11**)

Step 1b - Preliminary Post-Deactivation S&M Plan

An important consideration for the deactivation end state of the facility should be the support for the post-deactivation surveillance and maintenance activities, with special emphasis on worker, public, and environmental safety. Therefore, some degree of planning is required for input to the checklist items. (See **Post Deactivation Surveillance and Maintenance**). Again, a tailored approach can be used and the S&M plan could be centered on its own checklist with associated procedures and referenced practices.

Step 1c - End-Point Checklist Items

Specific checklist items are needed for input. The examples of Tables 2 through 11 can be used as a starting point. Examples that have been used by others are provided later. The tables and the example checklist were both derived from draft EM criteria published around 1993, although the tables are somewhat more comprehensive as they have factored in experience gained since then.

Step 1d - Checklist Template for the Facility

Using the completion criteria, the preliminary S&M plan, and example checklist items, a facility generic checklist *Template* is created. "Generic" means without regard to the specifics that might apply to the physical grouping of the facility. The 36 items in Part A of the example checklist shown later provide an example of such a Template.

Step 2 - Facility Groups by Physical Boundaries

Eventually a separate checklist will be created and applied to each of several areas in the facility. This step is to decide how the facility is to be divided up for this purpose. The bases for such grouping can include, for example:

- Physical boundaries, such as walls, rooms, buildings, etc.
- Systems or equipment, tanks, pools, etc.
- Logical work areas

Step 3 - Create an Applicability Matrix

This step is to decide which parts of the Template apply to each physical group. (An example is provided in Table 15.) Each row of the matrix is one of the checklist items determined in Step 1. The first column of the matrix is the checklist item. The remaining columns are for each physical group decided in Step 2. A check is placed in each cell where the checklist item applies to the group.

In this matrix, columns can also be used *for administrative functions* that apply to the facility as a whole and are not necessarily related to any specific physical boundary.

Step 4 - Specific Considerations

This step is to collect the specific conditions that apply to one or more of the physical groupings and which are used to augment the checklist Template for the appropriate group.

Step 4a - Facility Spaces Systems, and Equipment Deactivation Conditions

Spaces, systems, tanks, etc. should be listed and decisions made with regard to their end condition. Examples of straightforward ways to do this are in **Tables 12** and **13**. The considerations for checking each column in these tables are the same as for the hierarchical method "Case Assignments."

Step 4b - End-Points Unique to Groups

In addition to space and equipment end conditions, there may be other specific end-points that apply to one or more groups. These could be agreements with regulators, exceptions to the general list negotiated with the customer, etc. These should be collected along with notations for references when appropriate. The 4 additional items Part B of the example checklist illustrate this point.

Step 5 - End-Point Specification/Closeout Checklist(s)

Each column of the Applicability Matrix is used to create a separate checklist for each physical group from the generic items. Then the items unique are added as appropriate to each group. *Only one checklist is created for each physical grouping.* Thus, if the facility has 8 physical groups plus an administrative column as shown in the example Applicability Matrix of Table 15, there will be 9 end-point checklists.

Each project should create a format for the individual checklists to suit their needs. The closeout methods in **Deactivation Completion and Turnover** can be adapted to the format. An example format is shown in **Table 14** with randomly selected examples.

Checklist End-Point Examples

Tables 2 through 11 are examples of checklist items that may be used to develop a facility checklist Template.

Table 2 - Post-Deactivation Access and S&M Preparation Checklist Items

End-Point /End-Point Activity	Comment
List and specify deactivated status of each facility space,	See Table 12 for examples.

room, and area.	
Control facility access to preclude personnel entry other than that required for quarterly radiation and other surveys.	
Install and monitor systems needed for surveillance until decommissioning activities commence. Systems should be monitored at stations outside the contaminated facility.	
To the extent appropriate for surveillance, decontaminate/clean external surfaces of canyon vessels and internal surfaces of cells to remove significant radioactive or chemical residues.	This effort should only be conducted if it is essential for safe S&M.
Safeguards and Security systems and procedures shall be adequate to prevent unauthorized entry to any structures at the facility and to protect remaining nuclear and non-nuclear material.	In some cases accountable materials may necessarily remain within the facility after deactivation.
Prepare or update a surveillance and maintenance plan or monitoring plan, including a cost estimate, consistent with final condition of facility at turnover.	This is required for end-point planning, but is not a physical end-point in itself.

