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Waste Isolation Pilot Plant
Dry Bin-Scale Integrated Systems
Checkout Plan

March 1990

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Westinghouse Electric Corporation

Waste Isolation Pilot Plant

Carlsbad, New Mexico

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March 1990

WIPP DRY-BIN SCALE INTEGRATED SYSTEMS CHECKOUT PLAN

DOE/WIPP 90-002

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1.0 WIPP DRY-BIN SCALE INTEGRATED SYSTEMS CHECKOUT PLAN

1.1 INTRODUCTION

In order to determine the long-term performance of the Waste Isolation Pilot Plant (WIPP) disposal system, in accordance with the requirements of the Environmental Protection Agency (EPA) Standard 40 CFR 191, Subpart B, Sections 13 and 15, two performance assessment tests shall be conducted. The tests are titled "WIPP Bin-Scale Contact-Handled (CH) Transuranic (TRU) Waste Tests" and "WIPP In Situ Alcove CH TRU Waste Tests." These tests are designed to measure the gas generation characteristics of CH TRU waste. Much of the waste will be specially prepared to provide data for a better understanding of the interactions due to differing degradation modes, waste forms, and repository environmental affects.

The Bin-Scale Test is designed to emplace 124 bins. One hundred sixteen bins will contain various forms of specially prepared waste. Eight bins will be used as reference bins and will contain no waste. This Checkout Plan addresses the activities associated with conducting the Bin-Scale Test Plan for dry bins only. Dry bins are those bins that contain less than one percent free liquid. The Bin-Scale CH TRU Waste Test Plan published January 1990 identifies a total of eighty-four bins which meet the "Dry Bin" definition. Table 1-1 describes the waste matrix of these bins. At a later date, supplements to this Plan or separate plans will be issued to address emplacement of brine saturated bins, the in situ alcove tests, and, if implementation decisions are made, the EPA proposed room-scale tests and the Operations Demonstration.

Each bin will be instrumented with five thermocouples, two pressure gages, four pressure relief valves (two solenoid operated and two mechanical valves), one oxygen sensor, and two gas flow meters. Some of the bins will be initially argon purged and then de-oxygenated to less than ten (10) ppm oxygen. All the bins will be pressurized nominally to 0.25 psig to assist in accurately determining gaseous environmental conditions. Each bin will also be injected with the tracer gases neon and krypton. All gas injected into the bins and released from the bins will be measured and accounted for. A Volatile Organic Compound (VOC) Monitoring System (VMS) will route discharged gases to the mine ventilation system through a charcoal filter. An air sampler in the VMS will be used to sample the discharge, to ensure that the operation of the test is conducted in compliance with EPA regulations regarding the discharge of VOCs.

The Integrated Systems Checkout Plan (ISCP) addresses a two-phase approach to ensuring WIPP readiness to support the Dry Bin-Scale CH TRU Waste Test. The first phase includes all those activities necessary to ensure readiness of individual systems and equipment. The second phase is a bin-scale integrated checkout using four mock bins. The bins will be emplaced, operated for a period of time, with the operation then terminated and the four mock bins retrieved. Conduct of the test will be evaluated against the predetermined acceptance criteria outlined in

Table 1-1

DRY TEST BIN SUMMARY

Bin #	Waste Type	Brine Type	Brine Volume	Backfill, Getter, Other Materials		Initial Atmosphere
			Phase 1:			
TB001	Empty	None	--	None		Air
TB002	Empty	None	--	None	Pressure	Air
TB003	Empty	None	--	None	Baseline-	Argon
TB004	Empty	None	--	None	Reference-	Argon
TB005	Empty	None	--			Air
TB006	Empty	None	--		Gas	Air
TB007	Empty	None	--	None	Baseline-	Argon
TB008	Empty	None	--	None	Reference-	Argon
TB009	HONG	Dry	--	None	Operatn.-	Air
TB010	HONG	Dry	--	None	Phase	Air
TB011	HONG	Dry	--	None	Reference	Argon
TB012	HONG	Dry	--	None	Case	Argon
TB013	HONG	As-Received	--	None	Short-	Air
TB014	HONG	As-Received	--	None	Term	Air
TB015	HONG	As-Received	--	None	Reference-	Air
TB016	HONG	As-Received	--	None	Case	Air
TB017	LONG	As-Received	--	None	Short-Term	Air
TB018	LONG	As-Received	--	None	Reference	Air
TB019	LONG	Dry	--	None	Operatnl.-	Argon
TB020	LONG	Dry	--	None	Phase	Argon
TB021	LONG	Dry	--	None	Reference-	Argon
TB022	LONG	Dry	--	None	Case	Argon
TB023	PS	As-Received	--	None	Short-Term	Air
TB024	PS	As-Received	--	None	Reference	Air
TB025	PS	Dry	--	None	Operatnl.-	Air
TB026	PS	Dry	--	None	Phase	Air
TB027	PS	Dry	--	None	Reference-	Air
TB028	PS	Dry	--	None	Case	Air
TB029	HONG	Dry	--	Salt		Argon
TB030	HONG	Dry	--	Salt		Argon
TB031	HONG	Salado	12 L	Salt		Argon
TB032	HONG	Salado	12 L	Salt		Argon

(continued)

Table 1-1
(cont.)

DRY TEST BIN SUMMARY

Bin #	Waste Type	Brine Type	Brine Volume	Backfill, Getter, Other Materials	Initial Atmosphere
TB037	HONG	Dry	--	Salt/Bentonite	Argon
TB038	HONG	Dry	--	Salt/Bentonite	Argon
TB039	HONG	Salado	12 L	Salt/Bentonite	Argon
TB040	HONG	Salado	12 L	Salt/Bentonite	Argon
TB045	LONG	Dry	--	Salt/Bentonite	Argon
TB046	LONG	Dry	--	Salt/Bentonite	Argon
TB047	LONG	Salado	12 L	Salt/Bentonite	Argon
TB048	LONG	Salado	12 L	Salt/Bentonite	Argon
TB051	PS	Dry	--	Salt/Bentonite	Air
TB052	PS	Dry	--	Salt/Bentonite	Air

Phase 2

Bin #	Waste Type	Brine Type	Brine Volume	Backfill, Getter, Other Materials		Initial Atmosphere
TB057	HOOW	As-Received	--	None	Short-Term Reference-Case	Argon
TB058	HOOW	As-Received	--	None		Argon
TB059	HOOW	As-Received	--	None		Argon
TB060	HOOW	As-Received	--	None		Argon
TB061	HOOW	Dry	--	None	Operatnl. Phase Reference-Case	Argon
TB062	HOOW	Dry	--	None		Argon
TB063	HOOW	Dry	--	None		Argon
TB064	HOOW	Dry	--	None		Argon
TB065	HOOW	Dry	--	Salt/Bentonite		Argon
TB066	HOOW	Dry	--	Salt/Bentonite		Argon
TB067	HOOW	Salado	12 L	Salt/Bentonite		Argon
TB068	HOOW	Salado	12 L	Salt/Bentonite		Argon
TB073	HONG	Dry	--	Salt/Bent/Getter		Argon
TB074	HONG	Dry	--	Salt/Bent/Getter		Argon
TB075	HONG	Salado	12 L	Salt/Bent/Getter		Argon
TB076	HONG	Salado	12 L	Salt/Bent/Getter		Argon
TB081	HOOW	Dry	--	Salt/Bent/Getter		Argon
TB082	HOOW	Dry	--	Salt/Bent/Getter		Argon
TB083	HOOW	Salado	12 L	Salt/Bent/Getter		Argon
TB084	HOOW	Salado	12 L	Salt/Bent/Getter		Argon

Table 1-1
(cont.)

DRY TEST BIN SUMMARY

Bin #	Waste Type	Brine Type	Brine Volume	Backfill, Getter, Other Materials	Initial Atmosphere
TB089	PS	Dry	--	Salt/Bent/Getter	Air
TB090	PS	Dry	--	Salt/Bent/Getter	Air
TB091	PS	Salado	8 L	Salt/Bent/Getter	Air
TB092	PS	Salado	8 L	Salt/Bent/Getter	Air
TB093	PS	Castile	8 L	Salt/Bent/Getter	Air
TB094	PS	Castile	8 L	Salt/Bent/Getter	Air
TB095	HONG-SC	Dry	--	Salt/Bentonite	Argon
TB096	HONG-SC	Dry	--	Salt/Bentonite	Argon
TB097	HONG-SC	Salado	8 L	Salt/Bentonite	Argon
TB098	HONG-SC	Salado	8 L	Salt/Bentonite	Argon
TB103	HONG-SC	Dry	--	Salt/Bent/Getter	Argon
TB104	HONG-SC	Dry	--	Salt/Bent/Getter	Argon
TB105	HONG-SC	Salado	8 L	Salt/Bent/Getter	Argon
TB106	HONG-SC	Salado	8 L	Salt/Bent/Getter	Argon
TB111	LONG-SC	Dry	--	Salt/Bentonite	Argon
TB112	LONG-SC	Dry	--	Salt/Bentonite	Argon
TB113	LONG-SC	Salado	8 L	Salt/Bentonite	Argon
TB114	LONG-SC	Salado	8 L	Salt/Bentonite	Argon
TB117	PS/HONG	Dry	--	Salt/Bentonite	Argon
TB118	PS/HONG	Dry	--	Salt/Bentonite	Argon
TB119	PS/HONG	Salado	10 L	Salt/Bentonite	Argon
TB120	PS/HONG	Salado	10 L	Salt/Bentonite	Argon

Section 3.2 and an evaluation shall be made to support whether or not the WIPP is ready to receive CH TRU waste in support of the experimental program.

Successful implementation of the ISCP includes those start-up and training activities necessary to ensure that the WIPP is ready to receive experimental waste. The Integrated Systems Checkout (ISC) will exercise those controls necessary to 1) safely initiate and conduct the dry bin portion of the bin-scale test; 2) safely terminate the test; 3) retrieve the waste; 4) conduct post-test data gathering requirements; and 5) prepare the waste for shipment off the site. Some of the start-up and training activities are keyed to individual systems necessary to support Dry Bin-Scale Test requirements. For each system, the following functions, as applicable, must be satisfactorily accomplished to ensure safe operational implementation of that system:

- Development and approval of procedures to safely control:
  - Installation
  - Calibration
  - Start-up and acceptance testing
  - Operation
  - Termination and removal
- Equipment and system installation
- Start-up and acceptance testing
- Operator training and qualification

Upon satisfactory completion of the above functions, including rigorous documentation to support achieving compliance with procedural requirements, an integrated checkout of the Dry Bin-Scale Test will be performed and documented to ensure that WIPP is ready to safely commence the Dry Bin-Scale Test with CH TRU waste. Thus, the ISCP addresses both systems preoperational preparations and the operational checkout of systems in an integrated manner to support the Dry Bin-Scale Test requirements.

Section 5.0 of this ISCP describes prerequisites for achieving operational readiness on a system-by-system basis.

Section 3.0 provides a narrative of the Bin-Scale Integrated Checkout for the receipt, emplacement, operation, operational termination, retrieval, and preparation for shipment of the CH TRU waste contained in dry bins. To support this Integrated Checkout, additional administrative preoperational activity not keyed to specific systems must be accomplished. The activities include:

- Development and approval of procedures to safely control:
  - Receipt of dry bins in Standard Waste Boxes (SWBs)
  - Modification of SWBs to Radiation Control Boundaries (RCBs)

  - Unloading and transport of dry bins in RCBs to the underground
  - Emplacement of dry bins in RCBs
  - Placing into operation and sampling of dry bins
  - Data gathering
  - Terminating operation of dry bins
  - Retrieval of dry bins in their RCBs including transport to the surface
  - Post-test data gathering
  - Modification of RCBs to SWBs
  - Loading and preparation for off-site shipment of dry bins in SWBs

- Training of personnel in the performance of the procedures
- Validation of the procedural requirements

Two Integrated Checkout sequences are to be conducted within a period of four to five weeks. A major portion of the activities performed in the Integrated Checkout will be first-of-a-kind. Many of the time lines necessary to perform individual functions cannot be accurately estimated until completion of the start-up and training activities for individual systems.

Figure 7.1 identifies the major functional activities related to preparation for and implementation of the Dry Bin-Scale Integrated Checkout. Two checkout scenarios are currently planned to accommodate both an internal review and external observation. The internal review will be conducted by Department of Energy's (DOE) WIPP Project Office (WPO) and Westinghouse's Waste Isolation Division (WID) management to ensure that the WIPP team is fully ready to support the bin scale CH TRU waste test program for dry bins. The second checkout scenario will be conducted for the benefit of external organizations to observe the status of WIPP readiness. DOE will identify and invite the appropriate external organizations.

The Bin-Scale Test Program will require one or two rooms. Current plans are to use Rooms 1 and 2 of Panel 1 in the underground mine. Approximately 84 specially designed bins are planned to be emplaced for the dry bin test program. A few bins will be empty; most will be filled with specially prepared CH TRU waste. Some of the bins will also have brine injected (maximum 12 litres). The bins are instrumented and capable of being sampled periodically for gas. Access to the bin-scale test rooms is required throughout the test program. Individual bins will be contained within their RCBs. The bin/RCB configurations will be stacked two high in specially designed racks oriented to allow forklift access to each bin throughout the Bin-Scale Test program. This allows some room maintenance to be carried out and also allows decontamination of any sampling activities that inadvertently result in the release of contaminated material.

Remote readout of bin instruments will be accomplished via a Data Acquisition System (DAS) and recording equipment contained within the DAS Shed and DAS computer. The shed is located at the south end of Room 1. The DAS computer is on the surface. Access to individual bin instrumentation will be provided by modularizing the instrumentation and supporting it on the bin/RCB support rack.

The bin-scale test program has been designed to examine the effects of gas generation processes within the stored CH waste. To accomplish this, the test program is expected to have a minimum duration of three years. In that length of time, although not expected, there is some possibility that radioactive particulate contamination could be released from one or more bins, resulting in contamination of the RCB internals and/or instrumentation. Successful termination of the test, including the removal and appropriate disposal of support equipment, can become a more complex task if, in fact, radioactive particulate contamination is present. To provide maximum assurance that termination will be safely conducted and that procedures can adequately control anticipated conditions, the ISCP has been developed to include the checkout of activities necessary for personnel to safely function in a radioactive particulate contaminated environment during both the operation and termination of the bin-scale test.

