LIMITED DEMONSTRATION TEST PLAN

for the

VORTEC-PADUCAH MATERIAL HANDLING SYSTEM

at the

**UNITED STATES DEPARTMENT OF ENERGY
PADUCAH GASEOUS DIFFUSION PLANT**

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J. C. Simpson

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Prepared by:

**Vortec Corporation
3770 Ridge Pike
Collegeville, PA 19426**

Prepared for:

**U.S. Department of Energy
National Energy Technology Laboratory**

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DOCUMENT REVIEW AND APPROVAL

PREPARED BY: _____ DATE _____
 J.C. Simpson
 TEST LAB MANAGER
 VORTEC CORPORATION

REVIEWED BY: _____ DATE _____
 L.M. Bartone
 DIRECTOR OF PROCESS DEVELOPMENT
 VORTEC CORPORATION

 R. K. Hnat
 DIRECTOR QA/COST CONTROL
 VORTEC CORPORATION

APPROVED BY: _____ DATE _____
 J.G. Hnat
 PROGRAM MANAGER
 VORTEC CORPORATION

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VORTEC LIMITED DEMONSTRATION of MATERIAL PRE-TREATMENT AND CONDITIONING SYSTEM TEST PLAN

I. SUMMARY

This test plan has been prepared in partial fulfillment of the contract requirements of DOE/NETL Contract No. DE-AC21-92MC29120. This Test Plan describes the test work to be performed during a limited demonstration of Vortec's Material Pre-Treatment and System.

The scope of the Vortec Project Limited Demonstration Testing includes a series of subsystem tests, using surrogate materials, with Vortec's Material Pre-Treatment and Conditioning System at the DOE Paducah Gaseous Diffusion Plant (PGDP). This effort is part of a Research and Development Program sponsored by the U.S. Department of Energy National Energy Technology Laboratory (DOE NETL). The total program was originally structured to design, construct, and demonstrate Vortec's innovative vitrification technology. Settlement of a stakeholder lawsuit resulted in a DOE Environmental Assessment of the project and contributed to program delays and cost increases. DOE funding limitations have constrained the original scope of the project. In order to maximize the benefits of the design and procurement efforts already completed, the project was re-scoped to conduct a limited demonstration.

DOE studies concluded that with the funding available, construction of the Material Pre-Treatment and Conditioning Systems would be the most beneficial use of the investment in equipment. A demonstration of the Material Pre-Treatment and Conditioning System would then provide data that would serve the needs of processing mixed waste soil contained in 55 steel gallon drums and 85 gallon overpacks.

With the use of this technology, it is anticipated that significant cost benefits will accrue in the handling, characterization, transport, treatment, storage and disposal of drummed waste relative to DOE's current procedure for management of the waste. The process provides the means of safely handling larger quantities of waste – thus resulting in rapid final disposal; thus also reducing waste caretaker costs.

The goal of the project is to achieve significant cost benefits relative to DOE's current methods of waste management and disposal.

The major objective of the limited demonstration is to demonstrate that the Vortec Material Pre-Treatment and Conditioning System can either convert non-homogeneous drummed materials into homogeneous materials in bulk containers for direct disposal, or produce a feedstock appropriate for further treatment. Separating and combining the material from the individual 55-gallon drums or 85-gallon overpacks presently used for storage and drying the material without uncontrolled dust emissions accomplishes these goals.

Pre- test activities will consist of start-up and shakedown of equipment and systems. The testing will consist of several continuous operation testing segments. The purpose of the test protocol is to validate individual component and subsystem performance. The demonstration testing will

demonstrate acceptable subsystem performance over a 30 day test period to validate commercial readiness of the technology. All effluent streams from the subsystem shall be quantified, sampled, and analyzed by qualified laboratories.

A. PGDP FACILITY BACKGROUND

PGDP is in western Kentucky's McCracken County, about 10 miles west of Paducah, Kentucky. Most of the PGDP facility is surrounded by property that is deeded or leased to the public or the Commonwealth of Kentucky's West Kentucky Wildlife Management Area. Construction of PGDP began in 1951, and initial operations began in 1952. For more than 40 years, the facility has produced enriched uranium for commercial and military reactors. Since July 1, 1993, DOE has leased PGDP to the United States Enrichment Corporation (USEC). USEC has assumed production operations at the plant, but DOE has retained responsibility for environmental restoration and related waste management activities. These activities focus on environmental remediation efforts; environmental compliance; storage, treatment, and disposition of wastes; and decommissioning of inactive and surplus facilities. On May 31, 1994, the plant was placed on the National Priorities List. Past operations at PGDP have contaminated several areas at the facility on site and beyond facility boundaries. The Vortec demonstration will be conducted in the northwestern portion of the facility outside of the existing plant fence.

B. PGDP WASTE CHARACTERISTICS

A wide range of waste streams at the Paducah site potentially require treatment prior to final long-term storage/disposal. The waste streams are predominantly mixed hazardous waste, and PCB-containing waste streams. A large volume of these waste streams includes contaminated soil stored in steel drums. These streams are amenable to preprocessing through the Vortec system. Once the material has been preprocessed through the Vortec Material Pre-Treatment and Conditioning System, the material can be handled with ease for stabilization or destruction of the hazardous components present in the material.

C. PERMITTING

Based on operations with clean soil, neither a hazardous waste treatment (RCRA) permit nor an air emissions permit is required for this testing. An air permit will not be required because no hazardous air pollutants or radionuclides would be discharged, and the projected emissions of criteria pollutants are well below the minor source limits.

II. BACKGROUND

A. STATEMENT OF MIXED WASTE TREATMENT NEED

Several potential benefits exist for DOE in preparing drummed soils via this feed preparation approach. Handling of the prepared waste will be less complex and the cost of transportation, further treatment, and disposal will be reduced on a per unit basis. Similarly, there will be a reduction in sampling frequency to meet Waste Acceptance Criteria for off-site treatment or disposal. In addition to the cost savings, DOE will reduce the time until final disposal, and gain an environmental benefit (these drums may currently leak or begin leaking while in storage or transport).

The Waste Processing facilities are anticipated to yield a substantial cost savings over transporting unprocessed drums (current method) by:

- Reducing characterization costs, due to the homogenization of discrete waste streams, and packaging in bulk containers,
- Lowering transportation costs, since packaging in bulk containers will allow greater volumes to be shipped on a carrier.
- Reducing handling costs on the disposal side by removing moisture and metals, which can be disposed on-site.
- Elimination of long-term drum storage and oversight costs.

Analysis of the process indicates management and disposal costs could be as much as 50% relative to current DOE practice. The concern for safety has been addressed through the minimization of human handling of the waste during all phases of management, treatment and disposal.

The moisture content will be reduced via drying, and magnetic metal debris wastes will be removed and potentially disposed on -site at a lower cost. The particle size reduction, accomplished through the primary and secondary shredders; the homogenization in the rotary homogenizer; and magnetic metal removal will produce a relatively homogeneous feed material that is more amenable to continuous stabilization or other treatment processes.

B. CURRENT STATUS OR STAGE OF DEVELOPMENT

The individual items of equipment including shredders, enclosed conveyors, rotary homogenizer, metal removal equipment, and effective dust control are standard industrial items modified for strict emissions control. Combining them into a material pre-treatment and conditioning system will provide a new option to DOE for handling drummed contaminated soil.

C. STATUS OF PROPOSED TECHNOLOGY

The proposed technology of preparing drummed contaminated soil for further treatment by shredding the drums without removing the soil and then drying the soil and removing the magnetic metal does not operationally exist for radioactive wastes. The technologies for individual process unit operations are well developed; however, this system has not been accomplished on an integrated system commercial scale.

D. NEEDED TECHNOLOGY IMPROVEMENTS

The improvements being evaluated are the operation of the individual items as a system to process drummed soil and debris into a relatively homogeneous, shredded material. Technology improvements may be identified through the suitability of this material to be fed into additional processes, such as vitrification, for stabilization or destruction of the hazardous components in the waste material. For these additional processes, it is desirable to produce a material that is uniform and free flowing. The homogenization of the waste material is increased through blending during the drying processes; while the free flowing characteristic is achieved by shredding the drums and their contents, then drying and removing magnetic metal from the waste material. Specific performance issues that are addressed in this testing program include:

1. The effectiveness of the proposed system to remove soil and debris from steel drums with a drum shredding and material drying process.

2. The effectiveness of the proposed homogenizer to remove water from the soil and debris.
3. The effectiveness of blending between different drums that occurs during the processing of the material.
4. The effectiveness of fugitive dust emission control from the dust collection system.
5. The maximum continuous processing rate.
6. The effectiveness of the back-up electrical generation system to maintain the system at a slight negative pressure in response to a loss in the primary electrical power source.

III. REQUIRED DATA AND ACQUISITION APPROACH

The approach to collect the required data to evaluate the system is to construct a demonstration unit and perform a series of trials. These trials will process drums containing surrogate materials representative of material that could be encountered at DOE facilities. The trials will demonstrate the versatility and effectiveness of the proposed system on a range of materials including soils containing 15% to 30% moisture content, and combinations of soils and debris such as concrete chunks and steel reinforcement bars. The soils used in the proposed demonstration will be representative of the soils local to the Paducah facility. The following two subsections address the required data and the data acquisition approach.

A. REQUIRED DATA

The data required during the trials includes performance and regulatory data. The performance data is required to complete the understanding of the operation of the system while the regulatory data ensures that the operation of the facility is in compliance with all applicable regulations and provides data for any future permitting activities.

1. Performance Data

The demonstration test criteria will include measures of the effectiveness of drying, metals separation, ventilation and particulate capture, and product handling systems. The performance data to be collected during the trials and a brief description of the methods used to collect these data are given in Table III-1.

2. Regulatory Data

In addition to the performance data, facility compliance data regarding the discharge of materials will be collected. These discharge points include air emissions and solids discharge. Since the surrogate wastes are non-hazardous and will be prepared to specific recipe formulations, the processed solids will not be sampled to gather regulatory data. However, the feedstock and pretreated solids will be sampled and analyzed for performance data, as stated above.

There are two potentially regulated air emissions points, the Nuisance Dust Collection System vent and the Homogenizer Exhaust vent. The level of emissions under the limited demonstration scenario is low enough to constitute a minor source requiring no air permit. No hazardous air pollutants or radionuclides will be discharged and the emissions of criteria pollutants will be well below the minor source limits of 25 tons per year.

Table III-1 Performance Data Required During Demonstration Trials

Data Required	Collection Method
Moisture content of feed	-Measure amount of water added to surrogate materials during preparation. -Loss on drying analysis performed on grab samples from drums.
Moisture content of conditioned soil	Loss on drying analysis performed on grab samples of material to ST-90 boxes.
Particulate size distribution of feed	-Vendor Info or sieve analysis of material used to prepare surrogate materials -Sieve analysis of grab samples collected from drums.
Particle size distribution of conditioned material	Sieve analysis performed grab samples of material to ST-90 boxes.
Magnetic metal content of feed	-Weigh empty drum plus added metal -Weigh full drum
Magnetic metal content of conditioned material	-Weigh grab sample -Separate and weigh metal from grab samples of material to ST-90 boxes.
Homogenization during shredding and drying of material	-Concentration of tracer material in feed -Concentration of tracer material in grab samples of material to ST-90 boxes.
Particulate dust emissions from process vents	EPA Method 5 sampling and analysis.
Fugitive dust emissions	Visual inspection and recording in logbook of the presence, development and implement method onsite to prevent emission.
Utilities consumption	Electric meter and propane meter readings.
Maximum feed rate	Increase system feed rate until subsystem can no longer operate correctly.
Capacity to process 85 gallon overpacks	Feed 85-gallon overpacks to system and monitor system for mechanical failures.
Homogenizer Inlet Gas Temperature	Temperature transducer in inlet duct
Homogenizer Outlet Gas Temperature	Temperature transducer in outlet duct
Dust Collector Inlet Pressure	Pressure transmitter in nuisance dust and homogenizer exhaust filter inlets

B. DATA ACQUISITION APPROACH

The approach for collecting the data will be to operate the system over a series of five test runs. During the first four test runs, the feed material, packaged in 55-gallon steel drums, will be varied to determine the effect of different feed characteristics on the operation of the system. In the final test run, the feed material will be packaged in 85-gallon overpacks to validate the system capacity for this type of container. During the initial portion of each day of processing during the test runs, the system will be brought to a steady state and then the collection of the performance data listed above will be initiated. The regulatory data will be monitored by running one EPA Method 5 sampling event for each vent during the operation of the system.

Other potential methods for obtaining the efficiencies of the system for drying, shredding, and metal separations include obtaining specifications given by equipment manufacturers and preparing a sample which is then sent to each equipment manufacturer for processing. Obtaining equipment

specifications from manufacturers does not provide the detailed information and confidence of the system operating on the materials that would be encountered during the processing of waste from DOE facilities. Preparing surrogates and then processing these materials at vendor owned facilities provides a greater amount of information than vendor specifications. However, this method does not provide information regarding the transport of material through the system and potential maintenance problems that could arise from the integrated, continuous processing of the drums of waste. Additionally, and most importantly, these other methods would not provide information regarding the control of dust emissions during the drum shredding and material drying operations.

IV. TEST OBJECTIVES

The Phase IV demonstration contains five experiments performed over a 30 day period, which will consist of process-related tests to confirm that each component of the system is functioning properly and is ready to accept demonstration feed materials. During the demonstration period, the system will operate on one shift, weekdays only. The primary decision to be made from the proposed testing is if the material pre-treatment and conditioning system can produce a more homogeneous feedstock appropriate for direct disposal or further treatment from Paducah source materials or suitable surrogates.

To support the final decision of the suitability of this technology for conditioning and treating the material present at the Paducah site, the system will be operated with the test objectives summarized in Table IV-1. Detailed descriptions of the methods are given in the subsections following the table.

Table IV-1 Summary of Test Objectives and Objective Types

No.	Test Objective Title	Test Objective Statement	Objective Type
1	Homogenizer Drying Performance	Determine the homogenizer efficiency and the percent water in the conditioned material as a function of feed material characteristics and material feed rate.	Operating Data
2	Tramp Iron Magnet Performance	Determine magnetic metal removal efficiency and the amount of magnetic metals remaining in conditioned material.	Operating Data
3	Particle Size Reduction Efficiency	Determine the reduction in particle size that occurs during shredding and drying.	Operating Data
4	Homogenization Effectiveness	Determine the amount of blending that occurs in the system.	Operating Data
5	Drum Size Capacity	Verify the system capacity to process both 55-gallon drums and 85-gallon overpacks.	Operating Data
6	System Maximum Processing Rate	Determine the maximum system processing rate and the rate limiting subsystem.	Operating Data
7	Utilities Consumption	Determine the electricity and fuel required for processing material on a per unit basis.	Operating Data
8	Efficiency of Dust Emissions Control System	Determine the particulate emissions from the nuisance dust collection vent and the homogenizer exhaust vent.	Regulatory
9	Fugitive Dust Emission	Identify potential of areas which could lead to fugitive dust emission	Regulatory
10	System Response to Primary Electrical Power Source Failure	Determine the maximum system pressure during the back-up electrical generation subsystem response time.	Operating Data

The major objective is to demonstrate that using suitable surrogates of waste present on the Paducah site, the Vortec Material Pre-Treatment and Conditioning Systems can produce a homogeneous and dry material appropriate for direct disposal or further treatment. Data collected will include material physical characteristics. Also, equipment data regarding metals removal, utilities consumption, and homogenizer operations will be collected.

1. Homogenizer Drying Performance

Removal of water from the waste stream is a desirable step for many waste-processing systems. To quantify the drying performance of the rotary homogenizer (ME-106), the drying efficiency and moisture content of the conditioned soil will be determined. The drying efficiency is the percent reduction in the percent moisture from the feed material to the conditioned soil. The drying performance will be determined as a function of the feed materials characteristics (specifically moisture content) and material feed rates. The performance goal is a conditioned soil moisture content of less than or equal to 5 wt.% when the as-received soil moisture content is less than or equal to 30 wt.%.

2. Tramp Iron Magnet Performance

The material conditioning system is designed to remove the magnetic metals from the shredded drums and contained in the drums from the dried material by a tramp iron magnet (ME-129). This metal could have a negative impact on further processing of the soil. The magnetic material remaining in conditioned soil will quantify the tramp iron magnet performance. The magnet performance will be determined as a function of feed material characteristics and the material feed rate to the system. The performance goal is a ferrous metal content in the conditioned soil less than or equal to 1%.

3. Particle Size Reduction Efficiency

The Vortec Material Pre-Treatment and Conditioning System is designed to reduce the size of feed materials to less than 2 inches by a series of shredders. The efficiency of the shredder to reduce the particle size of large pieces of debris, such as concrete, will be evaluated by a comparison of the particle size distribution of the feed and conditioned materials and the maximum particle size in the conditioned material. The performance goal is a maximum size of non-metallic particles in the conditioned soil of 2", and maximum dimensions of metallic particles in the conditioned material of 2" by 6".

4. Homogenization Effectiveness

During the conditioning of the soil in the Vortec Material Pre-Treatment and Conditioning System, the drums of soil will be blended together as the shredded material passes through the rotary homogenizer. The blending in the homogenizer occurs due to the rotating action of the component shell. In the processing of drums containing different materials, the amount of blending which occurs between consecutive barrels is of great interest to determine the homogeneity of the conditioned material exiting the system. The Homogenization effectiveness of the system will be determined by feeding a

drum containing a non-toxic tracer and investigating the distribution of the tracer in the conditioned soil. The performance goal is an increase in homogeneity of the material.