Table 3 - Facility Structure Checklist Items

End-Point /End-Point Activity	Comment
Ensure that any structures at the facility and their required systems are structurally sound so as to permit deferred final decommissioning of such structures for up to 5 years after turnover.	Exceptions will be made to this requirement in cases where adequate funding to cover needed repairs can be provided by EM.
Recommend post-5 year inspections; e.g., for roof, drains, structure corrosion.	This may more properly be the responsibility of the post-deactivation S&M organization.

Table 4 - Waste and Liquid Effluents Checklist Items

End-Point /End-Point Activity	Comment
Inventory or remove unattached solid hazardous materials that are stored at the facility.	
Remove liquid hazardous and other chemical inventories that are stored at the facility.	
Terminate liquid effluents - remove all contaminated liquids.	In some cases, "all" may not be appropriate.
Fix in place or remove loose and friable asbestos.	In some cases, this may not be necessary in spaces that are never accessed during the S&M period.

Table 5 - Personnel Safety Checklist Items

End-Point /End-Point Activity	Comment
Conduct Housekeeping.	See Table 11 for examples.
Prevent personnel from utilizing the building and deactivate/clean all personnel support systems (i.e.	Cleaning should be limited to reasonable effort.

offices, bathrooms, lunchrooms, ventilation systems etc.).	
Place any structures at the facility in a safe, secure condition, removing any immediate threats to human health and safety.	Be sure to conduct a roof inspection. Repair or replace if appropriate to the long-term need.

Table 6 - Process Systems and Equipment Checklist Items

End-Point /End-Point Activity	Comment
List and specify deactivated status of each facility process system.	See Table 13 for examples.
Complete activities dependent on plant-specific process, operating, and facilities engineering expertise.	It is important to not leave systems in a state that requires re-start to facilitate ultimate dismantlement.
Complete activities dependent on existing, functional, facility specific equipment that will be inoperable following a decade deactivation period.	It is important to not leave systems in a state that requires re-start of abandoned in place or removed equipment to facilitate ultimate dismantlement.
Flush the internal surfaces of all process and chemical vessels to remove water-soluble chemical and/or radioactive residue. Empty vessels to the degree practicable. Record the amount of residual fluid.	Vessels are flushed and samples are taken until residual does not exhibit dangerous waste characteristics. Vessels are emptied as far as the in place transfer equipment will allow vessel to be emptied. No additional flushes should be performed exclusively for radionuclides; however, flushing to eliminate dangerous waste characteristics also removes product components and radioactivity.
Flush and drain the interior process and chemical piping to remove water-soluble residue.	Pipes are drained or flushed. However, this is performed to empty the pipe. Some water-soluble residues will remain.
Drain all other tanks, vessels, and piping.	
Leave in place, as a general rule, process and utility vessels and utility tanks, and piping systems.	
Remove equipment and tooling from within gloveboxes.	
Seal or otherwise physical isolate flow routes to disposal locations.	

Table 7 - Service and Utility Systems and Equipment Checklist Items

End-Point /End-Point Activity	Comment
List and specify deactivated status of each facility service and utility system.	See Table 13 for examples.
Deactivate, consolidate or cascade the facility Heating Ventilation and Air Conditioning (HVAC) systems so that only the necessary exhaust systems (fans, filters, monitoring and sampling systems) will remain operational.	
Deactivate loss prevention systems and all other electrical systems, retaining only those fire protection systems needed to ensure the integrity of the confinement	Fire protection/detection need can be determined in a revised Fire Hazards Analysis.

structures.	
Identify elevators and cranes for future use. Deactivate those in a manner that will allow future re-activation.	File documentation on information needed to reactivate.
Leave in place, as a general rule deactivated electrical systems. Physically isolate circuits not required for S&M activities.	
Drain, isolate, and abandon building steam and condensate systems.	