1.2 PURPOSE

The ISCP has been developed to provide assurance that operational activities dedicated to supporting the bin-scale tests can be achieved safely. To attain this assurance, a systematic approach will address:

- Development of procedures to control system and equipment start-up and acceptance tests
- Development of procedures to control operation of systems and equipment, waste receipt, emplacement, operation, test termination, waste retrieval, and post-test shipping
- Monitoring of systems installation and checkout to ensure systems meet acceptance testing criteria
- Initial operation of systems to validate procedural controls
- Training of personnel to perform systems operational activities in accordance with procedural controls
- Capability of corrective action for abnormal events
- Documentation of acceptance testing data and personnel training and qualification requirements

Successful completion of the above activities for all systems and operational tasks necessary to support the dry bin-scale testing will be verified. Upon completion of that verification, the stage will be set to conduct the Integrated Checkout of Dry Bin-Scale Test initiation, operation and termination, including retrieval. The ISC will produce the final validation that all activities can be conducted as an integrated whole.

1.3 SCOPE

The scope of this ISCP covers those activities which are to be accomplished at the WIPP to support the bin-scale CH TRU waste testing of dry bins. Dry bins are those bins which contain less than one percent free liquid by volume. The brine will be introduced after receipt at the WIPP. The actual number of bins used in the ISCP is four mock bins, containing no CH TRU waste.

Section 3.0 describes the Dry Bin-Scale Integrated Checkout. The major tasks required to 1) receive and emplace the waste; 2) initiate, operate, and terminate the Dry Bin-Scale Test; and 3) retrieve and ship the waste off-site are discussed. Included at the end of the narrative is a discussion of the criteria against which the success of the Integrated Checkout and the readiness of WIPP to receive experimental waste as demonstrated by the Integrated Checkout may be evaluated. Other sections address the following:

- Procedural requirements to control, where applicable, installation, start-up, acceptance testing, normal and abnormal operation, and removal of systems or equipment necessary to support dry bin-scale test requirements
- Validation of procedural controls for normal and abnormal operations and system removal
- Identification of potential radiological control problems and the development/validation of procedural controls to mitigate the consequences of radiological contamination
- Development and validation of procedural controls for waste receipt, emplacement, dry bin test operation, test termination, retrieval, post-test data gathering and preparation for waste shipment off the site
- Training of personnel
- Documentation of activities

Most of the activities described in the ISCP are first-of-a-kind. It is anticipated that some of the specifics related to individual tasks will be modified as experience is gained to improve on the safety and practicality of task accomplishment. The directions and descriptions within this ISCP should not preclude the application of common sense and practical safety techniques to work activities as these first-of-a-kind tasks are addressed. The oversight of safe work practices will be conducted in accordance with WP 12-1, the Safety Manual and WP 12-9, Emergency Plan and Procedures.

The scope of the ISCP focuses on those activities which are within the management jurisdiction of the DOE's WPO. Those activities which must be safely conducted by the generating sites to load CH TRU waste into bins and SWBs and, in turn, place the waste containers into TRUPACT-IIs for loading onto transport trailers are outside the scope of this ISCP. The DOE and/or its responsible contractors will address the front end of the CH TRU waste support of bin-scale testing as separate readiness programs.

1.4 DOCUMENTATION

Prior to initiation of the integrated checkout, readiness will be determined by validation that 1) the following documentation, as applicable for each system, is completed; 2) or documented evidence exists that management has effectively dispositioned deficiencies and made a positive determination that the deficiencies do not preclude a successful integrated checkout:

- Equipment is properly calibrated
- Start-up and acceptance testing is complete
- Operating procedures are approved
- Qualified personnel have received required training
- Engineering work packages and work orders are complete
- As-built drawings are complete

Upon completion of the integrated checkout, documented deficiencies will be reviewed and dispositioned. Those deficiencies which require close-out prior to declaring readiness to receive waste will be identified and scheduled for action and closure. Management of implementation of the required actions and allocation of resources to accomplish the work will receive the highest priority. Responsibility for completion of the work and overall management of the deficiency closure activity will be assigned and communicated to all affected organizations within WIPP. Frequent management reports will be issued to ensure continued focus on achieving closure of the significant deficiencies and to ensure a timely declaration of readiness to receive dry bins. The declaration of readiness will be based upon a documented evaluation of the success of those activities encompassed within the ISCP.

Significant deficiencies are defined as those deficiencies identified during the integrated test which meet one or more of the following criteria:

- Prevents a system from meeting its intended function
- Represents a significant radiological or hazardous material contamination risk
- Represents a significant industrial safety hazard
- Identifies a routine required task not adequately covered by procedure

- Identifies additional required and documented training necessary to ensure procedural compliance.
- Represents an activity which violates an imposed operational safety requirement (OSR) condition

2.0 DRY BIN-SCALE TEST PROGRAM

The Dry Bin-Scale Test Program will be conducted in Rooms 1 and 2 of Panel 1, 2150 feet below the earth's surface in the WIPP underground mine. Each room has an overall dimension of 13 feet high by 33 feet wide by 300 feet long. The DAS shed is located at the south end of Room 1. The shed is three to four feet from the west rib, and provides approximately 10 feet of clearance for passage of forklifts or other vehicles.

Bins will be stacked two high, as shown in Figure 2-1, and enclosed within individual RCBs in a specially designed support fixture on approximately twelve foot centers. Two rows of bins will run lengthwise in the room, each row adjacent to a rib, as shown in Figure 2-2. The bin stacks will be located at an angle approximately four feet from the adjacent rib, providing sufficient clearance between the rows for forklift access. This permits sufficient maneuvering room for a forklift to retrieve bins individually from their support fixtures. This arrangement also provides personnel access to all sides of each bin/RCB configuration during the test duration.

The RCBs are SWBs with a special lid designed to accommodate the leak-tight connections between the bin access port connecting hoses and the various instruments supporting each bin.

Individual bins are approximately four feet square and three feet high. For the purposes of the bin-scale test plan, a bin is specified to hold nominally six CH TRU drum-volume equivalents of loose CH TRU wastes. The CH TRU waste placed into the bins is specially packaged in disrupted plastic bags. Quantities of iron corrodant material, crushed salt/bentonite, and where appropriate, brine are added to the contents. To provide for monitoring of each bin's internal gas mixture and temperature, the individual bins have a number of protuberances which function as access ports. These ports provide access for the following functions to be accomplished:

- Monitor thermocouple readings inside the bin
- Gas flushing
- Pressure gage monitoring
- Pressure relief
- Gas sampling
- Tracer gas injection
- Brine injection
- Vacuum distillation

The bins are designed to be gas tight to a one psid design pressure. Relief capability to prevent exceeding 0.5 psid is provided by solenoid operated and mechanical relief valves. Each bin is equipped with multiple remote reading instruments.

- Five thermocouples
- Two differential pressure gages
- Two gas/flow volume gages
- A solid state oxygen sensor and gas recirculation fan

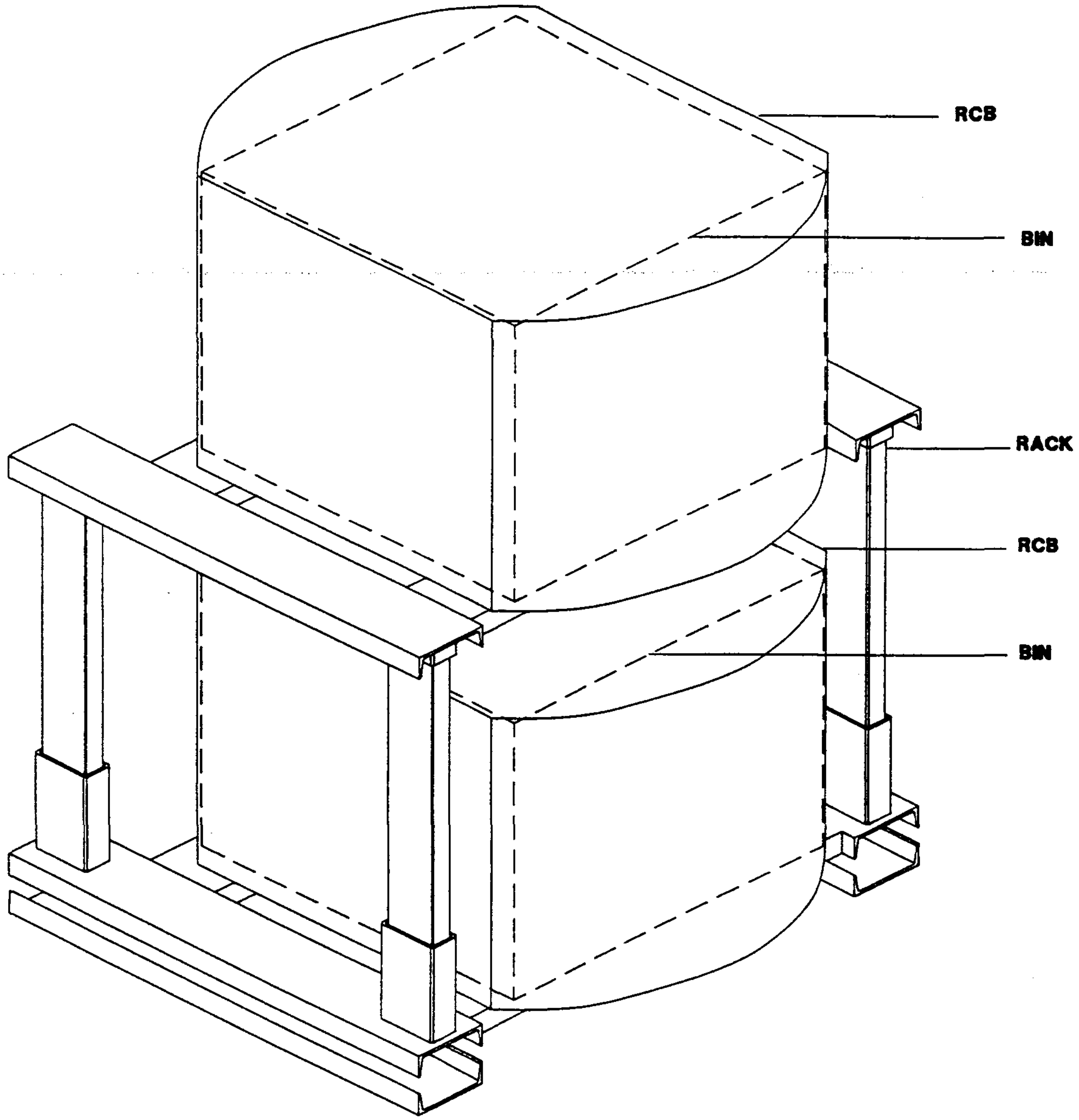


FIGURE 2-1 BIN, RCB AND RACK CONFIGURATION

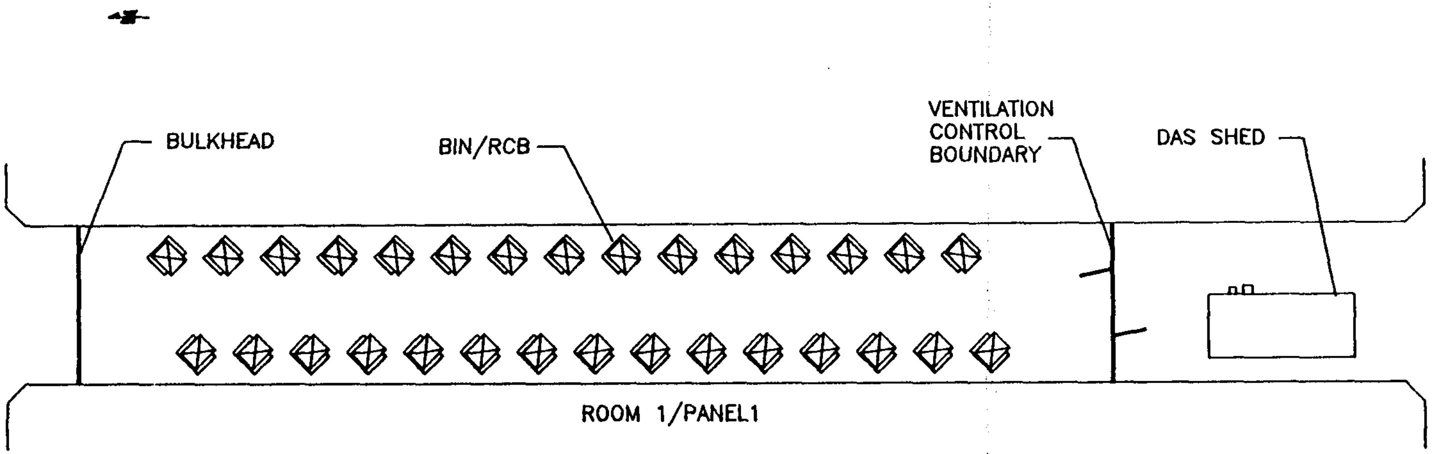


FIGURE 2-2 BIN LAYOUT

FIGURE 2-2. Bin Layout

Figure 2-3 is a schematic of the bin-scale test systems that are incorporated into a majority of the dry test bins.

The instrumentation is connected by cable to the DAS shed. Prior to bin/RCB retrieval, the cabling will be removed.

Approximately 84 dry bins will be emplaced, including eight empty bins. Over 50 percent of the bins will be inerted with an argon atmosphere and the remainder will contain air. Inerted bins will be made anaerobic to < 10 ppm oxygen by a combination of argon gas flushing and oxygen gettering. All bins will be pressurized initially to 0.25 psid, and maintained at greater than 0.1 psid. An electronically activated pressure control valve will relieve at 0.5 psid.