5. Drum Size Capacity

The Vortec Material Pre-Treatment and Conditioning System is designed to process materials in 55-gallon and 85-gallon steel overpacks not exceeding 1,200 lbs in weight. To verify that the larger size of the 85-gallon steel overpacks can be handled by the system, material packaged in 85-gallon steel overpacks will be fed into the system and the system monitored for mechanical failures, interruptions, and processing rate reductions. The performance goal is the processing of 85-gallon, steel overpacks with 90% availability.

6. System Maximum Processing Rate

As designed, the mechanical rate-limiting step in the Vortec Material Pre-Treatment and Conditioning System is the rate at which drums can be loaded into the skip hoist and lifted into the system by the skip hoist. It is anticipated that the other system components can process drums and materials at significantly greater rates. To validate that the skip hoist is the rate-limiting step, the system will be monitored at each processing condition for failure to demonstrate a 90% availability of the equipment. In this case, a failure is an event which leads to the processing rate being reduced to less than that set by the skip hoist. The performance goal is the processing of a minimum of 6 drums per hour at a 90% availability.

7. Utilities Consumption

An important factor in evaluating the economics of a processing technology is the utilities cost per unit of waste processed. Additionally, this information is useful for designing the auxiliary support required for a waste processing facility. Electricity and propane are the utilities to be used during the demonstration. The amounts of these utilities used for each test will be determined and related to the amount of material processed.

8. Efficiency of Dust Emissions Control System

During the proposed testing, the primary air emission concern from the processing of soil and debris is particulate material from two vents, the nuisance dust collection vent and the homogenizer exhaust vent. The efficiency of the dust control system will be characterized by the particulate concentration in the vent gases. To control the particulate emissions, cartridge filters and HEPA filters are included in the proposed system. To determine the emissions during the processing of the soil, the particulate emissions will be measured during EPA Method 5 sampling events on each vent. The emissions during the testing will be monitored as a function of input feed and system operating parameters to determine conditions that adversely effect the operation of the components or are signs of potential problems. The performance goal is to satisfy federal, state, and local particulate emissions standards.

9. Fugitive Dust Emission

A primary goal of the proposed testing is to demonstrate the ability of the Vortec Material Pre-Treatment and Conditioning System to remove the soil material from the drums and dry the material without the uncontrolled emission of dust from the system. During the proposed testing, if fugitive dust emission occurs, the emission location will be identified and a solution to eliminate the emission developed. In the case where a suitable solution can not be developed, the amount of fugitive dust emitted by the system will be determined by identifying the dust emission point and then collecting and measuring the dust mass for a specific time. The performance goal is to have no fugitive dust emissions.

10. System Response to Primary Electrical Source Failure

A back-up electrical generation subsystem provides power to the fans in the nuisance dust emissions and homogenizer exhaust dust collection subsystems in the event of loss of primary electrical power. The primary goal of the proposed testing is to demonstrate that the response time of the back-up electrical generation subsystem to failure of the primary electrical source is sufficient to prevent fugitive dust emissions during the response period. During the test, the pressure at the inlet to the nuisance dust and homogenizer exhaust filters will be recorded and subsequently plotted versus time to verify that the pressure does not exceed ambient pressure during the response period. The performance goal is that the pressure at the inlet to the dust collectors not exceed ambient pressure during the period of response.

V. DATA QUALITY OBJECTIVES

The overall QA objective for this demonstration is to produce well-documented data of known quality commensurate with the scope of the program. Such quality is measured by data precision and accuracy, representativeness, completeness, comparability, and achievement of target reporting limits (TRL) for the analytical methods. The data collection from the samples will be carried out according to standard procedures, where available, to insure quality of the data. The typical error in the measurements will be taken as that specified by the procedure. In a few cases, the multiple analyses will be performed on a single sample to validate that the data being collected is within the specified error range.

For some of the test objectives the data results will be presented in the form of a distribution since the data in this form tends to be more useful than an average value. For example, the distribution of particle size of a ground material provides greater insight into the further processing of a material than the average particle size. Again, the range of values associated with a specific measurement will be determined through the standard procedures.

A summary of the test objectives, the corresponding data to be collected, and the data quality objectives are summarized in Table V-1. Following the data quality objectives (DQO's) is a section describing the methods to insure the precision, accuracy, and representativeness of the data.

Table V-1 DQO's for Test Objectives

No.	Test Objective	Data Quality Objective
1	Homogenizer Homogenizer Drying Performance	-Determine the moisture content of soil to 0.5 % absolute. -Determine the percent water removed from the sample to 5%. -Quantify homogenizer feed rate to an accuracy of 5%.
2	Tramp Iron Magnet Performance	-Determine the maximum amount of metal remaining as calculated from the average plus 3 times the standard deviation.
3	Particle Size Reduction Efficiency	-Determine 90% confidence intervals for changes in the particle size distribution of material that passes through the shredding and drying system.
4	Homogenization	-Determine the distribution of trace material in feed to 5 % of the conditioned material exiting the system.
5	Drum Size Capacity	-Process a sufficient number of drums and overpacks to validate that drum size does not interfere with 90% system availability.
6	System Maximum Processing Rate	-Process a sufficient number of drums to validate 90% system availability.
7	Utilities Consumption	-Determine the electricity consumed by the facility to +/- 5%. -Determine the propane consumption by the facility to +/- 5%
8	Efficiency of Dust Emissions Control System	-Determine the maximum particulate emission rates to an accuracy and a precision of 25%.
9	Fugitive Dust Emission	-If required, quantify fugitive dust emissions that amount to greater than 0.01% of the feed rate.
10	System Response to Primary Electrical Power Failure	- Determine the maximum pressure at the inlet to the nuisance dust and homogenizer exhaust dust collectors

A. DESCRIPTION OF DATA QUALITY OBJECTIVES

The following subsections provide detailed descriptions of the data quality objectives. These descriptions address the types of data required; the amount of data required; which data are mandatory; which data are verified, validated, duplicated, and statistical methods; and which data are most key to addressing the test objective.

1. Homogenizer Drying Performance

The drying efficiency of the homogenizer is characterized by the moisture content in the final material and the amount of water removed from the feed material. These characteristics will be correlated to the feed rate of material into the system. The drying performance is required for determining the operating parameters to process wastes to produce a conditioned materials suitable for further processing or disposal. To determine the drying performance, the moisture contents of the feed and conditioned materials are required. Additionally, the operating conditions of the homogenizer are desirable so that they may be correlated with the drying efficiency. The moisture content of the conditioned material will be determined to plus or minus 0.5 percent absolute (e.g. if the moisture content of the conditioned material is 5 %, then the range in the value is from 4.5 to 5.5

%). The efficiency of water removal from the material will be quantified to plus or minus 5%, and the feed rate of material into the system to plus or minus 5% relative. The 0.5% range on the moisture contents of the materials is required to achieve the 5% range on the drying efficiency.

Duplicate analyses will be performed on split samples to validate the drying performance of the homogenizer. A sample splitter will be used to prepare the duplicate samples to insure that the analyses are representative of the feed or output streams.

2. Tramp Iron Magnet Performance

The tramp iron magnet performance is characterized by the percentage of magnetic material remaining in the conditioned material and the percentage of magnetic material removed from the feed stream. The data collected in this objective is key for determining if the metal remaining in the material will have a negative impact on the further processing of the conditioned material. The data required to calculate the metals removal efficiency are the feed and conditioned material sample mass, the mass of metal that can be separated from the feed sample with a magnet, and the mass of metal that can be separated from the conditioned material sample with a magnet.

The maximum metal concentration in the conditioned material for each test condition will be determined by assuming that the percent metal in a sample follows a normal distribution. The maximum metals concentration will be calculated as the average plus 3 times the variance of the individual metals concentrations measured for each sample collected. For each test condition, at least 7 samples of the conditioned material will be collected and analyzed.

The metal concentration in the feed material will be calculated based on the weight of an empty drum plus the weight of magnetic material added to the feed, and the total weight of the feed material.

3. Particle Size Reduction Efficiency

The data required to determine the particle size reduction efficiency of the shredding system are the particle size distributions of the feed and conditioned materials. Both particle size distributions will be considered mandatory for evaluating the efficiency of the shredders.

The particle size distribution of the feed material will be calculated from the particle size distribution of the materials used to prepare the surrogates. The particle size distribution of the surrogate ingredients will be determined from supplier specifications or measurements performed by Vortec. The mass of the individual ingredients added to the soil will be recorded to the nearest 1% in a laboratory notebook.

The particle size distribution of the conditioned material will be determined on grab samples collected using a method that completely intercepts the flow stream to ensure that the sample is representative. The particle size distribution will be determined by the mass of the material retained on certified sieves. The mass of the material retained on the sieves will be recorded to plus or minus 0.1 g.

The particle size distribution of the conditioned soil will be determined at least 3 times during a run condition to determine the range of particle size distributions. Duplicate sieve analyses will be performed on selected split samples to validate that the consistent results are achieved.

4. Homogenization

The data required for determining the Homogenization Effectiveness of the Vortec Material Pre-Treatment and Conditioning System are the mass percent of a tracer in the feed and conditioned soil as a function of time. These data are mandatory for evaluating the Homogenization Effectiveness test objective.

The volume fraction of tracer material in the conditioned soil as a function of time will be determined on grab samples collected using a method that completely intercepts the flow stream to ensure that the sample is representative. The samples will be collected at time intervals corresponding to 1/2 of the time interval between introducing drums into the system. The collection of samples will start after the barrel of tracer material is introduced into the system. Visually separating the tracer from the conditioned material and measuring the mass of tracer and sample will be used to determine the mass fraction of tracer.

The Homogenization Effectiveness will be determined at least three times to determine the variation under each test condition. Duplicate analyses to determine the mass percent of tracer in the conditioned soil will be performed on select samples to validate that the method produces consistent results.

To further verify the results, the total amount of tracer in the conditioned soil will be compared to the amount of tracer introduced into the system. The amount of tracer introduced into the system will be determined by weighing the container with the tracer. The amount of tracer exiting the system will be determined by integrating the amount of tracer as a function of time. The amount of tracer as a function of time will be calculated from the product of the weight percent tracer in the conditioned material and the flow rate of material exiting the system.

5. Drum Size Capacity

The Vortec Material Pre-Treatment and Conditioning System is designed to process material in 55-gallon steel drums and 85-gallon overpack containers. To verify the system's ability to accommodate both drum sizes, 90% availability of the overall system will be demonstrated with both drum sizes. To demonstrate the 90% overall system availability, at least fifty 55-gallon drums and fifty 85-gallon overpacks will be processed with the occurrence of a maximum of one failure event. A failure event is defined as an interruption to the process that leads to a decrease in the rate that drums are introduced into the system. To evaluate this objective, the failure rate of 1 drum in 50 was determined from considering the statistics associated with a binomial distribution. The data that is required to determine the availability is a record of the event failures. In the case where more than 50 drums are processed, a failure rate for the number of drums processed will be derived using the same statistical methods.

6. System Maximum Processing Rate

The anticipated maximum feed rate of material into the Vortec Material Pre-Treatment and Conditioning System is set by the rate which containers can be loaded into the skip hoist and lifted

into the system by the skip hoist. To verify that the skip hoist is the rate-limiting step, a 90% availability of the overall system will be demonstrated at the maximum rate of the skip hoist. During the proposed testing, at least 50 drums will be processed with a maximum of one failure event to validate a 90% availability of the remaining system components. A failure event is defined as an interruption to the process that leads to a decrease in the rate that drums are introduced into the system. The data that is required to determine the availability is a record of the event failures. To evaluate this objective, the failure rate of 1 drum in 50 was determined from considering the statistics associated with a binomial distribution. The maximum rate will be validated for each of the different feed materials. In the case where more than 50 drums are processed, a failure rate for the number of drums processed will be derived using the same statistical methods.

7. Utilities Consumption

The utilities consumption of the facility for processing waste material will be determined from meter readings and the utility provider invoices. The total amount of surrogate material processed through the system will be determined from a summation of the drum weights fed into the system. To determine the utilities consumption per unit of weight material treated, and thus address this test objective, both sets of data are required. The accuracy and precision of the measured drum weights and utilities consumption should be sufficient to calculate the unit-required utilities to within 5 percent.

8. Efficiency of Dust Emissions Control System

The data required to determine the efficiency of the dust control system during the run conditions is the Method 5 sampling event output for the nuisance dust collection vent and the homogenizer exhaust vent. The accuracy and precision of this method is 25%.

9. Fugitive Dust Emission

The data required to evaluate the fugitive dust emissions from the system is the identification of dust emission points through regular inspections of the system. Indications for fugitive dust emissions include, clouds of dust escaping from connections and dust piles accumulating under leaks. Under the proposed operating protocols, upon the identification of a fugitive dust emission point, a solution to prevent the dust from escaping from the system will be developed and implemented. A record of the fugitive dust locations and engineering solutions will be kept in the test logbook.

In the case where the proposed engineering solutions cannot successfully eliminate the fugitive dust emissions, the mass of dust emitted from a specific location in a given time period will be determined. Noting the emission location, recording the start and stop time of the collection of the dust sample, and recording the mass of the dust sample will be used to collect this data. This data will be recorded in a laboratory notebook and is required for determining the fugitive dust emissions from the system.

The minimum amount of fugitive dust requiring quantification will be 0.01% of the feed rate of the material introduced into the system. On a weight basis, this is on the order of 0.3 lb/hr. The mass of fugitive dust will be determined to +/- 1 % of the total amount collected. Additionally, the sample will be collected for at least 2 hours, measured to the nearest minute to insure that precision of the time measurement is approximately that of the mass measurement.

When possible, validation of the initial measurements will be performed by determining the flow rate of fugitive dust by repetitive measurements from the same emission point. The flow rates will be plot as a function of time to determine if there is a time trend associated with the emission point. Additionally, statistics will be preformed to determine the 90% confidence interval of the data using a student distribution for the number of samples collected.

10. System Response to Primary Electrical Power Failure

The data required to determine if the response time of the back-up electrical generation subsystem to failure of the primary electrical source is sufficient to prevent fugitive dust emissions during the response period are the pressure at the nuisance dust collector inlet and the pressure at the homogenizer dust collector inlet. The pressure at each location will be recorded every second during the system response test. If the pressure does not exceed ambient pressure, then the response time of the back-up electrical generation subsystem will be deemed sufficient.

B. DATA PRECISION AND ACCURACY

To insure that the precision of the data is sufficient to meet the data quality objectives, the precision of the instrumentation used in the analysis and measurements will meet the requirements for specified in Table V-2. The recording of the data will be designed to maintain the precision of the data. This data recording includes values manually recorded in laboratory notebooks and equipment logbooks, and data logged by computers and other devices.

Table V-2 Precision Requirements for Measurements

Property/Parameter	Method of Measurement	Measurement Precision
Mass for Laboratory Analyses	Scales, load cells	+/- 0.1% of weight.
Temperature	Thermocouples, RTD, thermometers	+/-3°F
Flow rate	Scales, computer clock	+/-5%
Particle Size	Sieves	Sieves certified by supplier to conform to ASTM Specification E-11
Dust Collector Inlet Pressure	Transducers/Transmitters	+/-0.03 i.w.c.

The accuracy of the measurements will be verified by checking the instruments used in the analysis with NIST traceable standards. Instrumentation requiring calibration/certification during the proposed testing will include the scales, sieves, temperature measurement devices, and flow devices. These calibrations will be carried out prior to the proposed testing. The calibration of the scales used in the analysis of samples will be verified on a weekly basis. All certification certificates and records of the calibrations and verifications will be kept in a logbook for future reference.

C. REPRESENTATIVENESS OF DATA

The representativeness of the data will be demonstrated through sample collection methods, positioning of sensors, and following established analysis procedures.

Standard procedures have been developed to ensure that the data and sample are representative of the process. These standard procedures will be used in the data acquisition design for the proposed test program. These standard procedures address the method for collecting samples and the methods for sample analysis.

Additionally, there is a potential for variation in the process to bias the overall evaluation of the process. Therefore, samples will be collected on a regular basis to determine the variability in the process.

VI. DATA ACQUISITION DESIGN

The data acquisition design describes the strategy for obtaining the data required to meet the test objectives and the amount and quality of the data required for addressing the data quality objectives. This strategy can be divided into 4 parts: Identification of Point Data Sets, Specifications for Obtaining Data for Each Data Set, Formulation of Data Quality Requirements for Each Data Set, and Preparation of Data Requirements Package for each Technical Objective. Descriptions of these 4 parts are given in the following subsections.

A. IDENTIFICATION OF POINT DATA SETS

Point data sets are measurements from specific locations within the processing system. These point data sets are used either alone or in combination to provide information and data for addressing the test objectives. This section describes the point data sets required for meeting the listed test objectives and the location of the data collection points. The data sets required to meet the test objectives are listed in Table VI-1. Additionally, the sampling locations for these data sets are listed in Table VI-2. The locations for obtaining the data sets are indicated on the process flow diagram in Figure VII-1 in Section VII.

B. SPECIFICATION FOR OBTAINING DATA FOR EACH DATA SET

The methods for collecting the data sets in Table VI-1 are listed in Table VI-3. Further descriptions of the methods and the location of the methods and specifications for these data sets follow.

1. Feed Grab Samples

Prior to the untreated surrogate soil in drums being loaded into the skip hoist, grab samples will be collected from the drums. A representative sample will be collected from the opened drums with a sample thief or other suitable device designed for wet soils. These samples will be used to determine the properties and percent moisture of the soil component of the surrogate material. Data regarding the larger components of the surrogate, such as concrete pieces and metal reinforcement bars, will be obtained through data generated and recorded during the filling of the drums.