Table 8 - Radiation Protection Checklist Items

End-Point /End-Point Activity	Comment
List and specify deactivated status for radiation and radioactive contamination of each facility space, room, and area.	Or use site radiological controls manual.
Paint as required, cell floors that have significant radionuclide retention to coat and fix contamination and minimize migration.	Routinely accessed spaces may require painting/fixative for contamination control. However, painting of spaces where access is not expected (e.g. canyon cells) should not be done.
Remove or stabilize radioactive source terms to reduce risk to a low hazard level in accordance with DOE Order 5480.23.	
Any structure(s) and existing radiation monitoring systems as required, shall be in a physical condition adequate to contain and monitor potential release of any radioactive contamination, in accordance with DOE Order 5400.1 (General Environmental Protection Program.) The most current radiation contamination, hazardous, and toxic materials survey of the facility and surrounding areas shall be provided.	No specific toxic material survey or sampling program need be performed. However, list dangerous materials left in the facility. Spaces where there have been contaminating leaks and spills should be identified. Comprehensive radiological survey maps for the facility should be provided as part of the turnover package.
Ensure that confinement structures are structurally sound and in good repair to contain radioactive materials and preclude rain or snow melt water from intrusion.	Louvers, pipes, vent pipes, hatches, etc.

Table 9 - Nuclear Materials Checklist Items

End-Point /End-Point Activity	Comment
Remove Special Nuclear Material (SNM) to meet less than level Category IV in accordance with DOE Order 5633.3, *Control And Accountability Of Nuclear Materials.*	The goal is to eliminate the need to maintain an SNM inventory.
All nuclear materials, reactor fuels, high-level waste, contaminated liquid wastes, and hazardous chemicals or materials/wastes that are stored at the facility shall be removed from the facility, unless otherwise agreed.	Replace Criticality Safety Operating Limits (CSOLs) and Nuclear Material Safety Limits (NMSLs) with "Exempt Fissile Material Only" limits.
Fissile material in glovebox exhaust systems, including ducts and plenums, shall be evaluated and removal	

decisions made in accordance with the hazard and the ability to stabilize in place.	

Table 10 - Hazardous Materials Checklist Items

End-Point /End-Point Activity	Comment
Collect and dispose of all hazardous materials used for deactivation and cleanup work in accordance with established procedures.	
Remove from facility all unattached hazardous material and dispose of in accordance with established procedures and applicable requirements.	(i.e., lead, mercury, etc.)
Locate, identify, and quantify all hazardous material which is attached and/or contained and cannot be removed without going into a decommissioning mode. Record as part of the shutdown/deactivation file.	
Remove, to the extent possible, all combustible materials.	Should be limited to loose materials or highly flammable materials. For example, do not remove electric cable only because its insulation is potentially burnable.

Table 11 - Housekeeping and Miscellaneous Materials Checklist Items

End-Point /End-Point Activity	Comment
Remove debris in and around the facility.	
Remove non-contaminated office furniture and equipment.	
Remove non-contaminated spare parts, tools, and supplies.	
Remove for other use, as desired, separable capital equipment not in radiological controlled zones.	Must be cost beneficial.
Establish and archive records that will be necessary to reactivate systems/equipment to be used for decommissioning including previous characterization efforts that can support decommissioning.	Include with turnover package.
Remove all classified documents, materials, tools, etc. and downgrade security requirements.	
Remove for disposition non-nuclear material that is valuable and excess.	e.g., precious metals, (gold, silver, platinum) and other valuable pure materials.