Test time T = 0 corresponds to completion of tracer gas injection of each individual bin. Tracer gases will be added to every bin to monitor for leakage. In addition, those bins identified to receive brine injection will be injected with 8 to 12 liters of brine within three days after emplacement and prior to T = 0. During the Integrated Checkout, two bins will be injected with brine. The sequence of bin/RCB preparation after placing a bin/RCB in a rack is as follows:

- Install all bin support systems.
- Perform bin systems pressure drop test.
- Start recirculation pump, collect gas sample.
- Perform argon purge, if appropriate.
- Perform oxygen gettering cycle, if appropriate.
- Inject brine, if appropriate, within 3 days of emplacement.
- Pressurize the bin (argon gas for all bins).
- Inject tracer gas (this defines T = 0).
- Collect first of regular gas samples within four hours of T = 0.

Thereafter, a gas sampling program will be initiated as follows:

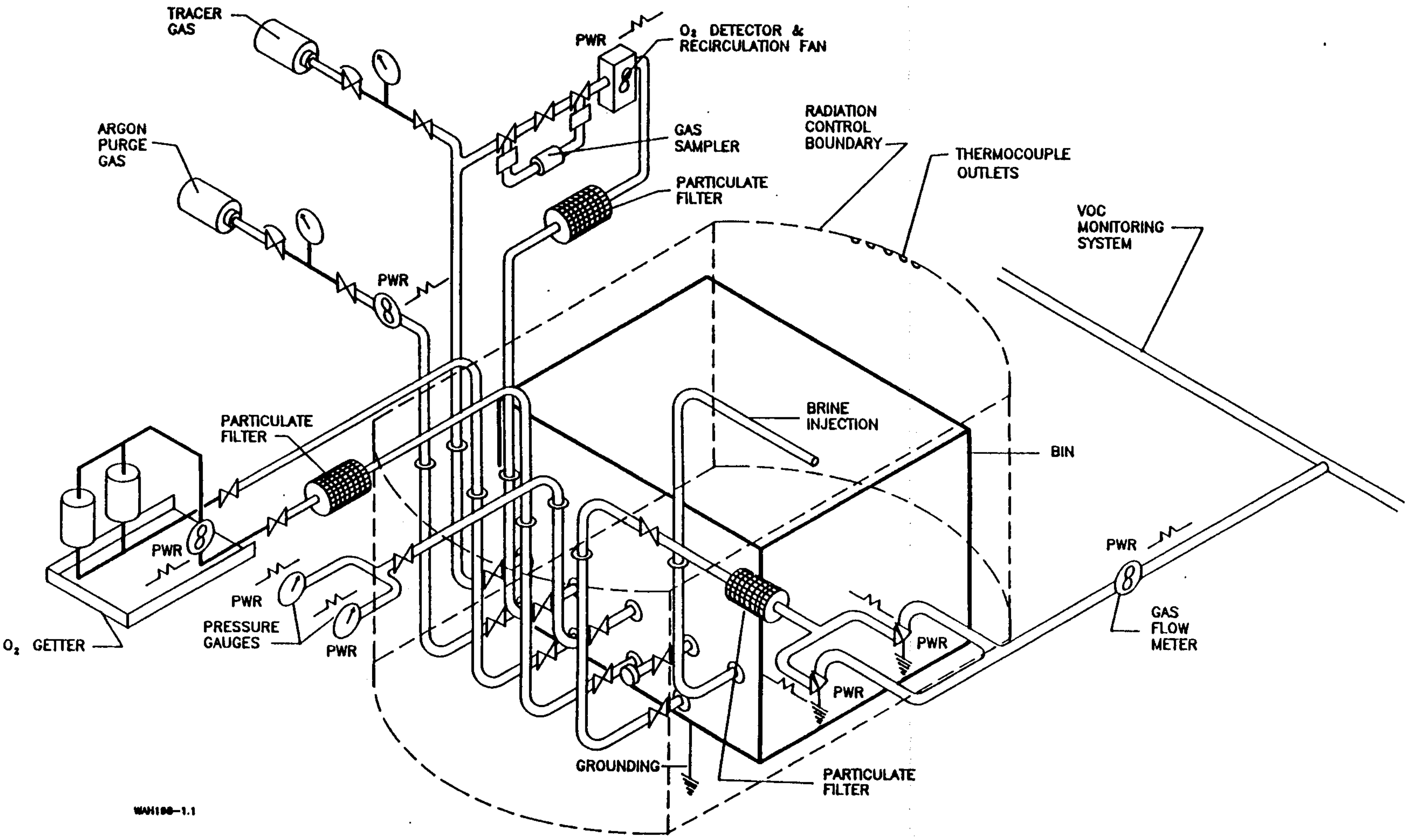
- Individual bins will have gas samples drawn at a decreasing frequency starting with the sample within four hours of T = 0. This sample also corresponds to the schedule below for day T = 1.

    - At day T = 1, 4, 7, and 14 days
    - During the week for T = 3, 4, 6, and 8 weeks
    - A once-a-month sample for a minimum of five years

Procedural controls for preparing the bins to accommodate the sampling program and for controlling the sampling program will be developed by Radioactive Waste Handling Engineering (RWHE) and the Sandia National Laboratories (SNL) support team assigned to the principle investigator. RWHE is responsible for the design and procurement of the bins, the RCB lid, and the support racks.

2.1 BIN AND RACK ASSEMBLY

Each bin is approximately four feet square and three feet high with a volume capacity of greater than 44.5 ft^3, or six standard 55 gallon drums. As described in 2.0 (above), each bin will have instruments attached to it and the capability to attach gas sampling equipment,



BIN-SCALE TEST SYSTEMS

FIGURE 2-3. Bin-Scale Test Systems

tracer gas ejection equipment, inert gas flushing and pressurization equipment and oxygen gettering equipment. The bins will be leak tested by the manufacturer. The leak rate will not exceed 1 x 10^{-7} standard cc/second of helium exclusive of the gasket. The gasket is tested separately to the same standard.

The Dry Bin-Scale Test Program within the underground consists of two phases. Phase I will have a number of bins which will be loaded to represent expected conditions over the short term and operational phase of the WIPP facility. Phase I will also contain eight bins used to provide a pressure baseline reference and a gas baseline reference. These eight bins will not contain any CH TRU mixed waste. No backfill, brine, getter, or metal corrodant material will be placed within these bins. A total of 42 bins will be emplaced during Phase I. Three waste types will be loaded into 34 of these bins:

- High Organic Newly Generated Wastes (HONG - less than two years old)
- Low Organic Newly Generated Wastes (LONG)
- Processed Sludges (PS)

These bins will also have one or more additives, including salt, bentonite clay, brine, or metal corrodant added. Twenty-two bins in Phase I will be inerted with argon gas.

Phase II bins are planned to be emplaced six to eight months after Phase I bins. Eight of the 42 bins planned for Phase II will provide short term and operational phase reference data. These eight bins will contain High Organic Old Waste (HOOW - waste that is more than five years old). The remaining 34 bins in Phase II will contain HOOW, HONG, LONG or PS waste and one or more additives including salt, bentonite, getter materials, and metal corrodants. Thirty-six of the 42 bins in Phase II will contain an argon inert gas atmosphere. In addition, 12 bins will have their waste contents super-compacted. A Phase III is defined but not yet fully described. The exact details of bin contents can be found in <u>Test Plan: WIPP Bin-Scale CH TRU Waste Tests</u> (M. A. Molecke, January 1990).

At emplacement, individual bins will have their port isolation valves open, the RCB lid penetrations will be capped. All remote reading instrumentation will be hooked up from the RCB lid penetrations to the MODCOMP DAS. The pressure relief valves and the oxygen specific sensor will also be connected to the DAS. The pressure relief valve discharges will be connected to the VMS. The bins will be individually pressure tested to ensure that their sealed condition was not compromised and that the additional connections made to put the bin into operation are leak tight. An initial gas sample will be taken from each bin subsequent to the pressure test. T = Emplacement is defined as completion of this initial gas sample. Within three days of emplacement, brine will be injected into two bins (8 liters and 12 liters).

For those bins which require an inert argon atmosphere, argon gas flushing and oxygen gettering will be exercised to reduce the oxygen concentration to < 10 ppm. The individual bins will be pressurized to 0.25 psid with either argon or air, depending upon each bin's initial atmosphere gas. All adjustments to an individual bin's pressure to maintain a minimum 0.1 psid thereafter will be made with argon. The maximum bin pressure is 0.5 psid. This is controlled by two solenoid operated pressure relief valves operated by the DAS at 0.5 psid and 0.6 psid, respectively. In addition, two mechanical pressure relief valves are installed as backups. After pressurization, tracer gases (neon and krypton) will be injected into each bin to an initial concentration of 100 ppm for each gas. Completion of tracer gas injection is defined as T = 0. A gas sample will be taken within four hours of completion of the tracer gas injection.

Upon completion of the above described bin preparation, each bin will be ready for continuous testing and periodic gas sampling and analysis, as appropriate. The sampling routine is as described in Section 2.0. Responsibilities related to the operation and sampling of bins are shown in Table 6-1.

3.0 DRY BIN-SCALE INTEGRATED CHECKOUT

Preparation for the Dry Bin-Scale Integrated Checkout includes four broad steps:

- Design and procurement of support systems components
- Development of procedural controls for
  - Installation
  - Start-up and acceptance testing
  - System operation
  - Test termination
  - Retrieval
  - Preparation for shipment
- Systems installation, start-up, and testing
- Personnel training and procedure validation

To ensure readiness to commence the Dry Bin-Scale Integrated Checkout, each system will require documentation of readiness. Figure 3-1 is the draft document to record system readiness.

Completion of the preparatory steps is followed by the Integrated Checkout using mock waste to conduct the full range of activities expected to be encountered during the bin-scale test program for dry bins. These activities include:

- Receipt and inspection of overpacked (SWB) mock bins in TRUPACT-IIs
- SWB to RCB conversion
- Emplacement of mock CH TRU waste filled bins/RCBs
- Installation of support equipment
- Initiation of test conditions
- Operation of the bins
  - Support systems operation
  - Monitoring of test conditions
  - Sample collection
  - Gas sample analysis
- Termination of test conditions
- Retrieval of mock CH TRU waste filled bins/RCBs
- Preparation of overpacked (SWB) mock bins for off-site shipment

Two planned Integrated Checkout sequences are anticipated to extend over a four to five week period, from initial receipt to completion of waste preparation for off-site transport.

During the conduct of the Integrated Checkout, the approved procedural controls will be used by qualified personnel as a validation of their acceptability. Abnormal conditions will be imposed to allow practical response training and evaluation of the response activity. Compliance to OSRs will be observed during the Integrated Checkout. The WIPP facilities will be in a completely operational mode.

Of the activities to be exercised during the Integrated Checkout, two will provide the greatest potential risk of spreading contamination after real waste is emplaced. The large number of instruments connected to the bins represent contamination risks whenever samples are taken, or instruments require maintenance. The second major risk is during termination of the bin-scale testing.

Upon termination of the Dry Bin-Scale Integrated Checkout, the instrumentation attached to each RCB must be removed to allow retrieval of the bins and RCBs. In the course of the five-year program, the RCB and some (if not all) of the instruments could potentially become contaminated. Replacement of the RCB lid to reconfigure the RCB as a SWB and removal and disposal of instrumentation components must be adequately controlled to prevent any contamination spread.

In view of these risks, close attention to the procedures controlling sampling, replacement of the RCB lid, and instrument removal and test termination activities will be exercised to identify any significant radiological control omissions that might unnecessarily increase the risk of contamination spread. Lessons learned from the Integrated Checkout will be incorporated into the applicable procedures.

3.1 DRY BIN-SCALE INTEGRATED CHECKOUT

The Dry Bin-Scale Integrated Checkout will utilize four mock bins. These bins will be constructed to the same specifications required of the test bins. However, the mock bins will not be subjected to the Quality Assurance (QA) documentation requirements necessary for the test bins. The mock bins will not contain CH TRU waste.

The mock bins will be loaded with the corrodant material, crushed salt/bentonite clay mixture, and noncontaminated waste material to simulate the internal bin environment expected to be encountered in a test bin. The mock bins will provide an opportunity to conduct training for personnel over the full range of expected activity during the actual Dry Bin-Scale Test Program. These activities will include:

- TRUPACT receipt and SWB unloading
- SWB conversion to an RCB
- Transport to the underground and emplacement
- Installation and removal of instrumentation
- Gas purging
- Brine injection

CERTIFICATION OF READINESS TO SUPPORT THE INTEGRATED CHECKOUT

I certify that the ______________________________ is ready to support the integrated checkout.

	Initial
All associated instrumentation/equipment is calibrated and operable.	______
All start-up and acceptance testing is complete, documented, and signed off.	______
Operating procedures are approved.	______
Qualified personnel have received required training and documentation is signed off.	______
Applicable EWRs and 030s are complete and signed off.	______
Applicable as-built drawings are complete.	______
Applicable deficiencies are documented and dispositioned.	______
No significant deficiencies are open.	______

____
(Responsible Section Manager)

System meets quality assurance requirements

____
(Appropriate Quality Assurance Manager)

Documentation meets operational readiness review requirements

____
(Operational Readiness Review Manager)

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FIGURE 3-1

- Oxygen gettering
- Tracer gas injection
- Gas sampling
- Test termination
- Retrieval
- Preparation for shipment off-site

The procedures controlling the activities associated with the Dry Bin-Scale Integrated Checkout will be validated during the training work-up conducted within the period immediately preceding initiation of the Bin-Scale Integrated Checkout. During this work-up, the procedures will be refined as experience is gained through practice and qualification of personnel. It is anticipated that a rigorous work-up and training effort will result in a set of procedural controls requiring only minor modifications during the Integrated Checkout.

The Integrated Checkout of the Dry Bin-Scale Test Program will be initiated by receipt of a TRUPACT-II trailer containing the mock bins overpacked in SWBs. TRUPACT-II receipt and handling will be performed by Waste Handling Operations in accordance with WP 05-105, TRUPACT Receipt, and WP 05-106, TRUPACT Handling.

3.1.1 TRUPACT-II RECEIPT AND SWB UNLOADING

Applicable procedures WP 05-106 through WP 05-120 are being written and revised to address all those activities necessary to handle bins from TRUPACT-II unloading of the overpacked SWBs to underground emplacement of the bins within RCBs. The RCBs are physically SWBs with the installation of a modified lid to allow connecting instrumentation and other support equipment to the bin via flexible hoses. In accordance with these procedures, the four mock bins are:

- Transported to the Overpack and Repair Room (OP&RR) where the SWB will be opened and the bin inspected for any obvious damage.