Table VI-1. Test Objectives and Required Data Sets

No.	Test Objective	Data Sets Required
1	Homogenizer Drying Performance	Material feed rate to system
		-Weight of individual drums
		-Time which drums are loaded into the system
		Moisture content of feed grab sample
		Moisture content of conditioned soil grab sample
		Particle size distribution and material characteristics of feed.
2	Tramp Iron Magnet Performance	Homogenizer inlet gas temperature
		Homogenizer outlet gas temperature
3	Particle Size Reduction Efficiency	-Mass magnetic material in conditioned soil grab sample
		-Mass magnetic material in feed sample.
4	Homogenization Effectiveness	Particle size distribution of feed material
		Particle size distribution of conditioned soil grab sample
5	Drum Size Capacity	-Fraction of tracer material in conditioned material grab sample.
		-Fraction of tracer material in feed.
6	System Maximum Processing Rate	Observation of system failure events
		Material feed rate to system
7	Utilities Consumption	-Weight of individual drums
		-Time which drums are loaded into the system
8	Efficiency of Air Pollution Control System	Propane and electricity consumed
		Particulate flow rates in the nuisance dust collection vent and the homogenizer exhaust vent.
9	Fugitive Dust Emissions	-Gas flow rate
		-Concentration of particulate in gas
10	System Response to Primary Electrical Power Failure	-Mass of dust collected at emission points
		-Observation of escaped dust throughout system.
11	System Response to Primary Electrical Power Failure	-Pressure at nuisance dust collector inlet
		-Pressure at homogenizer exhaust dust collector inlet

Table VI-2. Required Data Sets and Sampling Locations

Data Set	Location
Feed grab sample	Drums in holding area in queue to be fed-S1
Material feed rate into system	Drum hoist into sytem-S2
Conditioned soil grab sample	Second ST-90 box used for sampling-S3
Homogenizer inlet temperature	Gas duct from air heater to homogenizer-S4
Homogenizer outlet temperature	Gas duct leaving homogenizer-S5
Particulate flow rate in homogenizer exhaust	Gas duct leaving homogenizer-S5
Particulate flow rate in vent	Vent-S6
Mass of dust collected at emission points	Various
Observation of system failure events	Various
Utilities Consumption	-Propane supply line to air heater-S7 -Electric supply line to site
Pressure at dust collector inlets	-Nuisance dust collector inlet duct-S8 -Homogenizer dust collector inlet duct-S5

Table VI-3 Specification for Collecting Data Sets

Data Set	Instrumentation required
Feed grab sample	-Sample thief/core sampler
Material feed rate into system -Weight of individual drums -Times that drums are loaded into the system	-Computer for logging output from load cell and recording time.
Metal feed rate into system -Weight of empty drum -Weight of added magnetic metal	-Scale -Records in test logbook
Conditioned soil grab sample	-Modified ST-90 box for sample collection
Homogenizer inlet temperature	-Temperature element -Data transmitter/PLC analog-to-digital converter/Computer Interface Card -Computer for logging data
Homogenizer outlet temperature	-Temperature element -Data transmitter/PLC analog-to-digital converter/Computer Interface Card -Computer for logging data
Particulate flow rates in the nuisance dust collection vent and the homogenizer exhaust vent.	Standard Method 5 sampling instrumentation
Mass of dust collected at fugitive emission points	-Container for collecting fugitive dust at emission point. -Records in test logbook.
Observations of system failure	-Records in test logbook and computer monitoring of system.
Utility Consumption	-Record electric meter reading in logbook -Record propane meter reading in logbook
Nuisance dust collector inlet pressure	-Pressure transducer/transmitter/PLC analog-to-digital converter/Computer Interface Card -Computer for logging data
Homogenizer exhaust dust collector inlet pressure	-Pressure transducer/transmitter/PLC analog-to-digital converter/Computer Interface Card -Computer for logging data

2. Material Feed Rate Into System

The feed rate of material will be determined by the rate at which weighed drums are fed into the soil conditioning system. An electronic scale will be used to determine the mass of the drums. A computer logs the output from the load cell. Additionally, the computer will record the time that the drums are introduced into the system and used to determine the drum loading rate. This data can then be used to determine the mass per unit time of material entering the system.

3. Conditioned Soil Grab Sample

Representative grab samples will be collected by diverting the entire conditioned stream to an ST-90 box modified for sample collection¹. The time for diverting the stream will lead to a 10 lb grab sample of conditioned material. The present system design includes the capacity to switch the conditioned soil stream between two ST-90 boxes while maintaining a seal to prevent the emission of fugitive dust.

The modified ST-90 box for sample collection will contain a funnel in the top $\frac{3}{4}$ of the box that directs the incoming material into a sample collection pail. The funnel design will extend to the top edge of the ST-90 box so that all material is directed to the collection pail. The collection pail will have a volume on the order of approximately 3 to 5 gallons. The side of the modified ST-90 box will contain a door to allow for easy removal of the sample collection pail.

4. Homogenizer Inlet and Outlet Temperatures

The homogenizer inlet temperature will be determined by using temperature elements (RTD or thermocouples). The signal from the temperature elements will be logged with a computer at regular time intervals using standard computer instrumentation interfacing techniques. The position of the temperature elements in the ducts will ensure that the data collected is representative of the process conditions.

5. Particulate flow rates in the nuisance dust collection vent and the homogenizer exhaust vent.

The exhaust air exiting the Dust Collection System and the Homogenizer through the nuisance dust collection vent and the homogenizer exhaust vent will be analyzed using standard Method 5 practices and instrumentation. A certified outside vendor will be placed under contract to perform the Method 5 testing.

6. Mass of Dust Collected at Fugitive Emission Points

The mass of dust collected from fugitive emission points will be determined by placing a container to collect the dust for a set amount of time. The locations of the emission points are unknown at this time. Therefore, the design requirements for the dust collection containers are unknown. During the proposed testing, when a fugitive dust emission location is identified, through regular inspections of the system, a dust collection container specific to that point will be field engineered and used.

7. Observations of System Failure

A computer will monitor the operation of individual system components for failure events. These events will lead to a decrease in the rate that drums are introduced into the system due to additional time being required to allow for each system component to complete the processing of a specific drum. An example of such an event is a drum that cannot pass properly through the system shredder. An entry into the test logbook will be made including the time of the failure event, the drum number, and the involved system component. Additionally, a note describing the steps required to clear the system component will be made.

8. Utilities Consumptions

Cumulative consumption meters (totalizers) will measure the total propane and electric power consumed during the demonstration period. Each meter (one for propane and one for electric power) will be manually read, and the reading will be recorded in the test logbook at the beginning and end of each test shift.

9. Nuisance Dust Collector and Homogenizer Exhaust Dust Collector Inlet Pressures

The pressure at the nuisance dust collector inlet and the homogenizer exhaust dust collector inlet will be determined by using a pressure transducer/transmitter. The signal from the transmitter will be logged with a computer at regular time intervals using standard computer instrumentation interfacing techniques. The position of the temperature elements in the ducts will ensure that the data collected is representative of the process conditions.

C. FORMULATION OF DATA QUALITY REQUIREMENTS FOR EACH DATA SET

The data quality requirements are developed from the individual data quality objectives for the test objectives. These data quality objectives for the data sets insures that the data generated during the proposed testing is of sufficient quality to meet the proposed data quality objectives. The aspects of data quality considered for the data sets include where the data sets are collected, the frequency of data measurements, the methods of collecting samples, the frequency and methods of calibration, the tractability of standards, levels of accuracy and precision, repeatability of measurements, document control, and the philosophies used in selecting the methods. The following subsections address these aspects of the data quality requirements for the data sets listed for the test objectives.

1. Feed Grab Sample

The primary data quality requirement of the feed grab sample is to collect a sample of the soil in the drums that is representative of the material in the drum. This sample will be used to characterize the feed material with a mean and standard deviation for the drum population for the moisture content. Feed grab samples will be collected for all tests performed during the proposed demonstration.

The material in the drums to be processed will primarily consist of damp and wet soils. Therefore, the potential methods for sampling the drum include the use of a trier sampler (ASTM procedure 5451-93²), thin-wall tube (ASTM procedure D1587-94³), or hollow-stem auger (ASTM procedure D6151-97⁴). Care will be taken to insure that the size of the sampling device is suitable based on the largest particle sizes in the soil. This size is defined in the ASTM procedure to be used in the sampling.

Feed grab samples will be collected from every fifth drum. Based on this sampling rate, approximately 10 samples will be collected per day during steady state operation. Repeatability of the method will be determined by collecting duplicate samples from one drum each day.

ASTM procedure D4220-95⁵ Standard Practices for Preserving and Transporting Soil Samples will be used with the samples collected from the drums. The minimal information to be included on the sample containers is the sample name, the person that collected the sample, and the date and time

that the sample was collected. Additionally, this information will be recorded on a chain of custody form and field sample logbook. The sample logbook will serve as a record of the samples collected in the field. Additionally, the analysis to be performed on the sample will also be marked on the chain of custody form. The field-sample logbook is a controlled document that becomes part of the permanent site file. The logbook will consist of a bound notebook with consecutively numbered pages that cannot be removed. All data entries will be recorded using a non-erasable ink pen.

2. Conditioned Soil Grab Sample

The primary data quality requirement of the conditioned soil grab sample is to collect a representative sample of the conditioned soil flowing from the system. This sample will be used to characterize the conditioned soil with a mean and standard deviation moisture content, particle size distribution, metals content, and tracer concentration for the homogeneity testing. Conditioned soil grab samples will be collected for all of the proposed experiments to be performed during the proposed demonstration, except for the final test series that involves processing 85-gallon overpacks.

To collect a representative sample of the conditioned soil flowing into the ST-90 box, the complete stream should be collected for a given time. In the design of the Vortec Material Pre-Treatment and Conditioning System, the conditioned soil stream can be fed into one of two ST-90 boxes.

Therefore, diverting the complete conditioned soil stream to the ST-90 not currently being used for receiving processed material will collect the complete conditioned soil stream resulting in a representative sample. This sampling philosophy was developed from ASTM Method E300⁶.

Conditioned soil grab samples will be collected once every hour unless otherwise specified. Based on this sampling rate, approximately 8 samples should be collected per day during steady state operation. Repeatability of the method will be determined by collecting duplicate samples prepared by splitting one sample each day using suitable sample splitting techniques and equipment.

ASTM method D4220-95⁵ will be used with the samples collected from conditioned soil stream. The minimal information to be included on the sample containers is the sample name, the person that collected the sample, and the date and time that the sample was collected. Additionally, this information will be recorded on a chain of custody form and field sample logbook. This field sample logbook is the same logbook used for the feed grab samples.

3. Material Feed Rate into System

The characteristics of the conditioned soil are a function of the feed rate of the system. Additionally, the scaling information for processing a given sized waste stream can be determined from this information. In the proposed test, the feed rate, in pounds per hour into the system, is determined from the drum weights and the times that the drums are introduced into the system.

The desired error of the feed rate into the system is less than 5% on a relative basis. The potential limiting factor in achieving this error is the precision of the scale used to measure the drum weights. To achieve this error level, the precision and accuracy of the scale must be on the order of 5% of the measured weight. If the minimum weight of a drum is approximately 500 lb, then the resulting precision of the scale and the data recording system must be less than 25 lb. To verify the accuracy of the scale and recording system, the scale will be calibrated by a certified calibration service prior

to the proposed demonstration. The calibration service will provide documentation to insure that the standards used are traceable to NIST standards.

The weight and time into the system will be recorded for each drum. At a maximum processing rate of 10 drums/hour this would result in a measurement frequency of 10 records per hour. Additionally, each drum will be assigned a number during the preparation process. This drum number will be recorded during the feeding process along with the drum weight and time which the drum entered the system.

4. Homogenizer Inlet and Outlet Temperature

The outputs from the temperature transducers provide data on a continuous basis. A computer will record this data at 1-minute intervals, or 60 times per hour if expressed as a measurement frequency. The homogenizer temperature data will be backed-up on a daily basis to insure that this data is not lost.

The precision of the temperature transducer is achieved through the selection of the transducer type and the interface used to log the data with a computer. The desired accuracy for the temperature measurement is 3°F. The limiting factor in achieving this accuracy is the precision of the temperature measurement instrumentation. This level of accuracy can be achieved with both the transducer and the computer interface. The temperature transducer vendor will calibrate and certify the accuracy of temperature transducer and provide a certificate that NIST traceable standards were used for the calibration. The certificates for the calibration of the temperature transducers from the supplier will be placed in a logbook for future reference. During the demonstration, the temperature transducers will be monitored for failure. In the case of failure, the device will be replaced.

5. Particulate Flow Rates in the Nuisance Dust Collection and the Homogenizer Exhaust Vents

The particulate flow rates in the system vents will be determined by a subcontractor that specializes in stack testing. The contractor will perform the calibrations and certify that all instrumentation and probes used are in compliance. Vortec will insure that the ports used for the vent testing are in compliance with the requirements of EPA Methods 1-5. Based on the conversations with testing services, the accuracy of the test method is on the order of 25%.

6. Fugitive Dust Emission Point Identification and Fugitive Dust Collected Mass

The fugitive dust emission points will be identified through walk down inspections of the Vortec Material Pre-Treatment and Conditioning System at least once every 2 hours. If a fugitive dust emission point is identified, the time and location of the point will be recorded in the test logbook. The engineering solution developed to rectify the fugitive dust emission will also be recorded in the test logbook.

In the case where the fugitive dust emission cannot be eliminated, the emission rate will be determined to within 0.01% of the material feed rate into the system. To achieve this level of accuracy, the dust from the emission point will be collected for at least 2 hours and the weight determined to the nearest 0.003 lb (1g). The sample collection time span and the weight of dust collected will be recorded in the test logbook with the calculation of the flow rate of fugitive dust from the emission point. Duplicates of

the logbook pages filled out each day will be made at the end of each day to insure that the data is not lost and that uncontrolled changes to the original logbook are not made.

7. Observations of System Failure

The components in the Vortec Material Pre-Treatment and Conditioning System will be monitored continuously for events that lead to decreasing the rate that the skip hoist introduces drums into the system. In the case of a failure event, the time and steps to correct the problem will be recorded in the test logbook. Duplicates of the logbook pages filled out each day will be made at the end of each day to insure that the data is not lost and that uncontrolled changes to the original logbook are not made.

8. Utilities Consumption

The propane totalizer updates every 15 minutes, and the electric power totalizer updates continuously. The totalizer readings will be read by an operator at the beginning and end of each test, or at the beginning and end of each test shift if a test is longer than one shift in duration, and manually recorded in the test log book.

The data quality objective with respect to the accuracy of the utility consumptions is 5% of the total. To achieve this accuracy, the precision of the meters that provide the cumulative propane and electric power consumptions must be on the order of 5% of the total.

9. Nuisance Dust Collector and Homogenizer Exhaust Dust Collector Inlet Pressures

The outputs from the pressure transducers/transmitters provide data on a continuous basis. A computer will record this data at 1-minute intervals, or 60 times per hour if expressed as a measurement frequency during most of the demonstration test period. However, during the test of the system response to primary electrical power failure, the computer will record this data at 1-second intervals. The pressure data will be backed-up on a daily basis to insure that this data is not lost.

The precision of the pressure transducer is achieved through the selection of the transducer type and the interface used to log the data with a computer. The desired accuracy for the pressure measurement is 0.03 inches of water. The limiting factor in achieving this accuracy is the precision of the pressure measurement instrumentation. This level of accuracy can be achieved with both the transducer and the computer interface. The pressure transducer/transmitter vendor will calibrate and certify the accuracy of instrument and provide a certificate that NIST traceable standards were used for the calibration. The certificates for the calibration of the pressure transducers/transmitters from the supplier will be placed in a logbook for future reference. During the demonstration, the pressure transducers/transmitters will be monitored for failure. In the case of failure, the device will be replaced.

D. DATA REQUIREMENTS PACKAGE FOR EACH TECHNICAL OBJECTIVE

The guidelines for insuring the suitability of the collected data and analyses to address the technical issues are given in the data requirements package. The data requirements package typically specifies the frequency of scanning and logging of instruments; the frequency of sampling and total number of

samples required for analysis; analysis instrumentation calibration, analysis methods, requirements for precision, accuracy, and repeatability of measurements; and chain of custody and data handling requirements. A summary of the data requirements package for the individual test objectives is given in the following subsections.

1. Homogenizer Drying Performance

The data requirements package to evaluate the Homogenizer Drying Performance technical objective are summarized in Table VI-4.

Table VI-4 Data Requirements Package for Homogenizer Drying Performance Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	Homogenizer input and exit temperature will be logged once per minute. An average and standard deviation will be reported for the time period associated with an operating condition.
Frequency and Number of Samples for Analysis	At least 7 grab samples will be analyzed at a run condition to form a valid data point.
Analysis Instrumentation Calibration	The scale calibration for the water absorption analysis will be validated at least once per week.
Analysis Methods	The water content of the feed material and conditioned soil grab samples will be determined according to ASTM Method 4959-00 ⁸
Requirements for precision, accuracy, and repeatability of measurements	-For the moisture content analyses, the precision and accuracy will be 0.5% absolute, the repeatability will be 1%. -For the water removal efficiency, the accuracy of the measurement will be 5%, the repeatability will be at least 10%.
Chain of Custody and Data Handling Requirements	A chain of custody form will be required with the feed material and conditioned soil grab samples.

2. Tramp Iron Magnet Performance

The data requirements package to evaluate the Tramp Iron Magnet Performance technical objective is summarized in Table VI-5.

3. Particle Size Reduction Efficiency

The data requirements package to evaluate the Particle Size Reduction Efficiency technical objective is summarized in Table VI-6.