Table 12 - Space, Room, and Area Disposition After Deactivation

Identification of Space, Room, Cell, Area	General Status	Post-deactivation Activity		
		Not Restricted	Access for S&M	Infreq. or No Access
Analysis Lab				X
Boiler Room		X		
Entrance Yard	No restrictions	X		

Hot Machine Shop	Decontaminate and remove machine tools			X
Main Control Room	S&M route		X	
Outbuilding Q	View from outside			X
Sample Gallery	Contaminated		X	
Stack Base	S&M route, uncontaminated		X	
Ventilation Corridor	Contaminated			X
Waste Storage Vault			X	
Z Cell	Contaminated			X

Table 13 - System Disposition After Deactivation

System	Comment	Status		
		Operate and Maintain	Preserve, Mothball	Abandon in Place
4 kV Busses	De-energize except for lighting feeders	only lighting		all other
120 V Circuits	Isolate except for lights	only lighting		all other
480 V Busses	De-energize except for lighting feeders & elevator 17	only lighting		all other
Bridge Crane	Useful for future decommissioning		X	
Building X HVAC				X
Building Y HVAC - Exhaust	Needed for contamination control and personnel safety	X		
Building Y HVAC- Supply				X
Chilled Water	Isolate and drain			X
Communications - PA	De-energize			X
Communications - Telephone	De-energize - Remove unattached equipment			X
Condensate Storage Tank	Not contaminated			X
Containment Access Hatch Rails and Jacks	Future access anticipated via this route		X	
Distilled Water	Isolate and drain			X
Elevator 17	Needed for surveillance access	X		
Fire Main	Drain and isolate			X
Floor drains		X		
Fuel storage pool	Remove fuel, drain and apply fixant to surface			X

Gallery Crane	Obsolete - parts hard to find			**X**
Gaseous Radioactive Waste	Disconnect compressor from header			**X**
Instrument Air	Remove desiccant			**X**
Liquid Radioactive Waste	Isolate, cap			**X**
Nitric Acid Supply				**X**
Potable Water	Isolate and drain			**X**
Radiation Monitoring	De-energize			**X**
Sanitary drains	Isolate all fixtures			**X**
Service Air	Remove compressors			**X**
Service Water	Drain and isolate			**X**
Steam	Drain and isolate			**X**
Sump Pumping	Ground water inleakage	**X**		

Table 14 - Format for Final Checklist
(Table contents are arbitrary for purpose of example.)

Index	End-Point Checklist Item	End-Point Specification Statement /Ref.	Closeout Reference	Signoff	
				Deact.	Cust.
1	List and specify deactivated status of each facility space, room, and area. (Table 2)	Checklists prepared, completed and signed off by both organizations.			
14	Ensure that any structures at the facility and their required systems are structurally sound so as to permit deferred final decommissioning of such structures for up to 5 years after turnover. (Table 3)	Roof leaks repaired and suspect areas reviewed.			
		Roof will be inspected within six months of turnover date and necessary repairs made so that further maintenance will not be expected for 5 years.			
26	Drain, isolate, and abandon building steam and condensate systems. (Table 7)	Steam blanked at building main connection outside the building.			
27	Leave in place, as a general rule deactivated electrical systems. Physically isolate circuits not required for S&M activities. (Table 7)	Documentation is available confirming that zero energy checks were made on all de-energized electrical circuits and isolated pressurized systems e.g., water service air, steam, etc. using existing documents to the extent possible.			
		If electrical service is not disconnected by cutting the			

		feed cables, energy status will be documented on energized electrical systems.			
33	Locate, identify, and quantify all hazardous material which is attached and/or contained and cannot be removed without going into a decommissioning mode. Record as part of the shutdown/deactivation file. (Table 10)	Beryllium systems decontaminated and released where possible. Samples will be analyzed and areas where decontamination was not successful will be contained or stabilized and documented.			
		Vaccu-blast dust collector will have dust collection media removed.			
		WATS system components will be cleaned and closed according to RCRA closure plan.			
		Chemical bay piping will be removed from the trenches.			

Applicability Matrix Example

An example of an Applicability Matrix is shown in **Table 15**. This is a fictitious example that uses information from a field project different from the example that follows the table.