- Surveyed to ensure no loose surface contamination is present. If a bin is contaminated, it's SWB will be reclosed and returned to the generating site.

The procedures also prescribe requirements for the following activities:

- After inspection of the bin is completed, the bin port isolation valves will be opened and flexible hoses will be attached

- The hoses will be connected to the RCB lid and the lid installed on the SWB converting that container to an RCB.

- The RCB openings are capped and the bin is then pressure tested to ensure the integrity of the bin and hoses.
- The bin/RCB is then transported to the underground for emplacement.

3.1.2 BIN/RCB HANDLING AND EMPLACEMENT

The RCB containing a bin is placed on a facility pallet which can accommodate up to four RCBs and transported underground via the Waste Shaft. In the underground, the underground transporter will remove the facility pallet and take it to Room 1, Panel 1. Individual RCBs will be then forklifted into Room 1 and placed on the specially designed racks. As shown in Figure 2-2, the racks will be installed at an angle of less than 90 degrees from the room rib to facilitate forklift access to the emplaced RCBs. The RCBs will be stacked two high in two rows along the Room 1 ribs.

After completion of bin/RCB emplacement, a series of operational readiness activities must be accomplished in accordance with prescribed procedures prior to declaring each bin to be in an operational mode or final test configuration. These activities are completed in the following order for mock bins:

- Install all remote reading instrumentation, pressure relief valves, VMS connections and associated equipment. Connect the appropriate equipment to the DAS and conduct performance testing to verify operability. Experimental Operations personnel will perform and document satisfactory completion of these tasks. This effort shall be completed in about one day for each bin.
- Waste Handling Operations will conduct a pressure drop test using argon gas.
- Install the gas sampling system and draw an initial gas sample. Waste Handling Operations will transfer custody of the sample to Geotechnical Engineering, which will then carry out the sample analysis in accordance with analytical procedures.
- Waste Handling Operations will inject 12 liters of brine into one bin and eight liters into a second bin.
- Waste Handling Operations will purge the bin(s) with argon gas to an oxygen concentration of less than 1000 ppm oxygen. At this point, the oxygen gettering system will be attached to the RCB to bring the oxygen concentration of the bin to less than 10 ppm.
- The bin will be pressurized to approximately 0.25 psid.
- Neon and krypton tracer gases will be injected into the bin to a concentration of 100 ppm for each gas.

- Completion of tracer gas injection is designated as gas generation time T = 0. Prior to T = 4 hours, another gas sample will be taken.

3.1.3 Experiment Initiation, Operation, and Termination

Following extraction of the second gas sample, the bin will be ready for continuous testing. The periodic gas sampling will follow the schedule prescribed in Section 2.0.

Final configuration of the four mock bins will be two bin stacks each containing two bins. The stacks will be adjacent to each other on twelve feet centers.

Operation of the bins will continue for a minimum of five days. During this time period, the following activities and abnormal events will be interjected into the operations scenario to validate procedures and evaluate the level of proficiency of the personnel trained to support the Dry Bin-Scale Test Program. All of these activities will require rigorous enforcement of radiological controls, including recovery from abnormal events.

- At least one gas sample will be taken daily. The sampling procedure, the turnover of sample control from Waste Handling Operations to Geotechnical Engineering, the analysis of the sample, and the preparation of the sampling apparatus for reuse will be followed and reviewed for lessons learned.

- Failure scenarios including replacement of instrumentation simulating contaminated instruments will be conducted that include the following items:

  - One pressure transducer
  - One solenoid operated pressure relief valve
  - One mechanical relief valve
  - One oxygen sensor
  - One gas flow monitor

- Repressurization of a bin will be performed at least two times during operation.

- Controlled relief of a bin over-pressure condition will be performed at least two times during operation.

- At least one gas sampling exercise will simulate a radioactively contaminated gas sample particulate filter.

- At least one event of contamination and decontamination of the bin/RCB will be simulated.

- At least one personnel contamination event will be simulated.

- At least one event of loss of power to the DAS supporting two bins will be simulated.

Upon conclusion of bin operation, Waste Handling Operations will control and monitor the release of bin pressure. Instrumentation cabling and the installed instrumentation will then be removed. The equipment will be simulated to be contaminated and the controlling Radiation Work Permit (RWP) will be written to ensure implementation of appropriate radiological controls. The removed equipment will be bagged for disposal as CH TRU waste or low level radioactive waste (LLW). This determination will be made by radiation safety.

After all RCB penetrations for instrumentation and support equipment have been capped, the bin/RCB will be forklifted out of its rack, surveyed and transported to the underground transporter. The underground transporter will take the bin/RCB to the Waste Hoist for transport to the surface.

During removal of the instrumentation and support equipment including the VMS connections, at least one component will be simulated to be contaminated. In the process of containing and packaging the component, contamination of the mine surface will be simulated. Proper Health Physics response to the event and decontamination of the surface will be exercised.

All of the terminating activities will be conducted as prescribed in appropriate controlling procedures by technicians qualified to perform the required functions.

3.1.4 Retrieval

In preparation for the retrieval of bins and after termination of the bin operation, the DAS system and DAS shed will be removed for the Bin-Scale CH TRU Waste Test. For the Dry Bin-Scale Integrated Checkout the DAS system and DAS shed will not be removed. This will ensure continued support of the eight test bins which will be installed for developing pressure baseline and gas baseline data. Leaving the DAS system intact will also ensure its availability to support the initial shipment of test bins containing CH TRU mixed waste for emplacement in the Bin-Scale CH TRU Waste Test Program.

WP 05-109 and WP 05-110 will be modified to provide appropriate guidance for retrieval and handling of bins. The retrieval task is to safely remove bins/RCBs from the bin racks, and transport them to the surface.

Initiation of retrieval will commence with attachment of the RCB handling device to the forklift. One of the two upper RCBs will then be grappled and retrieved from the bin stack. The RCB, suspended from the RCB handling fixture, will be swipe-surveyed on those surfaces not previously accessible. If no additional radioactive contamination is present, the forklift operator will transport the RCB to the transfer area. Another forklift will transport the RCB to the underground transporter.

At least one RCB will be simulated to have contamination present on its outside surface(s). Upon detection of contamination, all retrieval activities will cease and personnel will leave the Room 1 area. The contamination conditions will be evaluated and the appropriate RWP changes will be made. Retrieval or decontamination will then be conducted in accordance with procedures applicable to retrieval of contaminated waste containers.

Upon removal of a lower RCB, HP personnel will survey the RCB support rack for evidence of contamination. Waste Handling Operations personnel will then dismantle the rack as prescribed by procedure and in conformance to the work controlling RWP. Uncontaminated rack components will be removed from Room 1 and stored or disposed of as uncontaminated waste. Contaminated rack components will be placed in an SWB for storage or disposal as CH TRU waste or LLW after Radiation Safety has concluded an evaluation.

As each individual RCB is retrieved, Waste Handling Operations personnel will update the WIPP Waste Tracking System (WWTS) with information to track the bin and RCB. Updating of the WWTS will be verified by Inspection Services personnel.

The underground transporter will convey the RCBs to the waste hoist for transport to the surface.

3.1.5 PREPARATION FOR SHIPMENT

Upon arrival on the surface, the RCB will be transferred to the conveyance loading room air lock. Surveys will be taken prior to transporting the RCBs into the OP&RR. In the OP&RR the RCB lid will be unbolted and raised sufficiently to allow swipe surveying of the bin for any loose contamination. The flexible hoses connecting the bin ports to the RCB lid will be disconnected and removed from the RCB. Surveying of the hoses will be conducted to ensure that no contamination is present. If contamination is found, the hoses will be classified as either TRU or LLW and prepared for off-site shipment.

After confirming that the bin is clean, it will be removed from the RCB and transported to the Vacuum Distillation System for removal of residual VOCs.

In the event that a bin is found to be contaminated, the existing conditions will be evaluated and a management decision will be made as to whether or not the bin is decontaminated and then put through the Vacuum Distillation process or simply remains within it's RCB which will subsequently be closed with an SWB lid and serve as the overpack for shipping the bin to an interim storage site.

Decontamination techniques will be exercised for at least one bin that is simulated to possess loose surface contamination. After the decontamination process is concluded, the bin will undergo vacuum distillation.

Vacuum distillation of the bins is required to remove residual VOCs which were not released during the five-year Bin-Scale CH TRU Test. Section 5.10 addresses vacuum distillation in more detail. Upon completion of vacuum distillation, bins will be returned to their respective SWBs and full closure of the SWBs' lids will be made. Those SWBs transported from the underground will then be cleaned to remove all traces of salt dust prior to loading into TRUPACT-IIs.

Under conditions requiring the shipping of large numbers of bins off the site, a specific number of SWBs may be designated to serve as bin containers between the underground and surface. Bins will then be packaged in clean SWBs that have not seen service in the underground. This process will ensure no salt dust is put into the TRUPACT-IIs, and will eliminate or significantly reduce the effort to clean salt dust off each SWB. Updating of the WWTS during these transfers will ensure control of inventory of all waste containers.

At the TRUPACT-II loading dock, the overpack packages will be weighed and then staged for loading to remain within the TRUPACT-II limits. TRUPACT-II loading will be conducted according to implementing procedures in support of a draft TRUPACT-II Payload Compliance Plan.

Waste Handling procedure WP 05-106 will require revision to address the loading of TRUPACT-IIs with overpacked waste containers.

In general, this process will include the following tasks:

- Individual bin identification serial numbers will be verified as SWB lids are placed on the RCBs to fully reconfigure them as SWBs. The SWBs identification numbers will be recorded in the WWTS, which is used for internal tracking. WWTS information will be uploaded to the WIPP Waste Information System (WWIS) after bins have been received and emplaced and, again, after bins have been retrieved and shipped off-site.

- The SWBs will then be transported to the TRUPACT-II loading docks and weighed. Applying individual container weights to the TRUPACT-II design weight criteria will provide the data for programming exactly how each waste container can be loaded into a TRUPACT-II.

- Assembly of the containers onto the TRUPACT-II pallet in compliance with the requirements of the TRUPACT-II SARP and Compliance Plan.

- Classification of the shipment in accordance with Department of Transportation regulations.

- Data will be input into the WWTS.

- Following assembly of containers onto the TRUPACT-II pallet, the pallet is lifted and placed into the TRUPACT-II Inner Containment Vessel (ICV).

- The ICV lid is then emplaced and locked. A helium leak test of the ICV O-ring seal is performed to ensure integrity in accordance with WP 05-111.

- The Outer Containment Vessel (OCV) lid is then emplaced and helium leak tested.

During the Integrated Checkout, loading of the TRUPACT-IIs will be carried out in strict compliance with procedural controls.

The loading of a TRUPACT-II trailer will be controlled by WP 05-106. With a TRUPACT-II loaded onto a forklift, the Waste Handling Operator must carefully maneuver the TRUPACT-II into alignment guides fixed on the transport trailer. These guides properly align the TRUPACT-II tie-down brackets with the trailer-mounted U-bolts at four points, to secure the TRUPACT-II for transport. Tie-down handles will then be rotated to put pre-tension on the tie-down brackets. U-bolts may be adjusted to achieve specified tension.

After loading, a tractor will move the trailer from the radioactive control area (RCA) to the security receiving yard. Final surveys will be conducted and required hazardous material signs will be fixed to the trailer. A Bill of Lading is prepared and the carrier is notified to pick up the shipment. Detailed check-off sheets will be inspected and signed off by Inspection Services personnel before releasing the trailer and TRUPACT-IIs for transport to the designated receiving site.

During the retrieval and processing for off-site shipment, inventory and tracking of SWBs and bins will be accomplished by updating of the WWTS. Evaluation of design changes for the WWTS are currently being accomplished by Waste Handling Operations. The WWTS will be upgraded to accommodate requirements associated with retrieval, processing of waste containers and shipment off-site; the upgrades will then be tested prior to the Bin-Scale Integrated Checkout. Changes to the WWIS are expected to be minimal. Design and implementation of changes to that system are also underway and validation testing will also occur prior to the Bin-Scale Integrated Checkout.

A TRUPACT-II Compliance Plan addressing the requirements for shipping CH TRU waste from the WIPP will be developed in draft form. Formal approval of this plan will not be made since there is no currently identified site or sites selected for receipt of waste from WIPP. The compliance plan will be written to address requirements established by the current TRUPACT-II SARP and the Nuclear Regulatory Commission (NRC) Certificate of Compliance document. The content of the draft compliance plan will be used to support the level of rigor addressed in implementing the ISCP activities. By developing a draft compliance plan and implementing its requirements to the fullest extent practicable, WIPP management will take advantage of the opportunity to exercise the full range of shipping compliance activities, associated documentation, and personnel training.

3.2 INTEGRATED CHECKOUT ACCEPTANCE CRITERIA

The acceptance criteria against which the handling, emplacement, operation and retrieval of waste containers and their processing for off-site shipping shall be judged will include the following:

- Were procedural controls established for performing all activities addressed during bin handling, emplacement, operation, retrieval and off-site shipping preparation?
- Were activities safely and effectively conducted in full compliance with approved procedures?
- Were simulated abnormal events effectively managed in accordance with radiological control procedures and abnormal event procedures?
- Were all personnel dose accumulations bounded by the FSAR addendum?
- Were all activities conducted safely and without personnel injury?
- Were all applicable requirements of the draft compliance plan met?
- Were the qualifications of individuals performing all activities documented, and were they approved?
- Did equipment performance meet design requirements?
- Were all applicable OSRs observed during the Integrated Checkout and processing for off-site shipment?

3.3 RADIOLOGICAL CONTROLS

The WIPP Radiation Safety Manual, WP 12-5, documents the policies and procedures used to control radioactivity on the surface and in the WIPP underground. Training, occupational dose limits and controls, external and internal dose measurements, surface and airborne contamination control, and the RWP program are defined and described in WP 12-5. The surveying, decontamination, and radiation control procedures described within the Radiation Safety Manual will provide the administrative controls to be exercised through implementation of appropriate RWPs, throughout all those processes which contain some risk of exposure to personnel. The following sections address the normally expected HP activities supporting the Integrated Checkout and the exercises that are intended to demonstrate that personnel are trained and procedures are in place, to safely address anticipated abnormal conditions.