Table VI-5 Data Requirements Package for Tramp Iron Magnet Performance Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	NA
Frequency and Number of Samples for Analysis	At least 7 grab samples will be analyzed at a run condition to form a valid data point.
Analysis Instrumentation Calibration	The scale calibration for the percent magnetic metal in the conditioned material will be validated at least once per week.
Analysis Methods	The analysis method to measure the amount of magnetic material in a sample will be developed in house. A copy of the test procedure and validation data will be provided in the final test report.
Requirements for precision, accuracy, and repeatability of measurements	For the percent magnetic material in the dry material analyses, the precision and accuracy will be 0.5% absolute, the repeatability will be 1% between duplicate analyses.
Chain of Custody and Data Handling Requirements	A chain of custody form will be required with the feed material and conditioned soil grab samples.

NA = Not applicable

Table VI-6 Data Requirements Package for Particle Size Reduction Efficiency Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	NA
Frequency and Number of Samples for Analysis	At least 7 grab samples will be analyzed at a run condition to form a valid data point.
Analysis Instrumentation Calibration	The scale calibration for weighing the material retained on the sieves will be validated at least once per week. New sieves with certified size openings will be used for the testing.
Analysis Methods	The particle size distribution of the grab samples will be determined according to ASTM D422-63 ⁷
Requirements for precision, accuracy, and repeatability of measurements	The mass retained on the sieves will be measured with a precision and accuracy 0.5% of the sample weight analyzed. The repeatability between duplicate samples will be 2%.
Chain of Custody and Data Handling Requirements	A chain of custody form will be required with the feed material and conditioned soil grab samples.

NA = Not applicable

4. Homogenization Effectiveness

The data requirements package to evaluate the Homogenization Effectiveness technical objective is summarized in Table VI-7.

Table VI-7 Data Requirements Package for Homogenization Effectiveness Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	NA
Frequency and Number of Samples for Analysis	At least 3 series of grab samples will be analyzed to evaluate the Homogenization Effectiveness. The sampling interval will be ½ the time interval between introducing drums into the system
Analysis Instrumentation Calibration	The calibration for the scale used for determining the fraction of tracer material in the conditioned soil will be validated at least once per week.
Analysis Methods	The analysis method to determine the fraction of tracer material in the conditioned soil will be developed in house. A copy of the test procedure and validation data will be provided in the final test report.
Requirements for precision, accuracy, and repeatability of measurements	For the fraction of tracer material in the conditioned soil, the precision and accuracy will be 0.5% absolute, the repeatability will be 1% between duplicate analyses.
Chain of Custody and Data Handling Requirements	A chain of custody form will be required with the feed material and conditioned soil grab samples.

NA = Not applicable

5. Drum Size Capacity

The data requirements package to evaluate the Drum Size Capacity technical objective is summarized in Table VI-8.

Table VI-8 Data Requirements Package for Drum Size Capacity Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	The processing of at least 50 drums will be observed.
Frequency and Number of Samples for Analysis	NA
Analysis Instrumentation Calibration	NA
Analysis Methods	NA
Requirements for precision, accuracy, and repeatability of measurements	Logbook references of failure events will be provided.
Chain of Custody and Data Handling Requirements	NA

NA = Not applicable

6. System Maximum Processing Rate

The data requirements package to evaluate the System Maximum Processing Rate technical objective is summarized in Table VI-9.

Table VI-9 Data Requirements Package for System Maximum Processing Rate Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	-The time and weight of every drum into the system will be recorded and used to determine the processing rate. -The processing of at least 50 drums will be observed.
Frequency and Number of Samples for Analysis	NA
Analysis Instrumentation Calibration	The scale used to measure the drum weights will be calibrated prior to the demonstration.
Analysis Methods	NA
Requirements for precision, accuracy, and repeatability of measurements	-The precision, accuracy, and repeatability of the recorded drum weights should be +/-25 lbs. -Logbook references of failure events will be provided.
Chain of Custody and Data Handling Requirements	NA

NA = Not applicable

7. Utilities Consumption

The data requirements package to evaluate the utilities consumption of the facility per unit waste is given in Table VI-10.

Table VI-10 Data Requirements Package for the Utilities Consumption Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	-The cumulative propane and electricity consumed will be read from meters and recorded at the beginning of the demonstration period and at the beginning and end of each test shift. -The total amount of material processed during each shift will be the sum of the weights of the individual containers fed into the system.
Analysis Instrumentation Calibration	-The propane meter vendor and electric provider will provide the calibration/validation of the utilities consumption meters. -The scale used to measure the drum weights will be calibrated prior to the demonstration.
Requirements for precision, accuracy, and repeatability of measurements	The precision, accuracy, and repeatability of the recorded drum weights should be +/- 5 lbs.
Chain of Custody and Data Handling Requirements	NA

8. Efficiency of Dust Emissions Control System

The data requirements package to evaluate the Efficiency of Dust Emissions Control System technical objective is summarized in Table VI-11.

Table VI-11 Data Requirements Package for Efficiency of Dust Emissions Control System Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	One EPA Method 1-5 test will be performed on each vent during the demonstration.
Frequency and Number of Samples for Analysis	NA
Analysis Instrumentation Calibration	The vent-testing subcontractor will provide the dates of the most recent calibrations of the instrumentation used in for the vent testing.
Analysis Methods	NA
Requirements for precision, accuracy, and repeatability of measurements	All instrumentation will meet the criteria set in the EPA guidance documents for Method 1-5 testing.
Chain of Custody and Data Handling Requirements	The vent-testing subcontractor will provide copies of the chain of custodies as required for sample s produced.

NA = Not applicable

9. Fugitive Dust Emission

The data requirements package to evaluate the Fugitive Dust Emission technical objective is summarized in Table VI-12.

Table VI-12 Data Requirements Package for Fugitive Dust Emission Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	NA
Frequency and Number of Samples for Analysis	At least one sample in the case of fugitive dust emissions.
Analysis Instrumentation Calibration	The scale calibration for the scale used to weigh dust emission will be validated at least once per week.
Analysis Methods	N/A
Requirements for precision, accuracy, and repeatability of measurements	-The precision, accuracy, and repeatability of the fugitive dust weights should be +/- 1 gram. -A record of the time of walk down inspections with logbook references will be provided.
Chain of Custody and Data Handling Requirements	NA

NA = Not applicable

10. System Response to Primary Electrical Power Failure

The data requirements package to evaluate the System Response to Primary Electrical Power Failure technical objective is summarized in Table VI-13.

Table VI-13 Data Requirements Package for System Response to Power Failure Test Objective

Data Requirement	Performance Measurement
Frequency of Scanning and Logging of Instruments	Nuisance dust collector and Homogenizer exhaust dust collector inlet pressure will be logged once per second.

VII. DESIGN OF EXPERIMENTS

The design of the experiments to be performed during the operation of the facility are critical to ensure that the data sets collected can be used to evaluate the test objectives. Well-designed experiments will also ensure that a sufficient amount of data is generated to validate the results. The design of the experiments can be considered in three parts: the Experimental design; the Equipment Design; and the Instrument, Process Monitoring, and Control Design. The Experimental Design describes the individual tests to be performed during the demonstration and how these experiments support the test objectives. The Equipment Design provides detailed information regarding the system components, system equipment layout, and systems engineering. The Instrument, Process Monitoring, and Control Design describes the control methodologies of the system components and the data logging methods.

A. EXPERIMENTAL DESIGN

The overall objective of the test series is to demonstrate the functionality of the material preparation and conditioning equipment leading to the integrated operation of the entire material pre-treatment and conditioning system. The demonstration of the Vortec Material Pre-Treatment and Conditioning System is to be evaluated on the basis of the test objectives listed in Table IV-1. These test objectives address the performance of the system under a wide range of feed characteristics that arise during waste processing. A summary of the test runs designed and the test objectives that they support is given in Table VII-1. The subsections following this table provide further details in the individual test runs and the test objectives are supported by these experiments.

Table VII-1 Summary of Test Objectives and Supporting Experiments

No.	Test Objective	Test Run 1 Average Moisture	Test Run 2 High Moisture	Test Run 3 High Metals	Test Run 4 Large Particulate Size	Test Run 5 85 Gallon Overpack Capacity
1	Drying Performance	X	X	X	X	
2	Tramp Iron Magnet Performance	X	X	X		
3	Particle Size Reduction Efficiency				X	
4	Homogenization Effectiveness	X	X			
5	Drum Size Capacity	X				X
6	System Maximum Processing Rate	X	X	X	X	X
7	Utilities Consumption	X	X	X	X	X
8	Efficiency of Dust Emissions Control System	X				
9	Fugitive Dust Emission	X	X	X	X	X
10	System Response to Primary Electrical Power Failure	X				

1. Description of Activities and Experiments

The demonstration of the Vortec Material Pre-Treatment and Conditioning System can be divided into 6 discrete modes of operation, the first being a pretest and common activities and then a series of 5 test runs that are summarized in Table VII-1. The details of these activities and test runs follow.

Pre-Test and Common Activities

In this experimental design, it is assumed that each individual piece of equipment will have been checked out during pre-startup activities. Any system deficiencies will have been corrected during this shakedown period. Also, utility connections and the control systems will be tested for functionality prior to initiating the Experiment Sequence.

The Nuisance Dust Collector system (blower, filters) will be operated during each test. The particulate emissions will be directly measured at the Nuisance Dust Collector Vent.

Test Run 1 – Average Moisture Content Feed Testing

During Test Run 1, the performance of the system will be evaluated with the average moisture content waste, averaging 15% moisture, the nominal design point of the homogenizer. The feed material for this test will be clean, damp soil in plastic lined drums. The moisture content of the drummed material will be adjusted as closely as possible to 15% by weight. Every fifth drum will be sampled to determine the average and range of moisture contents in the feed material. Each drum will be placed into the skip hoist by the manipulating arm, fed into the primary shredder, and treated through the remainder of the system. Grab samples of the shredded and dried materials will be

collected from the conditioned soil stream prior to the material entering the ST-90 box for disposal. These grab samples will be used to assess the moisture content in the conditioned soil, and the degree of metals separation. The duration of this test is 5 days. The feed rates will be 25%, 50%, 75%, and 100% of the maximum processing rate based on mechanical limitations.

The amount of homogenization that occurs during drying will also be evaluated during Test Run 1. Drums containing a tracer will be fed into the system and grab samples of the conditioned soil will be taken for tracer concentration analysis.

Additionally, during Test Run 1 the ability of the system to meet particulate emission criteria will be evaluated. One hour of flue gas sampling in accordance with EPA Methods 1 through 5 will be performed at the maximum feed rate.

The ability of the back-up electrical power generation subsystem to respond in time to prevent fugitive dust emissions from the system in the event of a primary electrical power failure will also be evaluated during Test Run 1. At some point during the performance of Test Run 1, the main circuit breaker on the electrical power supply to the system will be turned off. The pressures at the inlet to the nuisance dust collector and the homogenizer exhaust dust collector will be measured and recorded at one second intervals during the response period of the back-up generation subsystem. The pressures will be recorded until steady state conditions are achieved in the dust collection subsystems. After steady state conditions are achieved, the main circuit breaker will be turned back on. During the period of time when the main circuit breaker is off, the system will be also visually monitored for fugitive dust emissions.

Test Run 2 – High Moisture Content Feed Testing

The objective of Test Run 2 is to test the ability of the system to handle a high moisture content waste, 30% moisture, the maximum design value of the homogenizer. The protocol for Test Run 1 will be repeated. The feed material for this test will be clean, damp soil in plastic lined 55-gallon steel drums. The moisture content of the drummed material will be adjusted as closely as possible to 30% by weight. Grab samples of every fifth drum will be taken for moisture analysis prior to feeding the materials. Each drum will be placed into the skip hoist by the manipulating arm, fed into the primary shredder, and treated through the remainder of the system. Grab samples of the shredded and dried materials will be taken prior to the material entering ST-90 storage box and analyzed for moisture content. In addition, an assessment of the degree of metals separation will be made. The duration of this test is 5 days. The feed rates will be 25%, 50%, 75%, and 100% of the maximum processing rate based on mechanical limitations.

The amount of homogenization that occurs during drying will also be evaluated during Test Run 1. Drums containing a tracer will be fed into the system and grab samples of the conditioned soil will be taken for tracer concentration analysis.

Test Run 3 - High Metals Content Feedstock Testing

The objective of Test Run 3 is to check the effectiveness of metal removal at the ferrous metal separator. The feed material for this test will be clean, damp soil in plastic lined drums fed to the primary shredder. The drums will have additional scrap metal, rebar and other metallic materials added to the contents. The protocol for Test Runs 1 and 2 will be repeated. Grab samples of every

fifth drum will be taken for moisture analysis prior to feeding the materials. Each drum will be placed into the skip hoist by the manipulating arm, fed into the primary shredder, and treated through the remainder of the system. Grab samples of the shredded and dried materials will be collected from the conditioned soil stream prior to the material entering the ST-90 box for disposal. These grab samples will be used to assess the moisture content and metals concentration in the conditioned soil. The duration of this test is 5 days. The feed rates will be 25%, 50%, 75%, and 100% of the maximum processing rate based on mechanical limitations.

Test Run 4 – High Particle Size Testing

The objective of Test Run 4 is to determine the ability of the system to reduce the size of waste particles to a more homogeneous size distribution. The feed material for this test will be clean, damp soil in plastic lined drums fed to the primary shredder. The drums will have additional large particle size materials, such as concrete chunks, added to the contents. At least one drum will be filled with a single cast of concrete. The protocol for Test Runs 1 and 2 will be repeated. Grab samples of every fifth drum will be taken for moisture analysis prior to feeding the materials. Each drum will be placed into the skip hoist by the manipulating arm, fed into the primary shredder, and treated through the remainder of the system. Grab samples of the shredded and dried materials will be collected from the conditioned soil stream prior to the material entering the ST-90 box for disposal. These grab sample will be used to assess the moisture content in the conditioned soil and the degree of particle size reduction. The duration of this test is 5 days. The feed rates will be 25%, 50%, 75%, and 100% of the maximum processing rate based on mechanical limitations.

Test Run 5 – 85 Gallon Overpacks

The objective of Test Run 5 is to confirm the capability of the system to handle 85-gallon overpack containers. During the test, special attention will be given to the operation of the drum manipulator arm, the skip hoist, and the shredders to note any operating irregularities or problems.

The feed to the system during this test will consist of 85-gallon overpack containers filled with clean soil and other debris. The moisture content of the soil in the drums will be set to 30 percent by weight. The system will be brought up to a steady state operating condition and samples collected. Each drum will be placed into the Skip Hoist by the Manipulating Arm, fed into the primary shredder, and treated through the remainder of the system. The duration of this test is 3 days, and the feed rates will be 50% and 100% of the maximum processing rate based on mechanical limitations.

2. Data Collected During Test Runs

The analyses performed on the data sets collected during the test runs will be used to evaluate the test objectives. The following subsections address the analyses to be performed on the data sets and the steps taken to insure the validity of the data. Additionally, a description of which test runs support the test objectives is given in these subsections. Several of the test objectives will be supported with data from several test runs to determine the influence of the batch characteristics on the system performance.

Drying Performance

The drying performance of the homogenizer will be evaluated for a range of anticipated feed characteristics and feed rates during Test Runs 1, 2, 3, and 4. The drying performance is evaluated from the moisture analyses performed on the feed and conditioned soil grab samples. The moisture analysis of the samples will be determined using ASTM methods D4959⁸, D4718⁹, and/or D2216-98¹⁰.

The accuracy and precision of moisture content determined for the submitted samples relies on accurate and precise measurement of the sample weights before and after drying the sample in a laboratory oven. Weighing NIST traceable weights at least once per week during the testing period will validate the accuracy of the scales. The precision of the measured weights will be achieved through using scales that are capable of measuring the sample masses to less than 0.05 percent of the sample mass.

The representativeness of the analysis result is obtained through the analysis of duplicate and spiked samples. Duplicate samples will be prepared in the field by splitting the complete sample with an ASTM approved sample splitter. Spiked samples will be prepared by adding a weighed amount of dry sand to a sample container prior to submitting the sample for analysis. The mass of the spike material should be measured to within 0.1 weight percent of the mass of the sample. At least one duplicate and spiked sample will be prepared each day and submitted for analysis. The labeling scheme for the grab samples will be such that the laboratory cannot identify the spiked samples.

At least 5 samples will be analyzed at each run condition to determine averages and ranges for homogenizer drying performance criteria using normal statistics. The data in this format will allow for the moisture contents at various feed rates and feed characteristics to be compared.

Tramp Iron Magnet Performance

The tramp iron magnet performance will be evaluated based on the amount of magnetic material remaining in the conditioned soil as determined by a procedure developed by Vortec Corporation. During the proposed demonstration, the impact of the feed moisture content, the feed rate, and the metal form will be determined during Test Runs 1,2 and 3. The metal forms in the feed material will be the steel drum walls (all three Test Runs) and steel reinforcement bars added to the feed in Test Run 3.

At least 5 samples will be analyzed at each run condition to calculate averages and maximums for tramp iron magnet performance criteria using normal statistics. The data in this format will allow for the metals contents at various feed rates and feed characteristics to be compared. Through this comparison, the effects of the feed characteristics and feed rate on the performance of the tramp iron magnet can be determined.

The accuracy and precision of the metals content included in the submitted samples relies on accurate and precise measurement of the sample weight and the amount of magnetic material removed from the sample. Weighing NIST traceable weights at least once per week during the testing period will validate the accuracy of the scales. The precision of the measured weights will be achieved through selecting scales that are capable of measuring the sample masses to less than 0.05 percent of the sample mass.

Particle Size Reduction Efficiency

The particle size reduction efficiency is determined from a comparison of the particle size distribution of the feed and conditioned materials. The shredders in the soil conditioning system are designed to reduce large chunks of debris, dimensions on the order of several inches, to a size less than 2 inches. Based on the specifications provided for the surrogate soil to be prepared for the test, Test Runs 1, 2, and 5 should be free of material that would be significantly impacted by the shredder. The metal pieces placed in the drums will be shredded in the processing of the material; however, these pieces will be removed from the conditioned soil by the tramp iron magnet and thus difficult to sample. Therefore, the particle size reduction of the system is just determined from the data collected during Test Run 4.