Table 15 - Applicability Matrix Example

	Facility End-Point Applicability Matrix - EXAMPLE - Areas are fictitious Endpoint Acceptance Criteria	Individual Building or Facility Feature								
		Administrative	Facility General	Building Exterior	Fuel Examination Cell	Fuel Transfer Pit	Fuel Storage Pool	Reactor Containment	Fuel Pool Water Tanks	Diesel Fuel Oil Tanks
1.	Prepare and complete deactivation checklists.	X	X	X	X	X	X	X	X	X
2.	All pending Radiation Occurrence reports, Unusual Occurrence Reports and/or any other out-of-standard condition reports finalized and closed out in accordance with applicable procedures. No operable emergency sirens shall remain mounted on or powered from the building.	X								
3.	The Facility Safety Basis Report and Plant Emergency Procedures shall be reviewed and updated for deactivation shutdown status.	X								
4.	CVI (Certified Vendor Information) index, drawings, procedures, prints, photographs, history, design and operating documents provided.	X	X	X	X	X	X	X	X	X
5.	Full compliance with Site Radiological Control Manual must be assured, especially as it pertains to radiological posting.	X	X	X						

6.	All permanent radiologically contaminated zones to be decontaminated and released or the surface contamination levels reduced or fixed in place to minimize re-suspension and/or migration of loose contamination.			X	X	X	X	X		
7.	Temporary radiologically posted zones are cleaned up and radiologically released.			X	X	X	X	X		
8.	All stored radioactive and mixed waste removed.		X	X	X	X	X	X	X	
9.	All hazardous materials used for deactivation and cleanup work must be collected and disposed of in accordance with requirements.		X	X	X	X	X	X	X	X
10.	All unattached hazardous materials (i.e., loose friable asbestos, lead. mercury, etc.) must be removed from the facility and disposed of in accordance with requirements.		X	X	X	X	X	X	X	X
11.	Attached hazardous materials located, identified, quantified, labeled as necessary, and recorded.		X	X	X	X	X	X	X	X
12.	All reactor fuel elements and/or other source and special materials must be removed from the building.				X	X	X			
13.	Final radiological status surveys available.		X	X	X	X	X	X	X	X
14.	Tanks, vessels, drums, sumps etc. drained and heels removed.					X	X	X	X	
15.	All elevator and crane systems are laid up with documentation of the type, weight and class of fluid required for operation, should that become desirable in the future.		X	X	X			X		
16.	Documentation is available confirming that zero energy checks were made on all de-energized electrical circuits and isolated pressurized systems e.g., water, service air, steam, etc. using existing documents to the extent possible.	X		X						
17.	Electrical systems reduced to that only necessary for Post-Deactivation S&M and equipment preserved for subsequent decommissioning. This includes removal of emergency light fixtures and the associated batteries. Where appropriate, centralize the remaining electrical services to a single point.		X	X						
18.	All heating, ventilation and air conditioning supply and exhaust air systems shut down and de-energized. This criteria includes evaluation and, as appropriate, the shutdown of the High-efficiency particulate air-filtered (HEPA) ventilation exhaust from process areas.		X	X						
19.	All unneeded equipment shut down.		X	X	X					
20.	Fire protection systems downgraded.		X							
21.	The radiation space monitoring system should be reduced to a level required by the Health Physics organization.		X		X	X	X	X		
22.	The continuous air monitoring system should be reduced to a level required by the Health Physics organization.		X		X	X	X	X		
23.	The criticality monitoring and alarm system should be deactivated.				X		X			
24.	Reduce or eliminate the electrical, service air, and water supply services to the building in accordance with the requirements for S&M.		X	X						
25.	Remove all emergency lighting and dispose of associated batteries.		X		X	X	X	X		
26.	The building steam system should be deactivated and tagged.		X	X						
27.	All effluent flow routes to disposal sites are isolated by sealing at the building.		X	X						
28.	All building penetrations, i.e., louvers, open piping, etc. shall be closed off to prevent bird and animal intrusion.		X	X						