All activities involving the handling of radioactive material or potential spread of radioactive contamination will be conducted with oversight by HP personnel. The operating procedures controlling various processes for handling and containing radioactive material will be reviewed and commented upon by Radiation Safety supervisory level personnel as those procedures undergo administrative approval.

Surveying of equipment and waste containers will be conducted using hand-held mid and low-range beta/gamma instruments. Portable alpha detectors will also be used. However, materials or equipment suspect of alpha contamination will require swiping and counting of the swipe on bench scalers prior to release to uncontrolled areas.

Decontamination activities will normally require cessation of other activities during the decontamination effort. Rigorous planning and control under RWP instructions will apply to decontamination under all anticipated operating conditions. Initiation of decontamination will be timely to minimize the spread of radioactive material. Techniques will include physical lifting of contamination and the fixing in place where appropriate. Evaluation critiques to explore changes to prevent future incidents, and to more effectively address the adverse results of contamination events, will normally be conducted as a management effort to improve the control of those activities which risk inadvertent release of contamination.

3.3.1 TRUPACT-II RECEIPT AND SWB UNLOADING

Upon arrival of the trailer transporting TRUPACT-IIs to WIPP, Health Physics Technicians (HPT) will conduct swipe surveys of the TRUPACT-II containers prior to commencing any unloading activities. This ensures that no contamination will inadvertently get loose as the TRUPACT-II containers are removed from the trailer and brought into the Waste Handling Building (WHB).

As the TRUPACT-II container is disassembled, an HPT will periodically survey with instrumentation and swipes the exposed interior of the container. In addition, the container disassembly will take place under a hood which is designed to vent any escaping gases into the filtered WHB exhaust. As the overpacked bins are removed from the TRUPACT-II, the SWB surface will be surveyed to ensure it is free of radioactive contamination.

The SWB will be transported to the OP&RR where it will be modified by lid replacement to become an RCB. Upon removal of the SWB lid, additional surveying of the bin will be conducted to ensure it's freedom from contamination. Opening of the bin port isolation valves and attachment of the flexible hoses between the bin ports and the RCB lid will also be closely monitored by a qualified HPT. Throughout the preparation of the bin for transport to the underground, any detection of contamination will be cause for stopping the work activity and evaluating the conditions. Corrective action will be in accordance with the requirements of WP 12-5

3.3.2 BIN/RCB EMPLACEMENT

In the underground, emplacement of the bin/RCB will be monitored by an HPT. The removal of RCB hose covers and the installation of flexible hoses from the RCB to the instrumentation and the support equipment, can potentially expose personnel to contamination sources. Therefore all activities which involve a potential breach of contamination barriers (each port in the bin will contain a high efficiency particulate roughing filter to minimize the escape of radioactive particulate material from the bin) will be monitored by an HPT.

During emplacement of the bin/RCBs, two gas samples are taken from each bin and some of the bins are purged and de-oxygenated. Twenty-four of the bins will also have 8 to 12 liters of brine injected into them. All of the bins will be pressurized and then injected with 100 ppm each of the tracer gases Neon and Krypton. During the conduct of at least one of these tasks, a simulated release of radioactive contamination will occur to exercise response and procedural controls.

3.3.3 EXPERIMENT INITIATION, OPERATION AND TERMINATION

An individual bin is considered to be operational for the purposes of the Bin-Scale CH TRU Waste Test upon withdrawal of the gas sample taken within 4 hours of injecting the tracer gases. Thereafter gas samples will be drawn periodically in accordance with the Test schedule. The Dry Bin Scale Integrated Checkout over a five day period will use a modified schedule to ensure that operating personnel have the opportunity to exercise their skill at drawing the gas samples. HPTs will also be given the opportunity to conduct their monitoring responsibilities during these sampling tasks. Removal and counting of the particulate filter in the gas sampling system will also provide the opportunity for HPTs to practice their skills. It is anticipated that the gas samples will not contain any radioactive gases except for small quantities of Radon. However, this potential will be monitored by an HPT during the laboratory analysis process of the gas samples.

To monitor the bin-scale test room environment, two continuous air monitors (CAMS) will be installed in the room. One CAM is an alpha detector; and the other CAM is sensitive to beta and gamma radiation. In addition, during operation and retrieval, Radiation Safety will establish a bench scaler to provide low background detection capability for both alpha and beta/gamma. The release limits specified in the WIPP Radiation Safety Manual cannot be achieved by hand-held detection instrumentation. Only a properly calibrated and operated bench scaler can achieve the low levels of detectability required for release of material potentially contaminated with alpha activity.

As backup to the CAMs, Radiation Safety will also provide fixed air samplers. The open filters will normally be counted approximately twice per week for particulate activity. This range of installed continuous operating radiation equipment provides early warning of release of radioactive material. The fixed air sampler also functions as an integrating sampler that allows detection of low levels of activity over a period of time.

Upon termination of the Integrated Checkout, the instrumentation and equipment flexible hoses must be removed from the RCB to allow retrieval of the bin/RCB assembly. The procedures for controlling these removal activities will have had Radiation Safety review to ensure that the necessary radiological control practices are identified to reduce the risk of spreading any radioactive material if it is present. All the removal activities will be monitored by HPTs.

During removal of instrumentation connecting hoses and instrumentation, at least one incident of detection of radioactive material will be simulated. The proper control of the contamination will include the proper packaging for disposal of the contaminated material in a CH TRU or LLW container. Radiation Safety will make the evaluation of whether the type of material is TRU waste or radioactive waste.

An incident simulating the contamination of a mined surface will be introduced during the retrieval process. The source will be a contaminated instrument or bin test support component. The contamination of mined surfaces requires implementation of radiological controls that are different, in some respects, than those controls normally used to address contamination of waste container surfaces. The mined surfaces are not smooth; they are subject to generating dust, and are relatively easily abraded. Any incident which may potentially contaminate a mined surface should be addressed promptly. Two overriding conditions when dealing with potential contamination of rock make early action imperative:

- It is very difficult to analyze rock for contamination.
- If contaminated, migration of the contaminants into the rock can proceed until the contaminant is removed.

Therefore, the strategy for radiological control of mined surfaces is to prevent any contamination from occurring. But, if contamination does occur, efforts will concentrate on containment of the contaminants and rapid cleanup of the contaminated area.

The procedures for cleanup will address the use of a "vacuum blaster" which abrades the mined surface, allowing a high efficiency particulate filtered vacuum cleaner to then remove the contaminated material. To prevent spread of contamination during removal, consideration will be given to the degree of confinement of the cleanup equipment utilized, and the HP and/or Industrial Hygiene oversight required. Any contamination removal activity will be conducted in accordance with pre-approved procedures.

Prior to initiating actual retrieval of the RCBs, a detailed survey of the RCBs will be conducted.

3.3.4 RETRIEVAL

After completion of the termination activities, the individual RCBs will be removed from their respective racks by a forklift and taken to a transfer station at the Ventilation Control Barrier in Room 1. A second forklift will take the RCB to the underground transporter for transport to the Waste Hoist. The transfer station provides a "step off pad" capability in the event some contamination is found on the underside of the RCB after it is removed from the rack. It is expected that no contamination of a RCB exterior will occur since it is a secondary barrier. Should contamination be found on an RCB, it will be decontaminated prior to transporting it to the surface. At least one bin/RCB assembly will be simulated to have been dropped in removing it from an upper rack location. The extent of damage to the RCB to be simulated will be determined from the results of actually dropping a bin/RCB during the training and testing period preceding the Integrated Checkout.

Surveying of the racks and their disassembly will follow the retrieval of the RCBs. In the process of readying the racks for disassembly, all the attached instrumentation, oxygen sensors, pressure relief valves and gas flow meters will be removed, surveyed and disposed of appropriately. It is not anticipated to attempt to decontaminate any contaminated components. Contaminated components will be disposed of as site-generated radioactive waste or in the event of retrieval, packaged for off-site shipment. The racks will be stored unless contaminated. Under contaminated conditions, the racks will be disposed of as site-generated radioactive waste or in the event of retrieval, packaged for off-site shipment. At least one rack will be simulated to have radioactive contamination. The source will be a contaminated bin support instrument or component that was not appropriately removed resulting in contamination of the rack. Radiation Safety will evaluate the situation, modify the RWP as appropriate, and specify the required decontamination or disposal action. Packaging for off-site shipment will be assumed during the ISC.

3.3.5 PREPARATION FOR SHIPMENT

Once on the surface, the RCBs will be taken to the OP&RR for lid change-out to reconfigure the RCB as an SWB, survey of the condition of the bin, and transport of the bin to the Vacuum Distillation System. Close HP monitoring of the activities required to remove the RCB lid and disconnect the bin-to-lid hoses will ensure that any contamination that may be inside the RCB is identified prior to removing the bin. This will minimize the potential for spreading contamination if it is present. During this preparation phase, one RCB will be simulated to have been internally contaminated as a result of a leaking particulate filter and a partially failed hose. The conditions will be evaluated and a management decision will made as to the disposition of the bin:

- The bin may be decontaminated and put through the vacuum distillation process.
- The bin and RCB may be decontaminated as much as possible and reclosed without the bin being vacuum distilled.
- No decontamination activity may be implemented and the SWB simply closed up and loaded into a TRUPACT-II.

Upon completion of vacuum distillation, the bins will be loaded into SWBs, which in turn will be loaded into TRUPACT-IIs for shipment off the site. All the WHB activities required in this loading and shipping preparation will be monitored by qualified HPTs. After final trailer loading, swipe surveys of the TRUPACT-IIs will be taken prior to releasing the trailer for transport to the interim storage site.

Throughout all phases of the Dry Bin-Scale Integrated Checkout, the radiological control of activities will be monitored for compliance to procedures, ease of implementation, and practicality of operation.

4.0 SYSTEM READINESS

During the preparations for the integrated test (as described in Section 3.0), each system required to support the Dry Bin-Scale Test Program will be individually started up, tested, and documented in accordance with WIPP procedures. The degree of rigor and documentation supporting the start-up and acceptance testing will be dependent upon system complexity.

The initial step in system readiness is the development of procedural controls that management identifies as necessary for any individual system. The scope of procedures may include installation, calibration, start-up, acceptance testing, and operations if 1) the system is complex; and 2) its overall readiness program requires extensive time and effort. Conversely, a simple system or equipment assembly may have its control vested in only one or two procedures. These procedures will encompass the necessary controls to ensure that the system meets its design requirements and to ensure personnel using the system have sufficient documented guidance to safely operate the system as intended and within its design limits. In addition to procedures that may be specific to a particular system, there are more general procedures that address tasks. In the course of accomplishing these tasks, one or more systems or pieces of equipment may require operation. Unloading of a TRUPACT-II is an example of this type of procedure. Operation of a dry bin after emplacement is another example.

Each procedure will be subjected to a technical review prior to its formal approval. During the system readiness and training programs, procedural deficiencies will be identified and applicable procedures will be changed to improve the quality and practicality of accomplishing identified tasks.

As WIPP personnel receive the hardware necessary to construct and/or install a specific system, that hardware will be assembled as required. The assembly guidance may be by approved procedure or engineering drawing. Some systems may be delivered preassembled and require nothing more than electrical or pneumatic power. Once the system is available and the applicable procedures are approved, start-up and testing of the system will be conducted.

The mock bins will provide the platform upon which to test the systems and equipment supporting the Dry Bin-Scale Test. Figure 7.1 includes a matrix of the major functional activities supporting system readiness to initiate the Integrated Checkout.

4.1 DATA ACQUISITION SYSTEM (DAS)

The responsibility for installation and checkout of the DAS rests with SNL. The Experimental Operations Section (EOS) of the Westinghouse WID will support SNL in this task.

The DAS will receive all of the monitored parametric values from each bin and record these values in a Mod-Comp computer. A DAS shed containing signal processing equipment is located at the south end of Room 1, Panel 1, in the WIPP underground. The computer for recording information, scanning individual bin conditions, and controlling the two solenoid operated pressure relief valves on each bin is located on the surface.

The SNL QA Program is written in compliance with NQA-1 and is approved by the DOE. Procedures will be developed, approved, and implemented to address and document the detailed installation, calibration, start-up and checkout of the DAS, including the signal processing equipment and the computer monitoring, control and alarm functions. In addition, the bin support instrumentation which will interface directly with the DAS will be controlled by specific procedures with acceptance criteria, where applicable, for the following:

- Cable fabrication, installation and testing
- Pressure gage installation, calibration and repair
- Pressure gage connection and activation onto the DAS
- Thermocouple preparation and installation
- Thermocouple connection and activation onto the DAS
- Oxygen sensor installation, calibration, and repair
- Oxygen sensor connection and activation onto the DAS
- Solenoid operated pressure relief valve installation, calibration, and repair
- Solenoid operated connection and activation onto the DAS
- Mechanical pressure relief valve installation, calibration, and repair
- Gas flow meter installation, calibration, and repair
- Gas flow meter connection and activation on the DAS

Upon completion of the DAS checkout and start-up to support the Bin-Scale Test, and after receipt of mock bins and the required instrumentation, at least one bin will be set up in Room 1. Instrumentation will be installed and connected to the DAS. A complete operational cycle of the bin will then be conducted to evaluate the DAS ability to perform the parametric monitoring and control functions required by the Bin-Scale Test Program. Satisfactory completion of this phase will be the basis upon which to declare that the DAS is ready to support the Integrated Checkout. The acceptance criteria for the preoperational test will include, as a minimum, the following:

- The DAS will routinely read and record parametric values at the prescribed frequency.
- The DAS will change frequency and initiate alarms in accordance with the logic design.
- The failure rate of the individual parametric measurements is within the acceptance criteria.

- Pressure relief valves are activated with the setpoint plus calibration tolerance.

- The DAS response to power failure events is within the prescribed acceptance criteria.

4.2 BIN INSTRUMENTATION

Each emplaced bin will be outfitted with instrumentation to provide data to the DAS to assist in monitoring the bin internal conditions throughout the test period of five years. The instrumentation for each bin includes the following:

- Five thermocouples to monitor the internal bin temperature distribution. The thermocouples will be installed at the generating site prior to loading waste into the bin.