During this test run, the size reduction of standard size pieces will be evaluated through a comparison of the initial particle size to the particle size distribution of the conditioned material. The representiveness of the data will be confirmed by collecting at least 5 grab samples at each feed rate using methods to ensure that the entire conditioned soil stream is collected during the sampling period. The particle size distribution of the samples will be determined on the individual grab samples using ASTM method D422-63⁷. The instrument vendor will certify the analysis instrumentation used to determine the particle size distribution, specifically, the sieves. The results of the individual analyses will be compiled to determine the variability of the particle size distributions. The data produced from this analysis should allow for data collected at different system feed rates to be compared.

The accuracy and precision of particle size distributions determined for the submitted samples relies on accurate and precise mass measurements of the material retained on the sieves and the sieve size. Weighing NIST traceable weights at least once per week during the testing period will validate the accuracy of the scales. The precision of the measured weights will be achieved through selecting scales that are capable of measuring the sample masses to less than 0.05 percent of the sample mass. The hole size in the sieves will be certified by the sieve supplier.

Homogenization Effectiveness

The Homogenization Effectiveness of the Vortec Material Pre-Treatment and Conditioning System will be determined from the distribution of a tracer in the conditioned soil during Test Runs 1 and 2. Through these two tests, the effects of the feed rate and the moisture content of the feed material on the ability of the system to blend waste between drums will be quantified.

The representiveness of the data will be confirmed by collecting at least 3 series of grab samples at each feed rate using methods to ensure that the entire conditioned soil stream is collected during the sampling period. Each series of grab samples will follow one drum of tracer through the system. Visual separation of the tracer particles from the conditioned soil and a determination of their mass will determine the fraction of tracer in the conditioned material. The results of the individual analyses will be compiled to determine the average and range of the fraction of tracer in the conditioned materials. The data produced from this analysis should also compare data collected at different system feed rates.

The accuracy and precision of the weight fraction of tracer in the submitted samples relies on accurate and precise mass measurements of the sample and tracer separated from the sample. Weighing NIST

traceable weights at least once per week during the testing period will validate the accuracy of the scales. The precision of the measured weights will be achieved through selecting scales that are capable of measuring the sample masses to less than 0.05 percent of the sample mass. Duplicate analyses will be performed.

Drum Size Capacity

The Vortec Material Pre-Treatment and Conditioning System is designed to handle standard 55-gallon steel drums and 85-gallon steel overpacks. By feeding both types of containers into the system, the ability of the system will be validated. The validation of the system's ability to handle 55-gallon drums will occur specifically during Test Run 1, in which the feed soil is packed in 55-gallon drums. Test Run 5 is specifically performed to validate the operation while feeding 85-gallon overpacks into the system.

During both of these demonstration tests, at least 50 drums or overpacks with a maximum of 1 failure event will be processed to show a system availability of 90%. The required number of drums to process was determined through the calculations based on a binomial distribution. For the binomial distribution, the two states of the population considered were drums that processed with and without failure. Failure events during the operation will be recorded in the test logbook and compiled to allow a comparison of the events throughout the demonstration period.

System Maximum Processing Rate

The maximum processing rate of the Vortec Material Pre-Treatment and Conditioning System is limited by the rate at which drums can be introduced into the system by the skip hoist. To validate that this is the rate-limiting step for the range of feed materials anticipated, a 90% system availability will be demonstrated during Test Runs 1-4 while operating at the maximum rate of the skip hoist (100% skip hoist rate). By validating the maximum feed rate with the variety of feed materials, the confirmation of this rate will be representative of the range of waste materials to be processed in the system.

The validation of the 90% system availability at the maximum processing rate will require the processing of at least 50 drums with a maximum of 1 failure event. The required number of drums to process was determined through the calculations based on a binomial distribution. For the binomial distribution, the two states of the population considered were drums that processed with and without failure. Failure events during the operation will be recorded in the test logbook and compiled to allow a comparison of the events throughout the demonstration. Additionally, the reason for the failure and the steps to resolve the failure will be recorded in the logbook.

Utilities Consumption

The calculation of the utilities consumption will be supported by all of the Test Runs performed during the demonstration. By considering the total amounts of utilities consumed during each test, the utilities consumption per unit of mass of material processed would be representative since the utilities required for the start up of the facility would also be included in the measurement.

The accuracy of the utility composition measurements set by the data quality objective is 5% of the total. The propane totalizer meter updates the cumulative propane consumption every 15 minutes. It is anticipated that the nominal propane consumption during the demonstration will be about 2,000 scf/hr. Therefore, the error in propane consumption measured could be as much as 500 scf (2,000 scf times 0.25 hours). A typical test run is anticipated to be about 8 hours in duration, with a total propane consumption of about 16,000 scf. Therefore, the propane consumption measured over a test period is expected to have an accuracy of about 3.1%, within the data quality objective. Likewise, an estimated 3,400 kWh of electricity will be consumed during operation of the facility on each day of testing. The electricity totalizer will display the electricity consumed continuously to at least the nearest kWh. Therefore, the precision of the electricity consumed will be sufficient to achieve the desired accuracy.

Efficiency of Dust Emissions Control System

The dust emissions from the system vents will be determined with standard EPA Method 1-5 testing. During this analysis, the gas velocity in the vents will be measured and used to determine the gas flow rates. Filtering a measured volume of gas and then weighing the particulate collected on the filter will determine the particulate concentration in the gas. By combining the gas flow rate and the particulate concentrations, the flow rate of particulate matter in the vent can be calculated. A summary of the calculations is provided in the EPA Method 1-5 procedures. The vent-sampling subcontractor will perform the calculation and Vortec will review the data and calculations for errors.

Fugitive Dust Emission

The potential of fugitive dust emissions from the system will be supported by all of the test runs to be performed during the demonstration. By monitoring for fugitive dust emissions during all of the experiments, the efficiency of the system to control the dusting will be demonstrated.

System Response to Primary Electrical Power Failure

The ability of the back-up electrical generation subsystem to respond in time to prevent fugitive dust emissions will be evaluated in Test Run 1. It will be evaluated based on the pressure at the inlet to the nuisance dust collector and the homogenizer dust collector over the response period. The pressures will be recorded at one-second intervals throughout the response period. If the pressures do not exceed ambient pressure at any time during the response period, the response time of the back-up electrical generation subsystem will be deemed sufficient.

B. EQUIPMENT DESIGN

The equipment design for the Vortec Material Pre-Treatment and Conditioning System facilitates the collecting of data sets to address the test objectives. The description of the equipment design is broken down into a process flow sheet; a process flow diagram and mass and energy balance; a description of the key pieces of equipment; and a discussion of the instrumentation, process monitoring, and control design. See Appendix A for the Mass & Energy Balance.

1. Process Flow Sheet

The process flow sheet for the Vortec Material Pre-Treatment and Conditioning System is given in Figure VII-1. The process flow sheet is useful for giving an overview of the system and qualitatively describing the flow through the system.

The Vortec Material Pre-Treatment and Conditioning System processes clean soils in sealed metal barrels. These will be prepared and delivered by DOE to the Vortec facility. The sealed drummed soils will be weighed and loaded into the skip hoist bucket and transported to and dumped into the primary shredder. Materials will pass from the primary shredder to the secondary shredder to complete the drum shredding process. Shredding will yield metal strips no larger than 2" by 6", and it will also break down rocks, concrete and other objects for good metal separation and flow characteristics.

Upon leaving the secondary shredder, the metal strips and soil material are delivered to a belt conveyor. This conveyor transports the shredded materials to the rotary homogenizer where moisture content will be reduced by contact with hot air. Dried materials are discharged from the homogenizer onto a second belt conveyor and transported to the conditioned soil loading subsystem. At the head of the conveyor, a tramp iron magnet removes ferrous materials from the main waste material stream. Separated soils and metals streams are discharged to ST-90 boxes. DOE will remove the ST-90 boxes containing separated metals and the ST-90 boxes containing the dried soils for disposal.

The homogenizer air heater operates on propane and is provided with its own air and fuel controls. The drying air is heated, as required, to maintain the exhaust temperature from the homogenizer at a maximum of 250° F. The temperature of the air at the exit of the heater is also limited to a maximum of 750°F. The drying air is passed through a pulse-jet, cartridge filter dust collector and high efficiency particulate air (HEPA) filter to capture any fine particles prior to discharging them to the atmosphere.

The homogenizer is designed to minimize any air infiltration into the drying circuit. The homogenizer feeding assembly and the discharge breaching are equipped with low-leakage seals. Double gate airlocks provide the means for charging and discharging materials to and from the rotary homogenizer.

All of the soil processing equipment is enclosed and discharges to a dust control subsystem to eliminate fugitive dust emissions. The dust control subsystem provides the capability to withdraw air from all of the soil processing equipment and filter it through a HEPA filter prior to discharge to the atmosphere. The dust control subsystem consists of the ductwork, nuisance dust collector/HEPA filter, blower, and vent.

Both Dust Collectors (Nuisance and Homogenizer) are equipped with automatically controlled air pulse subsystems to clean the filter media. Dust collected at the bottom of the two Dust Collectors is returned to the final waste ST-90 box via a pneumatic conveying system.

Figure VII-1 Materials Pre-Treatment and Conditioning System Sampling Locations

A diesel-fired, electrical generation subsystem provides back-up electrical power to all components downstream of the shredders, the control subsystem, and some emergency lighting. Other emergency lighting is powered by battery. The skip-hoist and shredders will shut down in the event of loss of primary electrical power.

To provide transportability and ease of installation, equipment is skid mounted, meets Department of Transportation regulations, and uses flanged and/or hose connections. The systems are designed for outdoor operation.

2. Description of Key Pieces of Equipment

The process is composed of four subsystems. These are the size-reduction subsystem, the homogenizer subsystem, the metal-separation subsystem, and the filter subsystem. The process function is to take drummed waste materials and process them into two streams: a stream of material that is dry, free of ferrous metals, and is composed of the shredded waste material; and a stream of material that is dry, ferrous metals. The whole process is contained in ducts, chutes, enclosed conveyors, and process components that are maintained at slightly below the ambient atmospheric pressure to minimize the risk of fugitive particulate emissions. All air that is discharged from the process is filtered twice—first with conventional cartridge filters, and then with HEPA filters—prior to discharge to the atmosphere. Additionally propane and compressed air subsystems support the operation of the facility. A description of the individual components is given in the following subsection.

3. Shredding Subsystem

The size reduction subsystem receives the drummed waste material and reduces its size to that suitable for the remainder of the process. Each drum is transferred to the primary shredder by a manipulating arm and skip hoist. This subsystem consists of a manipulating arm, skip hoist, primary shredder, and secondary shredder. Each drum is placed into the basket of the skip hoist and is raised to the top of the primary shredder. At this point the drum is dumped into the primary shredder, and the drum and its contents are completely shredded. The shredded waste materials then fall onto the secondary shredder for further size reduction. The primary and secondary shredders are designed to produce particles no larger than 2", with some metal strips as long as 6". A belt conveyor then conveys the waste materials from the discharge of the secondary shredder to the drying subsystem.

4. Homogenizer Subsystem

The homogenizer subsystem consists of a rotary homogenizer, 6' diameter by 50' in length, designed to remove a maximum of 1400 pounds of moisture per hour. In the drying subsystem, the shredded waste materials enter the rotary homogenizer through a double-gate airlock. A fan forces hot air from a direct fired air heater through the homogenizer. This hot air contacts the waste materials and evaporates the water from the waste materials. The hot, moist air is then ducted through a dust collector, and a HEPA filter. The dust collector and HEPA filter capture any waste materials that may become entrained by the air ducted through the homogenizer. After filtration, the air is discharged from a vent to the atmosphere. The dry, waste materials

discharged from the end of the homogenizer are dumped through another double-gate airlock and into the metal-separation subsystem.

5. Metals Separation Subsystem

The primary component in the metal separation subsystem is a tramp iron magnet. Waste materials from the discharge of the homogenizer airlock are transported on a belt conveyor. As the material reaches the head of the conveyor, it passes the tramp iron magnet. Non-ferrous waste materials simply fall away from the magnet into a chute and ultimately into ST-90 boxes. These ST-90 boxes contain the final shredded and dry product. Ferrous waste materials are attracted to the magnet and are conveyed a short distance and are deposited into a separate ST-90 box.

6. Filter Subsystem

The final subsystem directly related to the processing of the material is the filter subsystem. This subsystem maintains the pressure of the enclosed process equipment to below ambient atmospheric pressure. This subsystem also maintains an air sweep at the inlet of the process (the primary shredder inlet) and collects dust at the discharge points of the process (i.e. at the ST-90 boxes). Waste materials accumulating in the dust collector in this subsystem, as well as the dust collector and HEPA filter bank in the drying subsystem, are pneumatically conveyed to a filter receiver and discharged into the same ST-90 box that collects the final, non-ferrous product.

7. Propane and Plant Compressed Air Subsystems

Propane, which is used as fuel for the homogenizer air heater, is trucked to the site and stored in the plant propane storage tank. The propane subsystem consists of an 18,000-gallon liquid propane tank, a propane pump, and a vaporizer all supplied with the necessary instruments, valves, and safety controls. The propane subsystem is designed for 21 MMBTU/hr of propane, while the homogenizer heater requires 7 MMBTU/hr.

The compressed air subsystem provides both instrument and utility air to the plant. The compressed air subsystem is designed to deliver a nominal 1000 scfm at 125 psig at a pressure dew-point of -40°F . The compressed air system consists of an inlet filter, single stage rotary type air compressor, air-cooled after-cooler, water separator, and air receiver. The water separator is a heatless, regenerative, desiccant air type dryer. Utility air is also passed through a coalescing filter, regenerative dryer, and an after-filter in order to provide instrumentation air with a -40°F dew-point.

8. Back-up Electrical Power Generation Subsystem

The back-up electrical power generation subsystem contains a 250kW, 480/277 wye, water-cooled, inline, four stroke cycle, compression ignition diesel internal combustion engine. The generator includes a 250 gallon, skid mounted “day tank” for fuel supply. All of the system components downstream of the shredders are connected to the back-up electrical power generation system.

C. INSTRUMENTATION, PROCESS MONITORING, AND CONTROL DESIGN

The instrumentation and control system provides the means to monitor and control the demonstration plant from one centralized location. Analog process data including temperatures, flow rates, pressures, and humidity, as well as digital information (on, off, open, closed), will be measured with various sensors and switches, and the output signals will be transmitted to the programmable logic controller (PLC). The data will be converted into engineering units and displayed through a graphical user interface (GUI). All PID loop controls will be performed by the PLC.

All operator action will be performed through the GUI including input of set point values; starting and stopping of equipment; opening, closing, or modulating control valves; etc. The GUI will display the status and operating conditions of each plant system. Automated sequencing requirements will be handled by the PLC. Alarm conditions will be displayed through the GUI and annunciated.

Historical data collection, trending, and customized data processing will be performed on a personal computer located in the control room.

VIII. RUN PLAN SUMMARY

The operation logistics of the proposed demonstration can be divided into an operation plan and a data acquisition and sampling plan. The operation plan provides details regarding the start up, steady state operation, and shut down procedures. The data acquisition and sampling plan provides details in the form of a matrix for collecting the data sets to support the test objectives.

A. OPERATIONS PLAN

During the demonstration of the Vortec Material Pre-Treatment and Conditioning System, the facility will operate for a 10-hour shift for 5 days during each test. It is anticipated that the same run plan will be used during each day of the facility operation. Differences in the daily operations of the facility will arise from the feed material to the system and the feed rate. Each test/experiment run condition will be held for at least one day. A description of the experimental run plan, including the four types of material to be tested, is provided in the Experimental Design section of this Test Plan. Each type of material will be processed in approximately 5 days.

Reliability, availability, and maintainability (RAM) data will be collected during the 30 days of demonstration testing. The RAM data will be collected in the form of operator logs and computer data files. These logs will identify interruptions to the processes, their causes, and the solutions required to continue operation. The data logged by the computer will help determine the ability of the system to run at a steady state. Additionally, a post-test inspection of the equipment will be used to identify areas of high wear that may lead to potential maintenance problems in the future. This collection of RAM data will be used to determine the over reliability of the system.

The run plan for each day of testing can be divided into three modes of operation; start up, steady state, and shut down. Details of these three modes of operation are described in the following subsections.

1. Start up

During the start up operations, the system temperature and the feed rate to the system are increased to those specified in the design for that day of testing. Typically, the system temperature is set so that the homogenizer exit temperature is 250°F while the specified feed rate to the system will vary from day to day. The primary concern during the start up procedure is to control the homogenizer temperature to prevent damaging the filter materials and to prevent moisture condensation in the ducts.

The start up procedure for the system consists of first initiating the rotation of the homogenizer and then starting the air heater to increase the temperature of the homogenizer. Additionally, the nuisance dust collector system is started at this time. Once the homogenizer exit air temperature reaches 250°F, the feed of drums into the skip hoist is initiated at a low rate. Increasing the feed rate to the homogenizer is expected to decrease the homogenizer exit temperature due to the energy required to vaporize the water in the feed and increase the temperature of the material. Therefore, the homogenizer exit temperature is monitored at this time and readjusted to 250°F by increasing the homogenizer inlet air temperature. Once the homogenizer exit air temperature reaches 250°F, the feed rate to the homogenizer can be increased by another small increment and the temperature readjusted. This increasing of the feed rate of material to the system and temperature adjustment is continued until the specified processing rate for the day is achieved.