29.	All systems that were open to facilitate deactivation and could present a radiological and/or an industrial safety problem if left open must be adequately closed off.		X		X	X	X	X	X	X
30.	Roof leaks repaired and suspect areas reviewed.			X						
31.	Office furniture and supplies removed.		X							
32.	Unnecessary parts, tools, and portable equipment removed.		X							
33.	Janitorial supplies and unattached hazardous materials removed.		X							
34.	Loose and/or damaged asbestos removed or stabilized.		X	X						
35.	Perform good housekeeping in all zones and areas in and around the facility.		X	X						
36.	Any required Environmental Monitoring Systems are identified and in serviceable condition.		X							
37.	Any seal pits, dry or wet, must be identified and their radiological status documented and of file.								X	X
38.	All doors should be bolted shut from the inside except those needed for entrance or to comply with emergency egress requirements. Emergency exit doors should have crash bar systems installed. Keys needed for entrance shall be turned over to S&M Organization.		X							
39.	Environmental and/or other applicable permits associated with the facility must be reviewed with S&M Organization to determine the status and applicability for maintaining them.	X								
40.	Deactivation of the facility shall be accomplished to the extent that future surveillance inspections will not be required on a frequency of more than once each quarter.		X							

Example of Check List Step 2, Checklist Items

This example is taken from a field case of the Hanford Plutonium Recycle Test Reactor. The items listed would be those used in the first column of the applicability matrix and subsequent checklists.

DECONTAMINATION AND DECOMMISSIONING (D&D) FACILITY
ACCEPTANCE CRITERIA FOR THE 309 BUILDING

The following information represents guidance relative to the acceptance criteria for the eventual transfer of the Hanford Plutonium Recycle Test Reactor (309 Facility) into the 100 Area Projects Program for the purpose of decommissioning. These acceptance criteria were designed such that the 309 Facility could be maintained in a surveillance and maintenance (S&M) mode for up to 20 - 25 years before final decommissioning.

Part A. Generic Conditions for Facility Transfer

Complete the deactivation check sheets for each facility or group of facilities signed off by the responsible personnel performing the actual work and the overview organizations with management's approval signatures.

1. Finalize and close out any existing occurrence reports, off-normal occurrence reports, unusual occurrence reports, and/or any other out-of-standard condition reports in accordance with applicable Management Requirements & Procedures (MRP) or other applicable Hanford Site requirements.
2. Complete a risk assessment and prepare 309 Facility Interim Safety Basis. (Reference)
3. Assure that Certified Vendor Information (CVI), Equipment Maintenance Standards (EMS), equipment operating procedures, records, prints, as-builts, photographs, etc., are available in an indexed file and in good up-to-date order for those items required to implement the S&M program. (Reference)