- Two gas pressure gages.

- Two solenoid operated gas pressure relief valves. The valves will be in series with gas flow/volume monitors, and will have their discharges routed to the VMS.

- Two mechanical relief valves in parallel with the solenoid operated valves.

- Two gas flow/volume monitors.

- One oxygen-specific solid state sensor and gas recirculation fan.

As a minimum, the preoperational calibration and the performance testing of this instrumentation shall address the following parameters, as taken from the Test Plan: WIPP Bin-Scale CH TRU Waste Tests (January 1990, M.A. Molecke):

- Preoperational checks:

  - Leak tightness for installed gages and valves will be accomplished in conjunction with the initial bin pressure test after bin emplacement. Fittings will be checked with a leak sensitive liquid.

  - Thermocouple Continuity testing. The Type E Chromel-Constantan thermocouples are operable up to 500°C with a ± 0.003°C resolution. The thermocouples will have a calibrated range up to 70°C.

  - Pressure Gage Calibration. The pressure instruments have a 0 to ± 2.5 psi range electrically centered on 14.1 psia. The accuracy is 0.25 percent. The gages will be recalibrated approximately every six months.

  - Pressure Relief Valve Function Test. Individual solenoid operated valves will be functionally tested to ensure valve operability upon receipt of a closed and open signal. Mechanical valves should be set and lift tested. Flow through testing or visual inspection should be documented to ensure there is no inappropriate obstruction in the gas relief path.

- Gas flow/volume monitors will be calibrated for specific measurement of air or argon depending upon in what bin a specific monitor is to be mounted.

- Solid state oxygen-specific sensors will be available from Neutronics, Inc. The dual range (0-100 ppm and 0-1000 ppm oxygen) sensors have a one percent accuracy and a resolution of 0.1/1.0 ppm. The sensor requires a supply and exhaust connection to the bin. A small fan will circulate bin atmosphere through the sensor. Calibration of the oxygen sensor and proper fan operation will be checked after bin installation.

NOTE: Figure 4-1 is a schematic depicting the instrumentation associated with each bin.

The development of the procedural controls for bin instrumentation, installation, and calibration is the responsibility of SNL. The procedures will address, as a minimum, the following:

- Precautions to ensure bin isolation is maintained during instrument installation
- Observation of radiological and As Low As Reasonably Achievable (ALARA) practices
- Detailed cable lay down instructions from the bin to the DAS shed, to minimize interference with bin operating activities conducted by Waste Handling Operations
- Verification that preoperational checks of instruments are completed prior to installation
- Documentation (including baselined drawings maintained up to date) specifically identifying instrument installed and bin affected
- Documentation identifying individual performing the work
- RWP controlling the work
- Any unusual or abnormal conditions noted on the RCB, storage rack, or instrumentation during installation

The development of the procedural controls for instrumentation removal is the responsibility of SNL. Since the potential for contamination is higher at removal than at installation, specific attention must be given

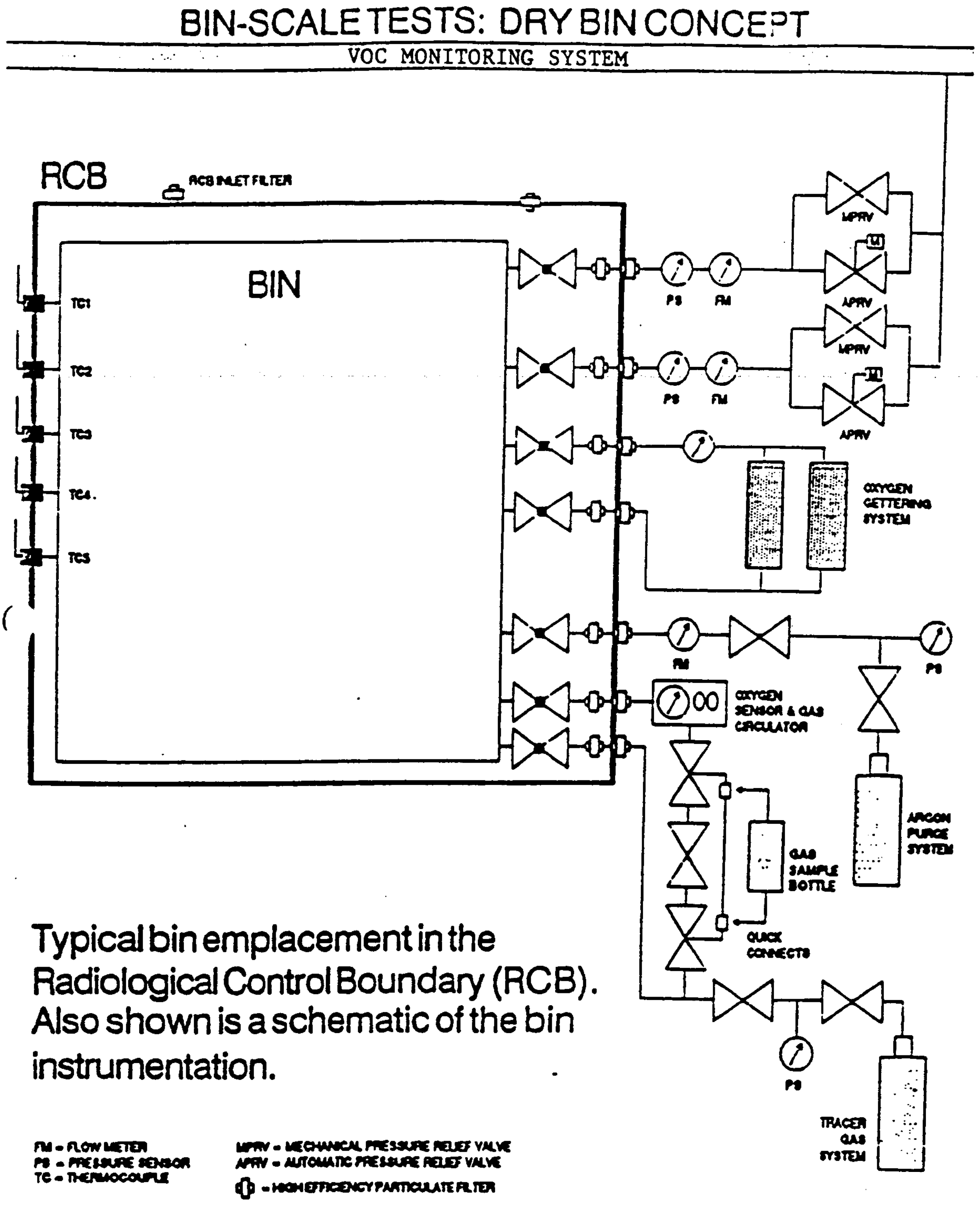


FIGURE 4-1. Bin-Scale Tests: Dry Bin Concept

to those procedural controls necessary to minimize contamination spread. As a minimum, the procedure will address:

- Surveying of instrument attached prior to any work
- RCB isolation from instrument to be removed
- Capture of any potentially contaminated residue during removal
- Packaging of instruments and associated tools at the RCB prior to transport out of the bin-scale test area
- Technical details of instrument removal
- Surveying and control of cabling removal to prevent contamination spread
- Preparation of RCB hose connections for subsequent instrumentation installation, to minimize contamination spread
- Detailed directions for control of instruments and tools up to completion of decontamination to appropriate release levels, or to completion of packaging as stored site-generated, radioactive waste, or noncontaminated waste

Utilizing the mock bin identified in Section 2.1, the procedures controlling bin instrumentation will be verified by installing the instruments on the mock bin/RCB. This task will initially be conducted on the surface. Upon completion of this validation process, the mock bin/RCB will be taken underground and the process will be repeated, incorporating procedures for connecting the DAS to the instrumentation. This will enable validation of the DAS to properly monitor the instrumentation and control the pressure relief valves.

4.3 BIN PRESSURE TEST SYSTEM

To ensure that handling of the bin during transport to WIPP, as well as bin emplacement and instrumentation installation, has not had any deleterious effect on the pressure integrity of a bin, each bin will undergo two pressure tests prior to being placed into operation. A pressurization system will be designed and procured to conduct this test. A pressure test will be performed after installation of the RCB lid and lid to bin hoses and a second pressure test will be conducted after bin/RCB emplacement and instrumentation installation. Detailed test pressures and acceptance criteria will be established upon which to evaluate bin integrity.

The preoperational testing of the bin pressure test system will not be defined until the system design is established. However, it is anticipated that a pressure control valve, a calibrated pressure gage, and a relief valve will require documentation of the following:

- Proper operation of the control valve over its range of operation
- Calibration of the test pressure gage
- Calibration and set-point check of an over-pressure relief valve

The operating procedure controlling the bin pressure test will accomplish the following items:

- Identify required safety precautions and RWP requirements.
- Specify the required test conditions and the acceptance criteria.
- Specify actions to be taken in the event of test failure.
- Require documentation of test results for each bin.
- Identify test operators by name.
- Document the as-left condition of the bin/RCB.
- Detail the step-by-step procedure for connecting, operating, and disconnecting the pressure test equipment.

Checkout of the bin pressure test system and validation of the operating procedure will be conducted on a mock bin/RCB assembly on the surface as a part of the overall Integrated Systems Checklist preparation.

4.4 ARGON GAS FLUSHING SYSTEM

For those bins required to be anaerobic, the initial oxygen removal step is by flushing with argon gas to a level of 1,000 ppm oxygen or less. The equipment used to accomplish this task will be a flask of pressurized argon gas with an appropriate control valve, pressure gage, and relief valve. In addition, the safety aspects of using argon gas as a flushing gas require the presence of an oxygen analyzer and a qualified operator. The gas flushing path will be through a gas pressure relief valve and into the VMS, and thence into the mine ventilation system.

The minimum preoperational checks for the argon gas flushing system will document the following:

- Up-to-date calibration of the gage, control valve, and relief valve associated with reducing and controlling argon pressure and flow
- Up-to-date calibration of the oxygen analyzer to monitor for oxygen during the flushing task

The argon gas flushing procedure, as a minimum, will address the following:

- Applicable safety precautions and warnings associated with argon gas

- Conditions which will be established prior to commencing gas flushing activities. These include the following:
  - Vent line attached to the VMS
  - A positive air flow in the room to disperse any argon gas which may leak
  - Oxygen analyzer available for room air
  - Bin solid state oxygen-specific sensor operable and recording oxygen level
  - RWP prepared to establish radiological controls
- A detailed step-by-step procedure for attaching argon gas source to the RCB
- A step-by-step procedure including argon gas inlet pressure limits for flushing
- Prescribed flushing times to reach predetermined oxygen levels

The checkout and validation of the argon gas flushing system and the applicable operating procedure will occur initially on the surface. Subsequent checkout underground will then ensure proper DAS monitoring of the mock bin oxygen sensor. During this checkout, flushing times to specific oxygen levels will be documented and incorporated into the operating procedure. This will serve as guidance to Waste Handling Operators to determine whether or not a specific flushing task is proceeding satisfactorily. The industrial hazard associated with argon gas requires a procedural approach that adequately addresses all safety aspects of working with the gas. If, in carrying out the flushing task, an operator can identify an abnormal trend he or she can stop the flush and investigate for unmonitored leaks.

Checkout of this system will be coordinated with checking out the Oxygen Gettering System.

4.5 OXYGEN GETTERING SYSTEM

It is anticipated that the argon flushing of a bin will not be practical below 500-1000 ppm oxygen. To achieve an oxygen concentration of less than ten (10) ppm, an oxygen removal process is required. The Oxygen Gettering System will use a copper-aluminum oxide catalyst bed as an oxygen scavenger agent. The system will be a self-contained skid-mounted unit which can be easily moved from RCB to RCB. Connection to an individual bin will be through the gas recirculation system associated with the oxygen sensor on each bin/RCB. Two systems will be procured to provide back up capability. The systems will use a Dow Chemical Company Q-5 reactant. The Q-5 reactant is a replenishable oxygen scavenging material that is commercially available. Q-5 reactant is a copper catalyst supported on a granular aluminum oxide substrate material. The chemical formula for the controlling reactions are as follows:

$$Cu\ (On\ Al_2O_3) + O_2 \rightarrow Cu_2O\ \text{(oxygen removal)}$$

$$Cu_2O + H_2 + Heat \rightarrow H_2O + Cu\ \text{(regeneration)}$$

To regenerate the reactant, a forming gas (3 percent H_2/97 percent N_2) is passed through the depleted reactant after raising the reactant temperature to 200°C. The resulting reaction is exothermic, causing the temperature to increase to approximately 300°C. The maximum temperature must be maintained at less than 400°C.

The oxygen gettering system will require a pump to move gas through the reactant bed, heat strips to heat up the bed, temperature monitoring, and water vapor condensing capability. Particulate filtration of the supply side will be required to minimize contamination of the reactant bed. The design will also require equipment to recirculate or exhaust the forming gas and measure the oxygen concentration of the system discharge.

The responsibility for the design and procurement of the oxygen gettering system, including the development of the start-up test, acceptance test, and operating procedure, rests with SNL. The scope of the start-up procedure, as a minimum, will address the following:

- Preoperational checks
  - Calibration and continuity checks of temperature monitoring instrumentation
  - Calibration and functional test of the regeneration gas discharge oxygen analyzer
  - Calibration and functional test of the gas flow recorder/controller
  - Electrical checkout and functional test of the gas recirculation pump
  - Heater control functional test
  - System leak test at a pneumatic pressure of 0.5 psig and a pressure decay of less than one percent over a 30 minute period
- Acceptance testing
  - Oxygen removal capacity at 40 cfm with 1000 ppm oxygen inlet gas flow and a discharge of one ppm oxygen
  - Q-5 reactant bed capacity > 2.0cc oxygen per gram of reactant at STP
  - Q-5 reactant bed discharge oxygen concentration < one ppm

- Q-5 reactant bed regeneration time of < 14 hour(s) to a gas discharge oxygen concentration of < one ppm given an oxygen input of 1000 ppm

The operating procedure for the bin oxygen gettering system will, as a minimum, address the following:

- Safety precautions associated with these items:
  - High temperature regeneration of the Q-5 reactant bed
  - Disposal of potentially contaminated regeneration water
  - Monitoring for potential leakage and concentration of hydrogen gas during regeneration
  - Radiological, hazardous chemicals, and ALARA controls associated with connecting and disconnecting the system to an RCB
- Detailed step-by-step direction for placing the system into operation for oxygen removal
- Detailed step-by-step direction for replacement of the Q-5 reactant
- Detailed step-by-step direction for regeneration of the Q-5 reactant
- Abnormal operations:
  - Hydrogen gas leakage
  - Excessive heat generation temperature ($\leq$ 400°C)
  - Temperature control instrument failure
  - Oxygen analyzer failure
  - Flow recorder/controller failure
  - Gas pump failure
  - Control and disposal of radioactive contaminated regeneration water

The checkout, start-up, acceptance testing and operating procedure validation for the system will be conducted initially on the surface. Subsequent checkout underground will be conducted in conjunction with argon flushing of a mock bin. Lessons learned from the checkout and validation processes will be incorporated into the operating procedures.