At the beginning of the start-up period, the propane and electric power totalizer meters will be read and the values recorded in the test log. During the start up operations, the computer will log the homogenizer inlet and exit temperature, the vent particulate concentration, and the drum weights and times that drums are fed into the system. Grab samples of the feed materials and the conditioned soils will not be obtained during the start-up operation of the system. Regular inspections of the system will be performed to identify emission points of fugitive dust. Upon identifying a fugitive dust emission point, the Test Engineer will be notified and a solution to prevent the dust emission will be developed. In the case where a suitable solution cannot be identified, the flow rate of dust from the emission point will be determined.

2. Steady State

During steady state operation, the feed rate will be held constant at the rate specified for that day, and the homogenizer outlet air temperature held at 250°F. The steady state operating conditions should allow for long-term system operation without major control adjustments for a feed with the same characteristics. Minor adjustments to the air heater may be required to increase or decrease the homogenizer inlet air temperature to maintain 250°F at the homogenizer exit. At temperatures in excess of 250°F, there is the potential to damage the exhaust gas filter material, while at temperatures significantly below 250°F the potential for moisture to condense from the homogenizer exit air exists.

The air outlet temperature varies with the mass and temperature of the inlet air and the amount of water that is vaporized from the feed material. Increasing or decreasing the homogenizer inlet air temperature or the feed rate of material into the system can be used to adjust the homogenizer exit air temperature. Since it is desirable to maintain a constant feed rate during steady state

operations, and response time to changing the inlet air temperature is quicker, the homogenizer exit air temperature control is achieved through increasing or decreasing the homogenizer inlet temperature by adjusting the air heater.

Additionally, during the steady state operation of the system, the weights of the ST-90 boxes collecting the conditioned soil and metal from the tramp iron magnet should be monitored to determine the fill level of these boxes. When the boxes are filled, the boxes should be replaced with an empty box without interrupting the operation of the system.

During steady state operations, the computer will log the homogenizer inlet and exit air temperatures, the vent particulate concentration, and the drum weights and times that drums are fed into the system. Grab samples of the feed materials and the conditioned soils will be obtained during the steady state operation for further analysis and characterization. Regular inspections of the system will be performed to identify fugitive dust emission points. Upon identifying a fugitive dust emission point, the Test Engineer will be notified and a solution to prevent the dust emission will be developed. In the case where a suitable solution cannot be identified, the flow rate of dust from the emission point will be determined.

3. Shut Down

At the end of each shift of operation, the Vortec Material Pre-Treatment and Conditioning System will be shut down. The concerns during the shutdown procedure are similar to those during the start up procedure; that is, controlling the homogenizer exit air temperature to prevent damage to exhaust filters and prevent moisture (condensation) from accumulating in the system.

At the initiation of the shutdown procedure, the feed rate of drums to the system will be decreased slightly. After decreasing the drum feed rate, the homogenizer exit air temperature will be maintained at 250°F by decreasing the air heater temperature. Once the system readjusts to the lower processing rate, the drum feed rate is further decreased and the homogenizer exit air temperature is readjusted to 250°F by decreasing the air heater temperature. This process of decreasing the drum feed rate and adjusting the homogenizer exit air temperature is continued until the drum feed rate is zero. The propane and electric power totalizer meters are then read, and the values recorded in the test log.

The system continues to operate until conditioned soil and shredded material stop flowing into the ST-90 boxes as determined by the weight gain of the ST-90 boxes. Once these flows stop, the shredder, homogenizer, and other supporting equipment, such as conveyors, can be stopped to complete the shutdown.

Data logging and sampling during the shutdown operations will be the same as that for the start up.

B. DATA ACQUISITION AND SAMPLING PLAN

The sampling and data acquisition during the testing shift is summarized in the sample data acquisition matrix in Table VIII-1. This table provides the sampling frequency for the data sets

during the start up, steady state, and shutdown operating conditions of the system. Additionally, the location for collecting the data sets are referenced as marked in Figure VII-1.

Table VIII-1 Matrix Description of Data Acquisition and Sampling Plan for Test Shift.

		Sample Location	Operating Conditions		
			Start up	Steady State	Shut Down
Data Sets	Feed Grab Sample	S1	Not Collected	1 sample/ 5 drums	Not Collected
	Material feed rate into system (drum weight and time)	S2	All Drums	All Drums	All Drums
	Conditioned soil grab sample	S3	Not Collected	1 sample/ 2 h	Not Collected
	Homogenizer inlet temperature	S4	1 time/ min.	1 time/ min.	1 time/ min.
	Homogenizer outlet temperature	S5	1 time/ min.	1 time/ min.	1 time/ min.
	Particulate flow rate in homogenizer exhaust	S5	1 time/ min.	1 time/1hr/ 1 test	Not Collected
	Particulate flow rate in vent	S6	Not Collected	1 time/1hr/ 1 test	Not Collected
	Fugitive dust emission inspections	Various			
	Utilities Consumption	S7	1 time/ beginning	2 times/ beginning and end	1 time/ end
	Nuisance dust collector inlet pressure	S8	1 time/min. or 1 time/sec.	1 time/min. or 1 time/sec.	1 time/min. or 1 time/sec.
Homogenizer exhaust dust collector inlet pressure	S5	1 time/min. or 1 time/sec.*	1 time/min. or 1 time/sec.*	1 time/min. or 1 time/sec.*	

* 1 time/sec. during test of system response to primary electrical power failure

IX. DATA ANALYSIS

During the demonstration, a range of data will be gathered and then analyzed to support the test objectives. The demonstration test will involve sampling and analyses of surrogate soil feed, processed material, wastewater, and vent gases. Additionally, operating conditions such as homogenizer exit temperature and material feed rate will be acquired. The data analysis will provide a means for converting the collected data into useful parameters for evaluating the test objectives. The description of the data analysis is included in the following subtopics: Description of Data Collected and Selection, Data Reduction and Analyses, and Data Presentation.

1. Description of Data Collected and Selection

The analysis of the samples collected through the data acquisition plan in Table VIII-1 will generate a series of results. Table IX-1 presents a summary of the numbers and types of results anticipated during each run condition, approximately one day of run time.

Table IX-1 Review of Number of Data Sets and Number of Individual Analyses Associated with Each Run Condition and Test Point.

	Number of samples
Moisture content of feed grab sample	8 per test condition
Moisture content of conditioned soil grab sample	8 per test condition
Mass magnetic material in conditioned soil grab sample	8 per test condition
Particle size distribution of feed material	8 per test condition
Particle size distribution of conditioned soil grab sample	8 per test condition
Fraction of tracer materials in conditioned material grab sample	3 series of 5 grab samples
Utilities Consumption	2 per test condition

A primary purpose of the demonstration is to determine the characteristics of the conditioned soil under a set of consistent operating conditions. Therefore the experiments in the demonstration were designed to develop a correlation between the commercial operating parameters and the conditioned soil characteristics. The correlations will be developed through operating the unit in a mode similar to that anticipated for commercial operation. In this mode, select operating parameters will be fixed, such as the homogenizer outlet air temperature, while other parameters are free to vary, i.e. the drum feed rate. The repeatability of the operating conditions of the system will be demonstrated through the characterization of multiple samples at a single operating condition and the start up and shut down procedures performed each day.

The analytical results from all the samples shown in Table IX-1 will be assessed using the criteria presented in Table IX-2. These criteria are based on the assumption that data will be normally distributed, and will exceed detection limits. The data will be tested for normality prior to applying the criteria, using techniques prescribed in "Guidance for Data Quality Assessment: Practical Methods for Data Analysis", EPA QA/G-9 (EPA/600/R-96/084; January, 1998). This document will also be used to modify the criteria and decision rules for any non-normal data. In addition, Vortec anticipates that many of the analytical results will be below the detection limit of the analytical method. Therefore, the document referenced above will be used as a guide for addressing data that are below the practical quantitative limits of the test methods presented in this test plan. For a data set to be complete, at least 80% of the data points collected must be meet these criteria. In the case where the operating parameter criteria cannot be met on a regular basis, the criteria listed in Table IX-2 will be re-evaluated. In this case, a description of the new criteria will be given in the final report.

Table IX-2 Criteria for Valid Data Points

Specification	Criteria
Drum Feed Rate to System	+/- 1 drum per hour
System failure rate	Less than 1 drum in 50
Homogenizer inlet air temperature	Not specified
Homogenizer outlet air temperature	Mean variation of +/- 10°F from design point over one hour

2. Data Reduction and Analyses

The raw data from the analysis will be converted into material characteristics with calculations performed on a spreadsheet. The moisture contents of the materials will be reported on a wet basis. The percent magnetic material, particulate size distribution, and Homogenization Effectiveness will be reported on a dry basis. Flue gas data will be corrected to dry volume basis. Equations for the calculations related to the analyses operating parameters are given in Table IX-3. For a single operating condition, an average and standard deviation will be calculated from the individual data points.

3. Data Presentation

The data collected during the demonstration of the Vortec Material Pre-Treatment and Conditioning System will be summarized in the final report in a series of plots and tables.

The first four test objectives and Test Objective 8 will be primarily supported through a series of plots, listed in Table IX-4, generated from the data analyses and related calculations. These plots will provide a visual method for determining the conditioned soil characteristics based on the system operating conditions and characteristics of the incoming material. Conversely, the plots generated can be used to determine the operating conditions, specifically material feed rate, to achieve the desired properties of the conditioned material. Test objects 5 to 7, and 9 will be supported by a combination of tables, listed in Table IX-5, and details provided in a narrative form.

Table IX-3 Equations for Calculating Material Characteristics

Parameter	Equation	Variable Definitions
Percent moisture	$M = 100 \times \frac{m_{s+c,i} - m_{s+c,d}}{m_{s+c,i} - m_c}$	M = % moisture in sample $m_{s+c,i}$ = crucible + sample mass before drying $m_{s+c,d}$ = crucible + sample after drying m_c = crucible mass
Moisture Removal Efficiency	$E_M = 100 \times \frac{M_f - M_{cs}}{M_f}$	E_M = water removal efficiency M_f = feed material percent moisture M_{cs} = conditioned soil percent moisture
Percent Magnetic Material	$P_M = \frac{m_{mm}}{m_{s,d}}$	P_M = % magnetic material in conditioned soil $m_{s,d}$ = mass of dry sample m_{mm} = mass of magnetic material removed
Particle Size Distribution -% retained on a sieve	$PSD_i = 100 \times \frac{m_{si}}{\sum_{i=1 \text{ to } n} m_{si}}$	PSD_i = % retained on a sieve size i n = number of sieves m_{si} = mass of material retained on sieve size i
Particle Size Distribution -% passing a sieve size	$PP_i = \sum_{j=1 \text{ to } i-1} PSD_j$	PP_i = mass % of material passing i^{th} sieve size For i^{th} sieve size: $i = 0$, pan $i = 1$, sieve with smallest sizes openings $i = n$, sieve with largest sized openings
Percent Tracer in Sample	$P_T = \frac{m_{mT}}{m_{s,d}}$	P_T = % tracer in conditioned soil $m_{s,d}$ = mass of dry sample m_{mT} = tracer material mass removed from sample
Homogenization Effectiveness	$E_H = \frac{P_{T \max}}{P_{T \text{ feed}}}$	E_H = Homogenization Effectiveness $P_{T \max}$ = maximum % tracer in conditioned soil $P_{T \text{ feed}}$ = percent tracer in feed material
Electricity Required per Unit for Processing	$EE = \frac{E_E}{Mass_T}$	EE = Electrical energy per ton of material processed (kwh/T) E_E = Electricity consumed during test (kwh) $Mass_T$ = total mass of material processed through unit (T)
Propane Required per Unit for Processing	$EP = \frac{E_P}{Mass_T}$	EP = Gallon propane per ton of material processed (gal/T) E_P = Amount of propane used during test (gallons) $Mass_T$ = total mass of material processed during test (T)

Table IX-4 Test Data Plots

Plot (dependent vs. independent variable)	Test Objectives Supported	Data Series on Plot	Comparison/Conclusions
Conditioned material moisture content versus feed rate for various feed conditions	1. Homogenizer Drying Performance	1. High moisture feed 2. Average moisture feed 3. High metals feed 4. Large particles in feed	1. Effects of material characteristics on the moisture content in the conditioned soil. 2. Effects of feed rate on the moisture content in the conditioned soil.
Water removal efficiency as versus feed rate	1. Homogenizer Drying Performance	1. High moisture feed 2. Average moisture feed 3. High metals feed 4. Large particles in feed	1. Effects of material characteristics on the moisture removal efficiency of homogenizer. 2. Effects of feed rate on moisture removal efficiency of homogenizer.
Metal Content of conditioned material vs. feed rate of material and metal removal efficiency	Tramp Iron Magnet Performance	1. High moisture feed 2. Average moisture feed 3. High metals feed	1. Effects of feed moisture content on metals content in conditioned material. 2. Effects of feed rate on metals content of conditioned material. 3. Impact of large metal pieces in feed on metals content of the conditioned material.
% passing a sieve size of vs. particle/sieve size	2. Particle Size Reduction Efficiency	1. Feed material 2. 25% maximum feed rate 3. 50% maximum feed rate 4. 75% maximum feed rate 5. 100% maximum feed rate	Effect of feed rate on particle size on large pieces passing through system.
50% less than particle size vs. feed rate.	2. Particle Size Reduction Efficiency	1. Data from Experiment 4	Determine the impact of feed rate on particle size reduction efficiency.
Tracer concentration in conditioned material vs. sampling time	3. Homogenization Effectiveness	Two plots, high and average moisture feeds each containing: 1. 25% maximum feed rate 2. 50% maximum feed rate 3. 75% maximum feed rate 4. 100% maximum feed rate	Illustrate blending effect of system.
Homogenization Effectiveness vs. feed rate	3. Homogenization	1. High moisture feed 2. Average moisture feed	Effect of feed rate on Homogenization Effectiveness of system.
Dust collector inlet pressure vs. time	10. System Response to Primary Electrical Power Failure	1. Dust Collector inlet pressure	Determine maximum pressure during back-up power generation subsystem response time.

Table IX-5 Test Data Reports

Data Reported in Table	Test Objectives Supported	Other details provide	Conclusions
Number of drums processed at each drum feed, number of failure events for Experiments	5. Drum Size Capacity	Description of failure events.	A sufficient number of drums were processed to demonstrate a 90% system availability for both drum sizes.
Number of drums processed at each drum feed, number of failure events for Experiments	6. System Maximum Processing Rate	Description of failure events.	A sufficient number of drums were processed to demonstrate a 90% system availability for each feed rate.
Summary of total utilities consumed, amount of material processed, hours of operation.	7. Utilities Consumption	Calculation of the total amount of material processed.	The resulting utilities consumption rate per unit of material processed.
Location, time, estimate emission rate, and corrective action.	9.Fugitive Dust Emission	Details of the corrective action	List of potential fugitive dust emission points

X. SUPPORT REQUIREMENTS

To successfully perform the proposed testing, adequate facilities, staff, materials, and decommissioning are required. The following subsections provide a brief description of these support components for the Vortec Material Pre-Treatment and Conditioning System.

A. FACILITIES

In addition to the material processing equipment present on the site, facilities will be provided for the staging of incoming and outgoing materials, personnel offices, and laboratory analysis. The materials staging area will allow for the safe handling and maneuvering of the drums provided by DOE Paducah. This area will accommodate a sufficient supply of drums so that the processing equipment can operate without interruptions due to lack of material to process. The personnel offices will provide an area for site manager, demonstration test manager, and test engineers to perform documentation and communication activities associated with the testing. The personnel offices will be equipped with desks, filing cabinets, personal computers, and data communication lines. A trailer containing a laboratory sufficient for the analysis of the feed and conditioned materials will also be located on the site. This laboratory will contain analysis equipment including scales, ovens for drying, and sieves and shaker for measuring particle size distributions and for metals separation. Additionally, a desk and personal computer will be provided for documentation and recording data.

B. STAFF

The demonstration personnel staffing level is based on 1 ten or eight hour shift per day, 5 days per week. Planned staffing is as shown in Table X-1.

Table X-1 Demonstration Test Staffing

Position	Qty	Filled By	Cost By	Assigned Station	HR. / Day
On Position Site Operational Personnel					
Control Room Operator	1	Vortec	Vortec	Control trailer	10
Conditioning System Operator	1	Vortec	Vortec	Process barrel loading	10
Conditioning System Operator and Fork Lift Operator	1	Vortec	Vortec	Barrel staging and storage. ST-90 box loading, removal and storage	10
Conditioning System Operator	1	Vortec	Vortec	Conditioned soil filling at ST-90 boxes	10
Plant maintenance	1	Vortec	Vortec	Maintenance area	10
<i>Total</i>	5				
On Site Operational Support Personnel					
Site Operations Manager	1	Vortec	Vortec	Office Trailer	10
Demonstration Test Manager	1	Vortec	Vortec	Office Trailer	10
Administration / CMA	1	Vortec	Vortec	Office Trailer	10
Sampling and Testing	2	Vortec	Vortec	Laboratory	10
QA Engineer	1	DOE	DOE	Office Trailer	8
Safety & Health Officer	1	DOE	DOE	Office Trailer	8
Environmental Compliance Engineer	1	DOE	DOE	Office Trailer	8
Receiving/Shipping Operator & Material Control	1	DOE	DOE	Office Trailer	8
Plant Security	3	DOE	DOE	Office Trailer	8
<i>Total</i>	12				

C. MATERIALS

DOE will provide surrogate waste in 55-gallon and 85-gallon overpack drums for the demonstration. Maximum design weight of a full drum is 1200 pounds. . Working weight of a 55-gallon steel drum with liner is 666 pounds (assumed 75% full with 30% moisture). Working weight of an 85-gallon steel overpack drum is 744 pounds. (assumed to contain working weight of a 55-gallon steel drum)

D. RESIDUAL DISPOSAL AND DECOMMISSIONING

DOE will provide waste and residual removal services. Waste and residuals consist of unprocessed surrogate waste material, conditioned waste surrogates, and process residuals including filters, trash, and sanitary wastes. All process wastes generated during operations including residues will be returned to DOE-Paducah. All soil disturbed during construction will remain on site.