4. Assure, where applicable, full compliance with WHC-CM-1-6, *WHC Radiological Control Manual*, especially as it pertains to radiological posting. This should be accomplished by having Health Physics perform an operational safety assessment, followed by operations correcting all noted discrepancies.
5. Review with 100 Area Projects (in coordination with Regulatory Program Integration) any existing environmental and/or other applicable permits associated with the facility to determine the status and applicability for maintaining them.
6. Decontaminate and release all permanent radiation zones (including blank flanges and duct work) or reduce the surface contamination levels to prevent re-suspension and/or migration of loose contamination in accordance with Health Physics direction, or, with concurrence of 100 Area Projects, seal the area.
7. Decontaminate and release all temporary radiation zones inside and outside of facilities, or, with concurrence of 100 Area Projects, seal the area.
8. Collect and dispose of all hazardous materials used for deactivation and cleanup work in accordance with established procedures.
9. Remove from facility all unattached hazardous material (i.e., lead, mercury, etc.) and dispose of in accordance with established procedures and applicable requirements.
10. Locate, identify, and quantify all hazardous material that is attached/contained and cannot be removed without going into a D&D mode and record as part of the shutdown/deactivation file.
11. Assure that final radiological status surveys are available on file, especially for all process equipment, drains, sumps, and air handling equipment.
12. Clean, drain, and/or remove heels from all tanks, vessels, drums, etc., or, with concurrence of 100 Area Projects, leave in place and sample and analyze for radionuclides and hazardous materials in accordance with applicable state and federal regulations. See item B-3 for further details.
13. Deactivate all crane systems with documentation on file as to the type, weight, and class of fluids used in the system so as to aid in any future startups. Also include files that relate to preventative maintenance information.
14. Develop an S&M Plan for guidance to 100 Area Projects on future requirements to maintain the facility in a safe, stable condition until final decommissioning.
15. Reduce or eliminate the electrical and water supply services to the facility in accordance with the requirements of the S&M plan.
16. Centralize, where applicable, the electrical services left for S&M activities to one location (i.e., lighting circuits that are required for S&M).
17. Remove all emergency lighting from the facility and recycle/dispose of associated batteries in accordance with applicable procedures.
18. Assure that there is documentation available on file showing that zero energy checks were made on all electrical circuits that were de-energized.
19. Install a continuous air monitoring system to a level required by the Health Physics organization (based upon air pattern smoke tests, personnel access requirements, and airborne contamination potentials).
20. Deactivate, environmentally seal (i.e., install a blank flange), and tag air supply and exhaust systems, where appropriate.
21. Reduce or eliminate year-round fire protection systems in accordance with the Fire Protection Group.
22. Reduce physical areas requiring radiation monitoring to a level required by the Health Physics organization.
23. Deactivate, double isolate, and tag the building steam system (note condensation handling capabilities).
24. Isolate all liquid effluent flow routes to disposal sites by sealing or capping at the facilities and screening off the outlet end of the discharge pipes for varmint control.
25. Close off all appropriate facility penetrations, i.e., louvers, pipe openings, vent pipes, etc., to prevent bird, animal, and weather intrusions.
26. Adequately close off all systems that were open to facilitate deactivation and could present a radiological and/or an industrial safety problem if left open.
27. Repair all known facility roof leaks and/or deteriorated roof panels to assure roof integrity for at least five years.
28. Remove and excess all office furniture.
29. Remove and excess all tools and equipment.
30. Remove all janitorial supplies from facility.
31. Remove or stabilize loose or damaged asbestos in and around the facility.
32. Perform good housekeeping in all zones and areas in and around the facility.
33. Identify the required workplace environmental monitoring systems and maintain in serviceable condition. (Reference)
34. Identify any seal pits, dry or wet, and assure that their radiological status is documented and available on file.
35. Lock from the inside all doors to the facility except those required for entrance by S&M crews. Turn over to 100 Area Projects any keys needed for entrance as part of the access and key control procedures.
36. Deactivation of the facility shall be accomplished to the extent that future surveillance inspections will not be required on a frequency of more than once each quarter.

Part B. Specific Conditions For the Transfer of the Plutonium Recycle Test Reactor (309 Building)

37. Record all deactivation activities in the deactivation logbooks and reports. Incorporate Lock & Tag logbook and asbestos survey information into permanent records.
38. The following are additional details related to item 12 of the above generic conditions:
    - Flush, clean, drain, decontaminate, and remove heels from all tanks, vessels, piping, sumps, ion exchange (IX) columns, IX vaults, filters, etc., that were used either for storage of chemicals or de-ionization of PRTR

coolant. This also includes previous equipment that has been out of service. A photographic record of the internal vessels should be made where applicable, or with the concurrence of 100 Area Projects, they are left in place, sampled, and analyzed for radionuclides and hazardous materials in accordance with applicable state and federal regulations.

- Blank the piping and duct systems at the appropriate location within the system after they have been flushed, cleaned, drained, and/or heels removed. Enter in the deactivation logbook a record of the blanks installed.
- Install liquid level and monitoring equipment in vessels, ion exchange vaults, or sumps that have the potential to receive significant liquid effluents from building leaks, consolidation of flushing solutions or storm water.
- Review and provide a file on the operating history of and the spare parts list for plant equipment that is required to be left operational in support of the S&M activities. This equipment shall not produce any liquid effluent discharges.

39. At such time as the containment crane is needed, it is repaired to a state such that it can be utilized during D&D efforts.
40. Relocate/remove 3763 building electrical power lead from 309 Building distribution system/switch gear.