4.6 TRACER GAS INJECTION SYSTEM

Tracer gases (neon and krypton) will be injected into each bin after initial pressurization. The gas quantity injected through each bin's gas recirculation system will be 100 ppm for both neon and krypton. The equipment to accomplish this injection will be a gas tight syringe with a calculated volume of both tracer gases. The injection port will be isolated by high efficiency particulate roughing (HEPR) filters on either side. This configuration will alleviate radioactive contamination of the injection needles. In addition, the injection port that is located downstream of the sampling ports will be isolated by check valves to prevent contaminating gas samples with high concentrations of tracer gas.

Acceptance testing of the gas injection system will require documentation of the following:

- Proper installation and operation of the gas tight syringe
- Verification of documentation certifying purity of the tracer gas
- Proper loading of the syringe with the calculated volume of tracer gas

The gas injection operating procedure, as a minimum, will address the following:

- Identification of required safety precautions and RWP requirements
- Detailed step-by-step direction for
  - Connecting the injection system to the bin/RCB
  - Gas injection including criteria for ceasing injection
  - Disconnecting the injection system from the bin/RCB
- Radiological control considerations
- Criteria for evaluating success of the injection task

Checkout and operating procedure validation of this system can be conducted on the surface, since the DAS is not required to support tasks associated with the injection of tracer gas. The checkout also does not require that the mock bin be de-oxygenated.

4.7 GAS SAMPLING SYSTEM

Gas samples for the bin-scale tests will be collected in miniature stainless steel cylinder assemblies. Gas samples will be collected from the gas recirculation loop, that is shared with the continuous oxygen sensor. All gas samples are collected downstream of HEPR grade filters, and again filtered through a redundant, removable filter disc (located on the gas sample cylinder inlet) that can be surveyed by HPTs. The cylinder assemblies are double ended to accommodate flow-through gas samples for maximum sample homogeneity. Low-dead-volume quick connects featuring leak-tight double end shutoffs will ensure that the gas sample is securely trapped when the assembly is disconnected from the recirculation loop. A valve located between the particulate filter holder and the cylinder will isolate the gas sample from contamination with outside air while the filter holder is opened for radionuclide monitoring. A septum fitting will allow removal of gas sample aliquots for compositional analysis.

Prior to each use, the gas sample cylinder assembly will be purged with high purity nitrogen (exhausting through a HEPR filtered fume hood); a new filter disc and septum will be installed; then the cylinder assembly will be evacuated to one millitorr. Successful maintenance of this high vacuum for a designated period will ensure that the assembly is leak tight prior to every use, and that no significant volumes of gas will enter the bin system boundary when the next sample is collected. A bypass valve in the recirculation line will divert the full recirculation gas stream through the sample assembly.

Acceptance testing of the gas sampling system will require documentation of the following:

- Operator training in proper handling and use of the gas sampling system
- Verification that the gas sampling system meets its leak tightness criteria to hold a vacuum of one millitorr
- Verification that removal of a particulate filter does not compromise the integrity of the collected sample

The gas sampling procedure, as a minimum, will address the following:

- Identification of required safety precautions and RWP requirements
- Detailed step-by-step direction for:
    - Preparation of the gas sampling system
    - Connection to and removal from the bin/RCB gas recirculation system
    - Maintenance of chain-of-custody control

Geotechnical Engineering is responsible for the development of the analytical procedure through which the gas sample will be processed. The checkout and operating procedure validation, including the laboratory analytical process, can be conducted on the surface. Power will be required for the gas recirculation fan associated with the oxygen sensor installed on the bin. It is anticipated that a number of the gas sampling assemblies will be constructed. Each of these assemblies should undergo a checkout routine to ensure its proper functioning.

4.8 VOC MONITORING SYSTEM

To ensure compliance with EPA requirements regarding VOCs, all gases released from the bins to the mine ventilation system require monitoring for VOCs. In order to collect these gases, the VMS, as shown in Figure 4-2, will be connected to the discharges from the bin pressure relief valves. The collection header of the VMS is normally isolated from the normal mine ventilation path by a solenoid operated vent valve. This valve will be open when the VMS Air Sampler Pump is off. The Pump will be programmed to shut down for 30 minutes every 5.5 hours. The Air Sampler will collect approximately 12 liters of gas per day in two six-liter collection bottles. The flow rate into the bottles is controlled by an adjustable needle valve. Upstream of the Air Sampler is a charcoal filter through which all bin discharged gas must pass before it is collected or discharged to the mine. It is expected that the charcoal filter will remove all VOCs from the discharge stream. The Air Sampler's primary function is to collect the filter discharge and analyze it to ensure that the filter is properly removing VOCs.

A helium addition system is also designed into the VMS. The helium function is to move the bin discharged gas through the VMS and thus reduce the residence time of the VOC within the collection header. As the Sampler Pump reduces pressure in the collection header, helium will be automatically released into the header when the pressure falls to approximately-0.1 psig. The helium addition will stop when header pressure returns to approximately 0.0 psig.

The DAS will control bin pressure to prevent exceeding 0.5 psid within a bin. At 0.5 psid, the DAS will open the affected bin's pressure relief valve for two minutes. The excess bin gas will discharge directly into the VMS collection header.

To minimize the impact of operation of the Sampler on individual bins, most of the piping associated with the gas collection header is normally isolated from the Air Sampler and charcoal filter piping. This collection header piping serves as an accumulator for the bins' discharge. When the Air Sampler Pump shuts off, the isolation valve opens and allows the gas in the collection header to enter the Sampler and charcoal filter manifold. The quantity of gas which passes through the charcoal filter is measured by a mass flow meter and is integrated on a totalizer display. When the pump restarts, the isolation valve automatically shuts.

The startup and acceptance testing program for the VMS will address the following tasks:

- Leak tightness of the system piping and components
- Functional testing of the Air Sampler and its associated pump, collection bottles, and flow control needle valve
- Calibration of all instrumentation and pressure regulating components

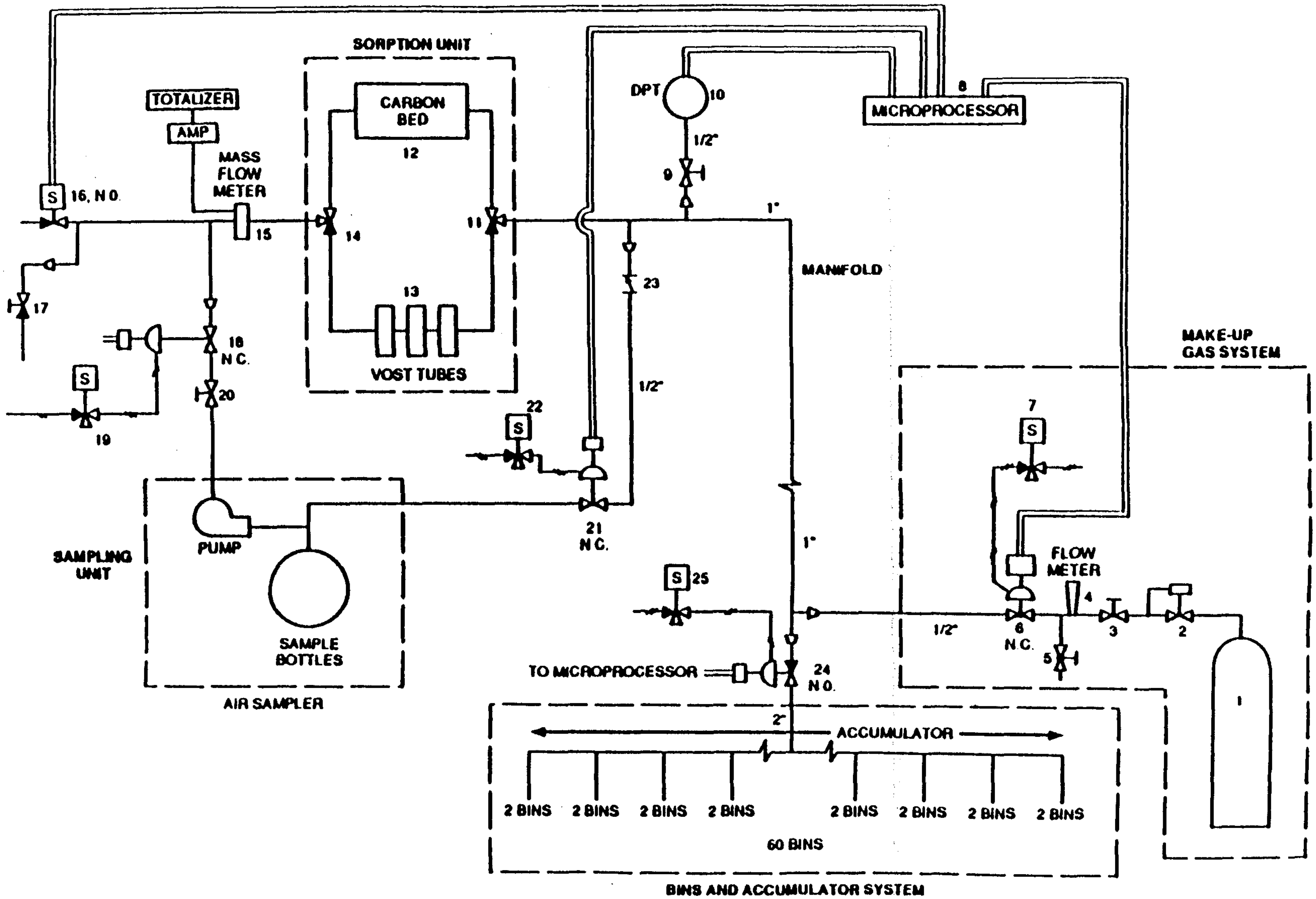


FIGURE 4-1 VOC MONITORING SYSTEM

FIGURE 4-2. VOC Monitoring System

- Calibration and proper operation of the mass flow meter and it's associated totalizer display
- Calibration and proper operation of the system microprocessor

The operating procedure for the VMS will address the following processes as a minimum:

- Collection header connection and disconnection to the bin/RCB assembly
- Installation and replacement of charcoal filters
- Installation and replacement of the helium bottle
- Installation and replacement of sample collection bottles.
- Installation and removal of the Volatile Organic Sampling Train (VOST) tubes
- Air Sampler Pump operation
- Setting of the Air Sampler needle valve and the helium control needle valve.

4.9 VACUUM DISTILLATION

At the conclusion of the five-year test period, the test bins will be retrieved from the underground. The experimental data requirements include the measurement of all residual VOCs which still reside in the waste matrix. In order to determine the quantity of VOCs remaining, each bin will undergo a vacuum distillation process for removal and quantification of the VOCs. The system requirements must raise the temperature of the waste to slightly less than 100 degrees centigrade and draw a vacuum on the bin to extract the released gases. The technical details of this process are under development by SNL.

Identification of specific test criteria and procedural requirements and restrictions must await the development of design criteria and technical requirements. Upon receipt of this information, appropriate test and operating procedures to control the checkout and performance test of the system will be developed and incorporated into the ISCP.

5.0 ADMINISTRATIVE AND TRAINING READINESS

Successful implementation of the ISCP requires the development of a number of new procedures to control operational activities, in addition to those that will support the start-up and acceptance testing of the systems described in Section 4.0. Table 5-1 identifies the most significant of these administrative controlling procedures. Other procedures which already exist will require modification to address the handling of bins and SWBs.

The training of personnel to properly utilize these new and revised procedures will require significant attention by management. It is vital that the preparation of new training material is adequate, and that sufficient time is made available for individuals to become proficient in required skills.

Implementing the ISCP incorporates effective management of procedure preparation, validation of the procedures, and training of personnel prior to commencing the Dry Bin-Scale Integrated Checkout. The period during which the Bin-Scale support systems and equipment are installed and acceptance tested, is programmed to provide the opportunity for training of operating personnel simultaneously with procedure validation. Taking advantage of the time frame will significantly improve the likelihood that the appropriate operating procedures will safely control the activities supporting the Integrated Checkout.

5.1 PROCEDURE READINESS

In preparation for the Dry Bin-Scale Integrated Checkout, a number of procedural controls will be developed and exercised to ensure procedure validity. The Waste Handling Operations Manual (WP 05-1) will control the receipt, emplacement, operation, retrieval, and shipment of bins. Some applicable procedures within WP 05-1 will require changes to reflect bin handling.