A limited decommissioning phase will be required at the conclusion of this limited demonstration since hazardous and radioactive materials will not be fed through the system. Decommissioning will include removing the visible remaining surrogate material from the system, inspecting the system for worn parts, and preparing the system for the idle period prior to further operation. This preparation should prevent deterioration of the system from inactivity (e.g. rust/corrosion due to standing water).

XI. REFERENCES

¹ Limited Demonstration Operational Plan for the Vortec-Paducah Material Handling System, Appendix N “Operational Sampling and Analysis Plan,” Prepared by Vortec Corporation for U. S. Department of Energy, July 2000, Vortec Document No. BFA-4110-904-005(0)

² ASTM procedure 5451-93

³ ASTM procedure D1587-94

⁴ ASTM procedure D6151-97

⁵ ASTM Method D4220-95 Standard Practices for Preserving and Transporting Soil Samples

⁶ ASTM Method E300-92 Standard Practice for Sampling Industrial Chemicals

⁷ ASTM Method D422-63 Standard Test Method for Particle-Size Analysis of Soils

⁸ ASTM Method 4959-00 Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating.

⁹ ASTM Method 4718-87 Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.

¹⁰ ASTM Method D2216-98 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

APPENDIX A

MASS AND ENERGY BALANCE

Mass and Energy Balance, Base Case (Pg. 1 of 4)

Basis for Heat and Mass Balance		
Ambient Temperature	degF	60
Ambient Relative Humidity	%RH	60
Production Rate Drums	drums/hr	9,050
Weight of Drum and Contents	lb	730
Weight percent of Contents that is water	%wt	30
Temperature of Drums into Homogenizer	degF	60
Temperature of Hot Gas into Homogenizer	degF	550
Temperature of Hot Gas exiting Homogenizer	degF	250
Temperature of Solids exiting Homogenizer	degF	180
Moisture content of Solids exiting Homogenizer	%wt	1
Cooling Air to Homogenizer Dust Collector	lb/h	0
Massflowrate of Drum Contents incl water	lb/h	6,064
Massflow of Drum Contents and Container	lb/h	6,607
Massflow of DrySolids entering Homogenizer	lb/h	4,781
Massflow of water evaporated in Homogenizer	lb/h	1,771
Front-End Dusting Rate	lb/h	6
Homogenizer Dusting Rate	lb/h	359
Back-End Dusting Rate	lb/h	30

Solver Check: balance must equal zero		
dust in	394	
dust out	394	
balance	0	
heat in	4,626,392	
heat out	4,626,392	
balance	0	

Solids Flow through Homogenizer

		101	102	103	104	106	107	108	109	110
		Skip Hoist Feed to Shredder	Water drainage from Shredder	Dusting Losses just before entrance of Homogenizer	Massflow of Solids entering Homogenizer	Solid Product exiting Homogenizer	Dusting Losses at exit of Homogenizer	Homogenizer Solid Product to Conveyor C4	C-4 Feed to Magnet (note: dusting to stream #153)	Metals from Magnet
Mass Balance										
Dry Solids	lb/h	4,787	0	1	4,781	4,781	358.61	4,423	4,419	577
Dry Air	lb/h	0	0	0	0	0	0	0	0	0
Water Liquid	lb/h	1,819	0	0	1,819	48	0	48	48	0
Water Vapor	lb/h	0	0	0	0	0	0	0	0	0
Propane	lb/h	0	0	0	0	0	0	0	0	0
Total Mass Flow	lb/h	6,607	0	1	6,601	4,830	359	4,471	4,467	577
Heat Balance										
Temperature	degF	60	60	60	60	180	180	180	180	180
Heat Flow, (datum is 32 degF)	Btu/h	111,381	0	0	111,381	326,656	0	326,656	326,656	9,389
Details for Design										
Pressure	inch WCG	0	0	0	0	0	0	0	0	0
Density	lb/ft3	96	62.4	96	96	96	96	119	119	489
Phase	Sol/Liq/gas	Sol/Liq	liq	Sol/Liq	Sol/Liq	Sol/Liq	Sol/Liq	Solid	Solid	Solid
Volumetric flow , solid and liquid	FT3/h	69	0	0	69	50	4	38	38	1
Volumetric flow, gas	scfm	-	-	-	-	-	-	-	-	-
Volumetric flow gas	acfm	-	-	-	-	-	-	-	-	-
O2	lb/h	-	-	-	-	-	-	-	-	-
N2	lb/h	-	-	-	-	-	-	-	-	-
CO2	lb/h	-	-	-	-	-	-	-	-	-
Metal	lb/h	595	0	0	595	595	0	595	595	577
Plastic	lb/h	70	0	0	70	70	0	70	70	0
Balance of Dry Solid: Clay,sand,concrete,organics	lb/h	4123	0	1	4,117	4,117	359	3,759	3,755	0
Weight Percent Active Ingredient	%wt	30	-	100	28	1	100	-	-	100
Step Wt% yield	%wt	-	-	-	-	-	-	-	-	97

Mass and Energy Balance, Base Case
(Pg. 2 of 4)

Air Flow through Homogenizer

		121	122	123	124	125	126	127	128	129
		Air into Airheater	Propane to Airheater	Hot Air to Homogen- izer	Seal Leakage into Homogen- izer	Heat Loss from Homogen- izer	Exhaust Gas From Homogen- izer	Cooling Air to Homogen- izer Dust Collector	Total Air to Homogen- izer Dust Collector	Compressed Air to Homogen- izer Dust Collector
Mass Balance										
Dry Solids	lb/h	0	0	0	18	-	358.61	0	358.61	0
Dry Air	lb/h	30,765	0	30,645	0	-	30,645	0	30,645	100
Water Liquid	lb/h	0	0	0	0	-	0	0	0	0
Water Vapor	lb/h	202	0	510	0	-	2,281	0	2,281	0
Propane	lb/h	0	189	0	0	-	0	0	0	0
Total Mass Flow	lb/h	30,966	189	31,155	18	-	33,284	0	33,284	100
Heat Balance										
Temperature	degF	60	60	550	60	-	250	60	250	100
Heat Flow, (datum is 32 degF)	Btu/h	426,293	4,088,718	4,477,278	0	20,498	4,279,238	0	4,279,238	2,357
Details for Design										
Pressure	inch WCg	0	125	0	0	-	0	0	0	0
Density	lb/ft3	0.0765	0.1000	0.0394	0.0765	-	0.0560	0.0765	0.0560	0.0710
Phase	Sol/Liq/gas	gas	gas	gas	gas	-	gas	gas	gas	gas
Volumetric flow , solid and liquid	FT3/h	-	-	-	-	-	-	-	-	-
Volumetric flow, gas	scfm	6746	41	6788	4	-	7251	0	7251	22
Volumetric flow gas	acfm	6746	31	13184	4	-	9901	0	9901	23
O2	lb/h	6461	-	5776	-	-	-	-	-	-
N2	lb/h	24304	-	24304	-	-	-	-	-	-
CO2	lb/h	0	-	565	-	-	-	-	-	-
Metal	lb/h	-	-	-	-	-	0	-	-	-
Plastic	lb/h	-	-	-	-	-	0	-	-	-
Balance of Dry Solid: Clay,sand,concrete,organics	lb/h	-	-	-	-	-	359	-	-	-
Weight Percent Active Ingredient	%wt	-	-	-	-	-	-	-	-	-
Step Wt% yield	%wt	-	-	-	-	-	-	-	-	-

Mass and Energy Balance, Base Case
(Pg. 3 of 4)

Air Flow through Material Handling

		141	142	143	144	145	146	147	149	151
		Air Drawn into Shredder	Air Drawn into Front-End Conveyor	Air Drawn into fume hood above drum at Homogenizer Feed End	Air exiting Shredder	Air from Over-Belt (Tail) for Homogenizer Feed Conveyor ME-102	Air from Under-Belt (Head) for Homogenizer Feed Conveyor ME-102	Air from Drum at Homogenizer Feed End	Totalized Nuisance Air from Front-End Material Handling	Air Drawn into Back-End Conveyor
Mass Balance										
Dry Solids	lb/h	0	0	0	4	0	1	1	6	0
Dry Air	lb/h	28,646	13,674	4,033	28,646	3,430	10,244	4,033	46,352	13,122
Water Liquid	lb/h	0	0	0	0	0	0	0	0	0
Water Vapor	lb/h	188	90	26	188	23	67	26	304	86
Propane	lb/h	0	0	0	0	0	0	0	0	0
Total Mass Flow	lb/h	28,834	13,764	4,059	28,837	3,453	10,312	4,060	46,662	13,208
Heat Balance										
Temperature	degF	60	60	60	60	60	60	60	60	60
Heat Flow, (datum is 32 degF)	Btu/h	396,931	189,473	55,879	396,931	47,529	141,944	55,879	642,283	181,823
Details for Design										
Pressure	inch WCg	0	0	0	0	0	0	0	-2	0
Density	lb/ft3	0.0765	0.0765	0.0765	0.0765	0.0765	0.0765	0.0765	0.0761	0.0765
Phase	Sol/Liq/gas	gas	gas	gas	gas	gas	gas	gas	gas	gas
Volumetric flow , solid and liquid	FT3/h	-	-	-	-	-	-	-	-	-
Volumetric flow, gas	scfm	6282	2999	884	6283	752	2247	884	10166	2878
Volumetric flow gas	acfm	6282	2999	884	6283	752	2247	884	10216	2878
O2	lb/h	-	-	-	-	-	-	-	-	-
N2	lb/h	-	-	-	-	-	-	-	-	-
CO2	lb/h	-	-	-	-	-	-	-	-	-
Metal	lb/h	-	-	-	-	-	-	-	0	-
Plastic	lb/h	-	-	-	-	-	-	-	0	-
Balance of Dry Solid: Clay,sand,concrete,organics	lb/h	-	-	-	-	-	-	-	6	-
Weight Percent Active Ingredient	%wt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Step Wt% yield	%wt	-	-	-	-	-	-	-	-	-

Mass and Energy Balance, Base Case
(Pg. 4 of 4)

Dust Recovery

		161	162	163	164	165	166	171	172	173
		Air Drawn into Pneumatic Conveyor System	Total Flow from Pneumatic System & Homogen- izer Dust	Total Flow To Pneumatic System Filter Receiver, ME-128	Compressed Air to Pneumatic Conveyor Filter Receiver ME-128	Dust Recovered from Pneumatic System Filter, ME- 128, bottoms	Flow from Pneumatic System Filter Receiver, ME-128 to Blower B- 113	Totalized flow to Nuisance Dust Collector Filter ME- 120	Compressed Air to Nuisance Dust Collector ME-120	Dust recovered by Nuisance Dust Collector ME-120
Mass Balance										
Dry Solids	lb/h	0	358	398	0	394.4096	3.8047	39.8047	0	39.7848
Dry Air	lb/h	2,250	2,250	2,250	36	0	2,286	77,477	100	0
Water Liquid	lb/h	0	0	0	0	0	0	0	0	0
Water Vapor	lb/h	15	15	15	0	0	15	508	0	0
Propane	lb/h	0	0	0	0	0	0	0	0	0
Total Mass Flow	lb/h	2,265	2,623	2,663	36	394	2,305	78,025	100	40
Heat Balance										
Temperature	degF	60	60	60	60	60	60	60	60	60
Heat Flow, (datum is 32 degF)	Btu/h	31,177	31,177	31,177	499	0	31,676	1,073,570	1,386	0
Details for Design										
Pressure	inch WCg	0	0	0	0	0	-8	-3	0	0
Density	lb/ft3	0.0765	0.0765	0.0765	0.0765	0.0765	0.0750	0.0759	0.0765	0.0765
Phase	Sol/Liq/gas	gas	gas	gas	gas	gas	gas	gas	gas	gas
Volumetric flow , solid and liquid	FT3/h	-	-	-	-	-	-	-	-	-
Volumetric flow, gas	scfm	493	572	580	8	86	502	16999	22	9
Volumetric flow gas	acfm	493	572	580	8	86	512	17125	22	9
O2	lb/h	-	-	-	-	-	-	-	-	-
N2	lb/h	-	-	-	-	-	-	-	-	-
CO2	lb/h	-	-	-	-	-	-	-	-	-
Metal	lb/h	-	-	-	-	-	-	-	-	-
Plastic	lb/h	-	-	-	-	-	-	-	-	-
Balance of Dry Solid: Clay,sand,concrete,organics	lb/h	-	-	-	-	394	-	-	-	-
Weight Percent Active Ingredient	%wt	0	14	15	0	100	0	0.1	0	100
Step Wt% yield	%wt	-	-	-	-	99	-	-	-	99.95

LIMITED DEMONSTRATION OPERATIONAL PLAN

for the

VORTEC-PADUCAH MATERIAL HANDLING SYSTEM

at the

**UNITED STATES DEPARTMENT OF ENERGY
PADUCAH GASEOUS DIFFUSION PLANT**

Topical Report

Reporting Period: May 11, 2001 – July 10, 2001

R.K. Hnat

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Prepared by:

**Vortec CORPORATION
3770 Ridge Pike
Collegeville, PA 19426**

Prepared for:

**U.S. Department of Energy
National Energy Technology Laboratory**

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DOCUMENT REVIEW AND APPROVAL

PREPARED BY:

R.K. HNAT
DIRECTOR QA / COST CONTROL
VORTEC CORPORATION

DATE

7/5/01

REVIEWED BY:

D.M. DETWILER
VICE PRESIDENT ENGINEERING
VORTEC CORPORATION

DATE

7/5/01

G.A. Eglinton
DIRECTOR PROCUREMENT
VORTEC CORPORATION

DATE

7/5/01

L.M. Bartone
DIRECTOR PROCESS DEVELOPMENT
VORTEC CORPORATION

DATE

7/5/01

APPROVED BY:

J.G. Hnat
PROGRAM MANAGER
VORTEC CORPORATION

DATE

7/5/01

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Definitions

Accident -	An unwanted transfer of energy or an environmental condition which, due to the absence or failure of barriers or controls, produces injury to persons, damage to property, or reduction in process output.
Competent person -	One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
Controlled Area -	Any area to which access is managed in order to protect individuals from exposure to radiation and/or radioactive material.
Emergency -	An emergency is the most serious event and consists of any unwanted operational, civil, natural-phenomenon, or security occurrence, which could endanger or adversely affect people, property, or the environment.
Permissible Exposure Limit -	The time-weighted limit for airborne concentrations that employees may be exposed to as required by the OSHA standards.
Radiological Area -	Any area within a controlled area which must be posted as a radiation area, high radiation area, very high radiation area, contamination area, high contamination area, or airborne radioactivity area in accordance with 10 CFR 835.603.
Qualified inspector -	One who has the necessary knowledge and experience to properly inspect equipment.
Qualified person -	One familiar with the construction and operation of the equipment and hazards involved.
Threshold Limit Value -	The time-weighted limit for airborne concentrations that employees may be exposed to as recommended by the ACGIH.

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The Vortec Waste Conditioning Demonstration Operational Plan is used to provide elements for directives, plans, and/or procedures relating to the conduct of operations at Vortec Corporation's Waste Pretreatment and Conditioning Plant located outside the fence at the Paducah Gaseous Diffusion Plant in Paducah, KY. This Operational Plan is focused for a Limited Demonstration activity; however, the plan also has direct application to plant operations when the plant becomes operational treating actual waste. Note that the current contract provides services up to construction. Operations will be contracted after construction.

This Operational Plan provides information and procedures for operation of the Vortec Waste Conditioning and Conditioning Plant, as well as data management and reporting requirements.

1.2 PROCESS DESCRIPTION

The Waste Conditioning System begins with clean soils drummed in sealed metal barrels, prepared by Bechtel-Jacobs Company, LLC (BJC) and delivered to the Vortec facility for the limited demonstration project. The drummed materials will be prepared in accordance with recipes outlined in the Test Plan. The sealed drummed soils will be weighed and loaded into the Primary Shredder via the Manipulating Arm and Skip Hoist. Materials will pass from the Primary Shredder to the Secondary Shredder to complete the drum shredding process. Shredding should yield metal strips no larger than 2" by 6" and break down rocks, concrete and other objects for good metal separation, flow characteristics, and subsequent homogenization. A Simplified Process Diagram is shown in Figure 1-1.

Upon leaving the secondary shredder, the metal strips and drummed contents are delivered to a belt conveyor transporting and elevating the shredded materials to the Rotary Drum Dryer where moisture content will be reduced by contact with heated air and material homogenization will occur. Dried and homogenized material discharge from the Rotary Drum Dryer onto a belt conveyor, which transports material to the conditioned soil loading subsystem. At the head of the conveyor, a tramp iron magnet separates ferrous metals from the material stream. Separated metals are discharged to an ST-90 box for DOE disposal. The conditioned soil will discharge from the belt conveyor to the conditioned soil loading subsystem into ST-90 boxes for DOE disposal.

Necessary process equipment ancillary to the waste pretreatment and conditioning plant include a dryer air heater system, a treatment subsystem for the dryer exhaust air stream, dust control subsystem, the propane subsystem, the compressed air subsystem, power and controls.

The soil is assumed to contain up to 30% water by weight, and a rotary dryer will dry the soil to a free flowing condition. Warm air from the dryer is passed through a cartridge filter dust collector and High Efficiency Particulate Air (HEPA) filters for control of particulate prior to discharge to the atmosphere. The rotary dryer air heater operates on propane and is provided with its own air and fuel controls. The drying air is heated as required to maintain moist air temperature leaving the dryer at minimum of 250° F.