- WP 05-105, TRUPACT-II Receipt
- WP 05-106, TRUPACT II Handling. This procedure will require change to reflect 1) unloading overpacked bins; and 2) loading overpacked bins into a TRUPACT-II.
- WP 05-109, CH TRU Waste Emplacement
- WP 05-110, CH TRU Waste Retrieval
- WP 05-113 through WP 05-120, Bin Operation - These procedures will be written to address, as a minimum, the following bin operations. Those activities which are one-time-only may be established as start-up procedures:
    - RCB lid installation and hose connection to the bin
    - Pressure testing of the bin in the Overpack and Repair Room (OP&RR) after installation of the RCB lid and hoses

Table 5-1

ADMINISTRATIVE CONTROLLING PROCEDURES

Activity/Procedure	Responsible Organization
Bin rack assembly and emplacement	Underground Operations
Bin receipt and emplacement	Waste Handling Operations
Instrumentation installation, calibration and repair	Experimental Operations
Bin operation including: - Bin pressure testing - Bin systems pressure testing - Brine injection - Argon gas purging - Oxygen gettering - Pressurization - Tracer gas injection - Gas Sampling	Waste Handling Operations
RCB Lid	Waste Handling Operations
DAS operation	Experimental Operations
Gas sample analysis and disposal	Geotechnical Engineering
Bin/RCB retrieval	Waste Handling Operations
Support rack disassembly and disposal	Waste Handling Operations
Bin processing for TRUPACT-II loading	Waste Handling Operations
Ventilation Control Boundary Installation	Underground Operations
CAMS and radiological controls	Radiation Safety Programs
Hazardous chemical controls	Safety and Plant Protection
Bins gas collection system operation	Waste Handling Operations
VMS operation	Regulatory and Environmental Programs
Vacuum distillation installation, start-up and acceptance testing	Radioactive Waste Handling Engineering
Vacuum distillation operation	Waste Handling Operations

and after initial emplacement of the bin/RCB assembly to the following criteria:

1. Pressurize to 0.6 psig + 0.1 psig - 0.00 psig.

2. Hold for 15 minutes + 1.0 minute - 0.00 minutes.

3. Acceptable if pressure does not decrease less than 0.0001 psi.

- Action upon failure to pass pressure test

  1. Overpack and store as CH TRU waste.

- Brine injection

- Argon gas flushing

  1. Include safety precautions when working with argon.

- Oxygen gettering system operation

  1. Include system regeneration and precautions for high temperature.

- Tracer gas injection

- Initial bin pressurization and maintaining over-pressure condition

- Gas sampling including radiological control precautions and handling activities, up to relinquishing control to Geotechnical Engineering personnel

• WP 05-109, CH TRU Underground Handling - This procedure will require change to reflect emplacement of support racks and bin/RCBs into a Panel 1 room.

  - Rack location
  - Bin/RCB emplacement into the rack top and bottom locations

• WP 05-110, CH Waste Package Retrieval - This procedure will require changes to reflect:

  - Retrieval of bin/RCBs from a support rack

  - Disassembly and storage or disposal of racks, including contaminated and uncontaminated rack components

• The WWIS will require re-evaluation to determine what, if any, program changes are necessary to accommodate bins in an overpack configuration for shipment from the WIPP.

- The WWTS will require evaluation to determine what, if any, program and/or procedure changes are required to accommodate the retrieval, transport and TRUPACT-II packaging of bins out of Panel 1 rooms.

- The TRUPACT-II compliance plan will require the development of implementing procedures.

As described in Section 3.0, a number of procedures addressing specific systems and component start-up and acceptance testing will be developed during the preparation for the Integrated Checkout. Included in this development will be specific operating procedures. Appendix A identifies responsibilities for procedural development controls pertaining to activities within the scope of the ISCP.

5.2 TRAINING READINESS

The start-up and acceptance testing, and the operating procedure validation for systems supporting the mock waste bins in the Bin-Scale Test Room, provide some excellent training opportunities. The Technical Training Group (TTG) within the Human Resources department shall review all the procedures associated with the ISCP in the initial draft stage and identify specific training needs and opportunities. The TTG will place emphasis on the development of documentation to support the following:

- On the job training activities accomplished during the start-up and test program, which can be applied to refresher training at the time of termination of bin-scale testing and retrieval, if necessary

- Systematic needs analysis of the required activities to ensure development of lesson plans to support future refresher and initial training

- Direct observation of the start-up and test activities, supervisory feedback for the systematic evaluation of previous training, and measurement of the effectiveness of that training

- The identification of subject matter experts (SMEs) and their area of expertise, to ensure qualified resources for future training needs

An individual within the TTG will be dedicated to supporting responsible managers to ensure that maximum advantage is taken of the training opportunities made available by this ISCP.

Training will be coordinated with the receipt of equipment and the development of training materials. As equipment is received and system components are assembled, operator indoctrination and hands-on exercises will be introduced during the start-up and acceptance testing of the systems or system components. The actual manual tasks required to start-up and test equipment will be performed by personnel assigned to the responsible operating organization, under the guidance of a responsible start-up or design engineer.

Upon receipt of the mock bins an appropriate training area will be established within the WHB. This area will be utilized to configure a bin (with its instrumentation) as it becomes available, including the RCB mockup, to provide an environment in which to demonstrate and validate those procedures for the following activities:

- Reconfigure an SWB to an RCB including installation of hoses from the bin to the RCB lid and from the lid to the instrumentation and support components.
- Sample gas from a bin.
- Add brine to a bin.
- Argon purge a bin.
- De-oxygenate a bin.
- Pressure test a bin.
- Depressurize a bin.
- Emplace and retrieve a bin/RCB assembly.
- Remove contaminated instrumentation.
- Remove the RCB lid and hoses to the bin.
- Install the SWB lid.
- Install and remove connections to the VOC Monitoring system.
- Process the bin through the vacuum distillation system.

Practical factor training and qualification certification for personnel will take place during this training period. When appropriate, as determined by the responsible section managers, the training location should be moved to the underground. A fully configured mock bin/RCB should be electrically connected to the DAS and the previously described processes repeated to assure that the impact of the changed location does not introduce any nuances which are not addressed in the appropriate procedures.

Upon completion of this training cycle, a QA audit shall be conducted to review the completeness of the documentation supporting the qualification of individuals, the documentation supporting the incorporation of approved changes to procedures, and the close out of deficiencies identified during the training and procedure validation process.

6.0 QUALITY ASSURANCE

All programs identified in this ISCP are to be controlled by the existing DOE approved WID QA Program and supporting procedures for managing and operating the WIPP. This program encompasses the 18 Basic Requirements and Supplements of ANSI/ASME NQA-1 as required by DOE Order 5700.6B and AL Order 5700.6B. It additionally invokes the requirements of 10 CFR 71 for the use of the TRUPACT-II Type "B" Packaging and DOE Order 5400.1 for Environmental Monitoring and Surveillance Programs.

The requirements are implemented by a "Graded Approach" program which evaluates and establishes the complexity and nature of each considered item, system, and function. From this, the QA requirements are applied to ensure and document an "in compliance" end product.

The Environmental Monitoring and Surveillance Program includes QA Program requirements for 1) organizational responsibility; 2) program design; 3) procedures; 4) field quality control; 5) laboratory quality control; 6) human factors; 5) redirecting; 6) chain-of-custody procedures; 7) audits; 8) performance reporting; and 9) independent data verification.

All test procedures shall document the performance and verification of all necessary testing to demonstrate that equipment, facilities, and systems: 1) will operate in accordance with established design criteria as defined in the FSAR; and 2) will operate satisfactorily and safely per approved plant design documents/specifications (reference WP 03-001, Rev. 5).

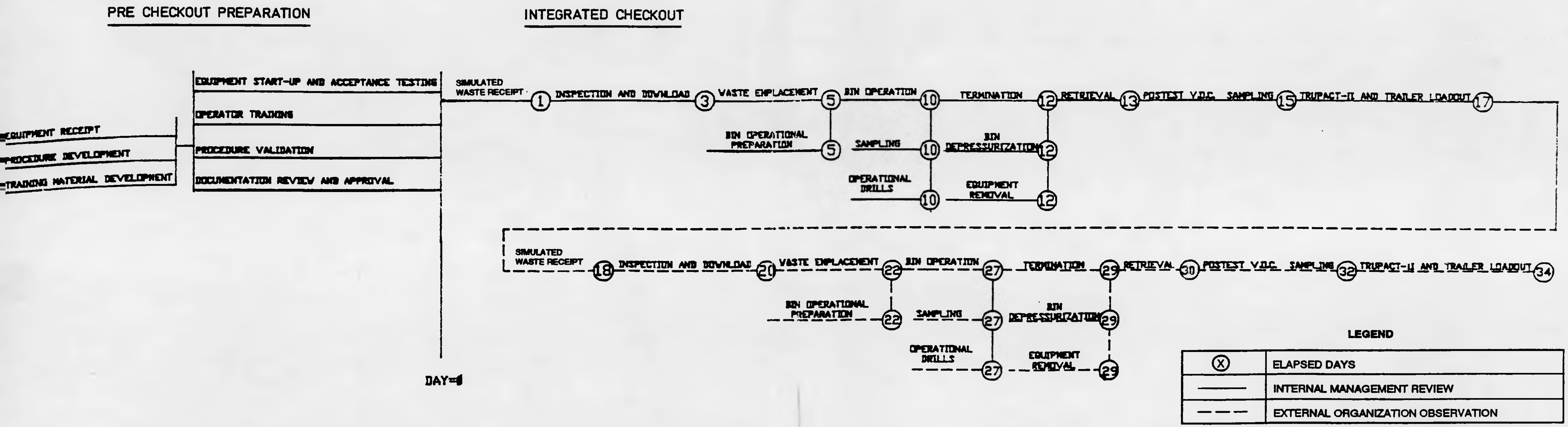
All persons conducting start-up testing must be certified test engineers per WP 03-001.

In the event the decision is made to ship waste from the WIPP, revisions and additions to the program will be incorporated to comply with the WACC, 10 CFR 71, the TRUPACT-II SARP, and the DOT requirements for shipping waste in TRUPACT-IIs to other sites. A draft compliance plan using the documents previously described will be developed to support the simulation addressed during the Integrated Systems Checkout Program.

7.0 SCHEDULES

Figure 7-1, Dry Bin-Scale Integrated Checkout, identifies the major functional activities required in preparations for conducting 1) the Dry Bin-Scale Integrated Checkout; and 2) the scheduled timeline for conducting the checkout. Two complete checkouts are planned to accommodate, first, an internal management review and, following this review, an opportunity for invited external organizations to observe an integrated checkout.

DRY BIN-SCALE INTEGRATED CHECKOUT



NOTE: (1) INITIAL CHECKOUT FROM (1) TO DAY (17) FOR REVIEW BY WIPP PROJECT OFFICE MANAGEMENT. CHECKOUT SEQUENCE TO BE REPEATED FROM END TO END FROM DAY (18) TO DAY (34) FOR OBSERVATION BY DOE INVITED FEDERAL, STATE AND LOCAL INTERESTED PARTIES.

(2) DAY 0 CORRESPONDS TO THE DATE FOR THE START OF THE "INTERNAL DEMO" AS SHOWN ON THE BIN SCALE READINESS LINE OF THE DECISION PLAN FOR WIPP.

FIGURE 7-1. Bin-Scale Integrated Checkout

8.0 REFERENCES

Draft Final Plan for the Waste Isolation Pilot Plant Test Phase: Performance Assessment, DOE/WIPP 89-011, December 1989.

Draft Plan for the Waste Isolation Pilot Plant Test Phase: Performance Assessment and Operations Demonstration, DOE/WIPP 89-011, April 1989.

Design Criteria, A Waste Isolation Pilot Plant (WIPP) Revised Mission Concept-II (RMC-IIa), WIPP/DOE-71, Revision 4, February 1984.

Environmental Protection Agency Standard, 40 CFR 191, Subpart B, Sections 13 and 15.

Final Report for the Contact-Handled Transuranic Waste Mock Retrieval Demonstration, WEC, January 28, 1988.

Response to Contamination Events, WP 12-914.

Test Plan: WIPP Bin-Scale CH TRU Waste Tests, Martin A. Molecke, SNL, January 1990.

TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant, WIPP/DOE-069, Revision 3, January 1989.

Waste Isolation Division Quality Assurance Program Manual, WP 13.

WIPP Radiation Safety Manual, WP 12-5.

WP 05-1, WIPP Waste Handling Operations Manual.

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PROCEDURE DEVELOPMENT RESPONSIBILITY

Procedure Scope	Organizational Section
Bin Pressure Leak-Testing Procedure	RWHE
Bin Argon Gas Flushing Procedure	SNL
Bin Gas Sampling Procedure	Geotech Engr
Bin Tracer Gas Injection Procedure	Geotech Engr
Bin Operation Radiological and Safety Procedures	Rad Safety
Oxygen Gettering System Operating Procedure	RWHE
Radiological Monitoring Acceptance Test	Rad Safety
Bin Rack Installation and Removal Procedure	WHO and U/G Ops
Bin Handling, emplacement, Retrieval and Overpack Procedure	WHO
TRUPACT-II Ventilation Hood Acceptance Test	RWHE
Bin Instrumentation Installation, and Calibration Procedure Pressure Gauges Pressure Relief Valves Thermocouples Oxygen Sensor Gas Flow/Volume Gages	SNL
Bin Instrumentation Removal Procedure	SNL
DAS Installation and Calibration Procedure	SNL
DAS Start-Up and Acceptance Test Procedure	SNL
Bin Radiation Control Boundary (RCB) Installation and Removal	RWHE
Bin Oxygen Getter System Installation and Removal Procedure	*RWHE
Bin Oxygen Getter System Instrumentation Calibration Procedure	*RWHE
Bin Oxygen Getter System Preoperational Test	*RWHE
Bin Oxygen Gettering System Start-Up and Acceptance Test	*RWHE
Bin Oxygen Gettering System Operating Procedure	*RWHE

* SNL input from M. Molecke required for procedure responsibility.

Modification of Various Waste Handling Procedures to Address - Weighing of Overpack Containers in WHB Prior to TRUPACT-II Loading - of Overpacks into TRUPACT-II	WHO
Upgrade WWIS	Tech Support
Upgrade WWTS	WHO

PROCEDURE DEVELOPMENT RESPONSIBILITY (cont.)

Procedure Scope	Organizational Section
VOC Monitoring System Installation, Start-Up, Acceptance Testing and Removal Procedures	RWHE
VOC Monitoring System Operation	RWHE
Dry Bin-Scale Integrated System Checkout Test	RWHE

LEGEND - Ex Ops - Experimental Operations

Fac Engr - Facility Engineering

Geotech Engr - Geotechnical Engineering

Maint and Tech SVC - Maintenance and Technical Services

Mine Engr - Mine Engineering

Rad Safety - Radiation Safety

U/G Ops - Underground Operations

WHO - Waste Handling Operations