The dryer operates under a slight negative pressure and is designed to minimize any air infiltration into the drying circuit. The dryer feeding assembly and the discharge breaching are equipped with purged low-leakage seals. Double gate airlocks provide the means for charging and discharging materials to and from the Rotary Dryer to keep the dryer air and dust collection air separated.

All of the soil processing equipment (shredders and conveyors) have been designed to be enclosed and discharge to a dust control subsystem to eliminate fugitive dust emissions. The dust control subsystem provides the capability to withdraw air from all of the soil processing equipment and filter it through a dust collector and HEPA Filter prior to discharge to the atmosphere. The dust control subsystem consists of the ductwork, Nuisance Dust Collector/HEPA filter, blower, and stack. The Dryer exhaust air is similarly vented through a dust collector and HEPA filter. Both Dust Collectors (Nuisance and Dryer) and the Dryer HEPA filter are equipped with automatically controlled air pulse subsystems to clean the filter media. In each unit, the dust removed from the filter media drops to a live bottom hopper where it is discharged to a pneumatic conveying system for delivery to the conditioned material loading subsystem. In this manner, all potential dust sources during operation of the system are effectively controlled and fugitive losses are minimized or eliminated.

The propane subsystem consists of the Liquid Propane Tank and ancillary equipment. The propane subsystem delivers 7 MMBTU/hr of propane to the dryer air heater as required.

The compressed air subsystem provides both instrument air and utility air to the plant. It consists of a single stage rotary screw type compressor with air-cooled aftercooler, a heatless, regenerative, desiccant type air dryer and air receiver. The subsystem is designed to provide 800 scfm of compressed air at 125 psig with a -40°F dew point. The compressor and dryer operate with manufacturer provided local control panels.

To provide transportability and ease of installation, most equipment is skid mounted, meets Department of Transportation regulations, and uses flanged and/or hose connections. The systems are designed for operation outdoors at temperatures below freezing.

Figure 1-1 Simplified Process Flow Diagram

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2. ROLES AND RESPONSIBILITIES

2.1 VORTEC

The following sections outline specific roles and responsibilities of Vortec Corporation.

2.1.1 Administrative

Vortec will perform all administrative functions required for the safe and efficient operation of the waste pretreatment and conditioning plant during demonstration testing and subsequent operational activities. This will include, but not necessarily be limited to, configuration and data management control, operation and maintenance, supervision, personnel hiring and scheduling, operation planning, plant operator and materials handling training, reports to the United States Department of Energy (DOE), and security within the waste pretreatment and conditioning plant site.

2.1.2 Plant Operators

Vortec personnel will perform the day-to-day operation functions of the waste pretreatment and conditioning plant. These personnel will include Site Manager who will serve as the Demonstration Test Manager, Plant Operations Manager, Plant Supervisor, Operators and Rovers for the systems within the plant, Material Handlers, and Maintenance personnel. Vortec personnel will train, or arrange for training from others including DOE, all personnel involved in plant operations and maintenance with respect to material waste handling, operating procedures, emergency procedures, health and safety procedures and security procedures. Training imposed by PGDP will be conducted by PGDP. Figure 2-1 shows the Vortec Waste Pretreatment and Conditioning Plant Organizational Table. Position descriptions for all site personnel are in Appendix I.

2.1.3 Waste Handlers

Vortec personnel will be responsible for the handling of the surrogate waste material that the DOE/Paducah Gaseous Diffusion Plant (PGDP) delivers to the site as well as all other products and wastes generated within the site in accordance with applicable state, federal, and DOE regulations. The PGDP will deliver to an incoming surrogate waste receiving area only that surrogate waste material which Vortec requests. Upon delivery of the surrogate waste, Vortec personnel will verify that only material requested is received and will not open and inspect surrogate waste drums. Vortec will perform all material movement within the waste conditioning plant and will shred all drums received. Vortec will deliver processed waste materials from the waste conditioning process to outgoing staging areas. The PGDP will then pick up processed waste materials from the waste conditioning plant at the designated staging areas and transport the material off-site for disposal. Vortec will maintain documentation for all waste received, all wastes on the demonstration site and in process as well as all processed wastes removed from the waste-conditioning site.

Figure 2-1
Vortec Waste Pretreatment and Conditioning Demonstration Plant Organizational Chart

2.2 UNITED STATES DEPARTMENT OF ENERGY

The PGDP will provide Vortec with the surrogate waste streams to be processed through the waste pretreatment and conditioning plant. Additionally, the PGDP will deliver surrogate waste which Vortec requests to a designated incoming waste receiving area in accordance with the procedures for waste delivery to the waste-conditioning site.

The PGDP will pick up waste from the waste pretreatment and conditioning process at designated staging areas and transport the waste from the plant site for disposal. The PGDP will be responsible for the disposal of the waste removed from the waste-conditioning site.

The PGDP will provide electrical and process water utilities to the waste pretreatment and conditioning plant site. Wastewater is not generated routinely in the conditioning process. No wastewater treatment is planned. DOE will pickup wastewater that may be generated.

The PGDP will conduct any training PGDP imposes upon Vortec.

The DOE's responsibilities also include:

- Integration of the Bechtel-Jacobs Management Team efforts at the PGDP and
- Development of agreements and negotiations with Vortec for the operation of the unit after the successful demonstration.
- The DOE is responsible for Fire and Emergency Response.

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3. OPERATIONS PLAN

3.1 Chapter 1 Operations Organization Administration

A high level of performance in plant operations is accomplished by establishment of high operation standards, communicating the standards to the working level, providing sufficient resources to the operations, ensuring personnel are well trained, closely monitoring performance on operations, and holding workers and their supervisors accountable for their performance in conducting activities.

3.1.1 OPERATIONAL POLICIES

Operational Policies Procedures or other definitive documentation are policies that are applied for operations. These policies will specify goals and the means to achieve those goals. These documents will also provide for the types of controls necessary to implement policies.

Operations procedures support facility and DOE guidance for operations. Responsibilities for implementing these policies, including the responsibility of shift personnel, if applicable, will be clearly defined. Operations personnel should clearly understand their authority, responsibility, accountability, and interfaces with other groups.

The following Vortec policies/procedures are applicable to operations of the plant and are included in Appendix K:

Vortec Corporation Safety Policy

QP1 Engineering and Design Control

QP8 Procurement and Purchasing

QP9 Government Contract Receiving, Inspection, and Miscellaneous Surveillance

QP10 Performing Construction and Installation Surveillance Activities at Government Demonstration Plants

QP11 Control of Non-conforming Conditions for Government Contracts

QP12 Government Contract Demonstration Plant Installation Control

QP13 Control of Government-Owned Property, Facilities, and Materials

QDP211-9-001 Procedures for Plant Receiving, Inspection, and Maintenance Surveillance at the Paducah Kentucky Demonstration Plant

QDP211-1-001 Instructions for Resolving Material Discrepancies and Deficiencies at the Paducah Kentucky Demonstration Plant

QDP-211-0-001 Respiratory Protection Plan

QDP-211-0-002 Chemical Hygiene Plan

QDP-211-0-003 Personal Protection Equipment Plan

QDP-211-0-004 Hazard Communication Program (HAZCOM)

QDP-211-0-006 (Draft) Hot Work Permit Program

3.1.2 RESOURCES

The operations supervisor will be provided with sufficient resources in materials and personnel to accomplish assigned tasks without requiring excessive overtime by the operations staff. These resources include technical personnel needed to support the operations. The current staffing plan for the Limited Demonstration is shown in Table 3.1-1. The Limited Demonstration Testing activity is planned for a 5-day 10-hour day operation. During the Limited Demonstration, no radioactive or hazardous materials will be processing.

Table 3.1-1 Limited Demonstration Operational Staffing

Position	Qty	Filled By	Assigned Station
On Site Operational Personnel			
Control Room Operator	1	Vortec	Control trailer
Conditioning System Operator	1	Vortec	Process barrel loading
Conditioning System Operator and Fork Lift Operator	1	Vortec	Barrel staging and storage. ST90 box loading, removal and storage
Conditioning System Operator	1	Vortec	Conditioned soil filling at ST90 boxes
Plant maintenance	1	Vortec	Maintenance area
<i>Total</i>	5		
On Site Operational Support Personnel			
Site Operations Manager	1	Vortec	Office Trailer
Demonstration Test Manager	1	Vortec	Office Trailer
Administration / CMA	1	Vortec	Office Trailer
Sampling and Testing	2	Vortec	Laboratory
QA Engineer	1	DOE	Office Trailer
Safety & Health Officer	1	DOE	Office Trailer
Environmental Compliance Engineer	1	DOE	Office Trailer
Receiving/Shipping Operator & Material Control	1	DOE	Office Trailer
Plant Security	3	DOE	Office Trailer
<i>Total</i>	12		
Off Site Operational Support Personnel			
Chemical Engineer	1/4	Vortec	Collegeville Office
Process Engineer	1/4	Vortec	Collegeville Office
Mechanical Engineer	1/4	Vortec	Collegeville Office
Secretary / CMA	1	Vortec	Collegeville Office
Management	1	Vortec	Collegeville Office
Procurement	1/4	Vortec	Collegeville Office
<i>Total</i>	3		

3.1.3 MONITORING OF OPERATION PERFORMANCE

As described in Chapter 6, operating problems will be documented and evaluated. Based on assessments of these problems, corrective actions will be taken to improve the performance of the operations department performance. Additionally, frequent direct observation of operations activities by supervisors and managers will occur.

3.1.3.1 Safety and Operational Goals

Goals will be auditable, measurable, realistic, and challenging. Meeting goals will require a definite set of actions or an action plan. The action plan will be developed with input from personnel involved in conducting operations, reviewed by the operations supervisor, and approved by plant management. The progress toward completing the action plan and achieving goals will be monitored periodically. An audit of performance relative to operating goals will be provided to facility management. This summary should include an explanation of performance and actions planned to improve future performance.

Operating and safety goals will be set and used as motivators for improvement, not as ends in themselves. The purpose is not simply to meet a numerical goal; rather, the purpose is to improve and monitor operating performance. Meaningless goals (i.e., goals that are easy to meet with little action) will not be used.

Safety and operational goals will be established for the following:

Table 3.1-2 Safety and Operational Goals

Item	Goal	Applicable to Ltd Demo	Applicable to Operational Facility
1	Minimizing the unavailability of safety systems	x	x
2	Minimizing personnel errors	x	x
3	As-Low-As Reasonably-Achievable (ALARA)		x
4	Minimizing lost facility capability		x
5	Minimizing the number of unscheduled facility shutdowns per year		x
6	Minimizing the amount of overtime		x
7	Achieving and maintaining complete staffing and training of shift positions		x
8	Minimizing waste		x
9	Minimizing the number of lighted annunciators		x
10	Minimizing loss productive time		x
11	Minimizing lost time and other OSHA recordable incidents	x	x

3.1.3.2 Inspections, Audits, Reviews, Investigations, and Self Assessments

Inspections, audits, reviews, investigations, and self-assessments are a part of the checks and balances in an operating program. Line managers and supervisors will perform routine observations of personnel performing operating activities. Deficiencies identified will be documented, trended, and corrected. Also, other groups, such as quality assurance personnel, will periodically review and assess operation performance. These reviews can assist line managers and supervisors in identifying and correcting problems.

3.1.4 Accountability

Workers and their supervisors will be held accountable for operating performance. Personnel involved in significant or frequent violations of operating practices will be counseled, retrained, and disciplined, as appropriate. Supervisor performance appraisals and promotions will include an assessment of operating performance.

3.1.5 Management Training

Formalized supervisory and management training will include be provided as required. During the Limited Demonstration Test, existing Vortec personnel and experienced labor provided by DOE and USEC will be utilized.

3.1.6 Planning for Safety

Facility guidance exists which describes safety-preplanning requirements for all operational activities. A Construction Site Specific Health and Safety Plan (BFA-4110-904-002) has been issued and a Draft Operational Health and Safety Plan (BFA-4110-904-001) is being prepared. All operations personnel will be provided safety training as required.

3.2 Chapter 2 Operational Practices

Effective equipment monitoring is necessary to detect abnormal conditions or adverse trends so that the appropriate action can be taken before equipment malfunction occurs. Notifying supervisors promptly of unusual or unexpected situations helps to ensure that proper attention is given to changing and/or off-normal conditions.

It is the responsibility of the on-shift operating crew to safely operate the facility through adherence to operating procedures, technical specification or operational safety requirements, and sound operating practices. The authority for operations is invested in the on-duty shift supervisor or site operations manager and transferred only through formal turnover to a qualified relief.

The on-duty supervisor or operations manager has authority and responsibility for all facility operations. If a special test, evolution, or abnormal condition arises; facility personnel shall be made aware of their responsibilities and authority. No individual is authorized to bypass or overrule the supervisor's or operations manager's operational judgment. Vortec Corporation's management located in Collegeville, PA will resolve any conflicts.

3.2.1 Status Practices

The plant supervisor responsible for the facility will be promptly notified of all changes in facility status, abnormalities, or difficulties encountered in performing assigned tasks. Similarly, the operator will notify the plant supervisor of any unexpected situations. A daily status log will be maintained.

3.2.2 Safety Practices

Operations personnel will adhere to the requirements of the facility Operational Health and Safety Plan, BFA4110-904-001. To reduce the potential for injury, proper hearing, eye, head, foot, and respiratory protection will be worn in designated areas. Similarly, ladders or other approved means will be used to access equipment located in the overhead when permanent steps or catwalks are not available, thus minimizing the potential for accidents. Operators will not routinely climb or walk on facility components and insulation, because this could result in personnel injury or damage to equipment. Operators will exercise appropriate precautions when entering or working in or around energized panels or equipment.

3.2.3 Operator Inspection Rounds

Operator rounds will be of sufficient detail to ensure that the status of equipment is known. Each operator will conduct a thorough round of all areas within his/her responsibility, making appropriate equipment inspections at designated times at least once per shift. However, the plant supervisor may designate specific areas to be inspected less frequently because of adverse radiological (not applicable for the Ltd Demo Test) or equivalent personnel safety conditions, or more frequently if problems have been encountered. In these cases, the plant supervisor will specify an alternate inspection schedule. Plant security concerns will not override operator safety assessment duties. A round normally will be made early in the shift, before the operator attends to other duties, so that he/she can become familiar with the condition and status of equipment for which he/she is responsible. During the round, equipment will be inspected to ensure that it is operating properly or, in the case of standby equipment, that it is fully operable. In addition, the following activities should be conducted in conjunction with the tour:

- The status of equipment (i.e., operating, standby, work in progress, or out-of-service) should be determined so that the operator will be best able to respond to problems he/she may face during his/her shift.
- Components, such as electrical panels, alarm panels, auto-start standby equipment, and breakers should be inspected for abnormal or unusual conditions. Unexpected conditions such as equipment vibrations, unusual noises or smells, or excessive temperatures should be reported to the control room so that the plant supervisor will be aware of the conditions and be able to direct repairs, troubleshooting, or additional operator action, as necessary.
- Equipment panel alarm light bulbs and annunciators should be periodically checked to ensure satisfactory operation of visual and audible abnormal condition indicators.
- Each operator should inspect all areas for which he/she is responsible and note any deficiencies that may be present. These deficiencies may include steam, oil, or water leaks; fire and safety hazards or radiological problems; seismic concerns such as open electrical panels and mobile objects; clogged floor drains; housekeeping or cleanliness problems; and building deficiencies such as inoperative lighting, roof leaks, or doors that do not close properly.

Operators should take appropriate action to correct or report deficiencies noted during tours. Equipment deficiencies should also be documented in accordance with the facility maintenance work request system.

3.2.4 Round Inspection Sheets

A Round Inspection Sheet will be utilized to record key equipment parameters. Round inspection sheets also facilitate operator turnover of equipment status and are an effective aid in the training and qualification of new operators.

Round inspection sheets will be developed and approved by the operations manager. They will include areas located within the particular shift position and important parameters for equipment. Where appropriate, equipment parameters will include maximum/ minimum values or expected operating ranges to enable operators to recognize abnormal readings quickly. Safety limits derived from Technical Specifications or Operational Safety Requirements should be highlighted. Equipment should be listed on round sheets in the same order that it would be encountered during a normal tour of the operating station, and the round sheets should include a narrative section.

Operators will use the narrative section to document major evolutions, causes of abnormal conditions, and actions taken to correct abnormal conditions. A narrative logbook may be substituted for the narrative section on the round sheet. Data will be recorded on round sheets at the times specified by the operations manager. When round sheet data are not obtained within one hour of the specified time, the actual time the data were obtained should be noted on the round sheet.

Parameters exceeding the specified maximum/minimum values will be circled or otherwise highlighted on the round sheet and promptly reported to the control room and/or the operations manager. The causes of abnormal indications will be promptly investigated with the plant supervisor becoming involved as appropriate. A supervisor will review the round sheet data on each shift to identify trends or abnormal readings and to verify that data have been properly recorded.

To ensure that comprehensive tours continue to be conducted, supervisory personnel will periodically monitor operator rounds as necessary and perform periodic inspections of equipment and areas not listed on the round sheets.

3.2.5 Personnel Protection

Operations personnel should be appropriately qualified to follow good personnel protection practices to maintain personnel exposure as low as reasonably achievable (ALARA) to radiation (DOE 5480.11) (not applicable to the Ltd Demo Test), chemicals, electromagnetic fields, toxic materials, or other personnel hazards. In particular, operations personnel will observe the following requirements:

- a. Operators will adhere to all posted personnel protection requirements and observe proper practices and precautions while in controlled areas.

- b. Operators will correctly utilize appropriate monitoring instruments when required.
- c. Operators will be cognizant of their own exposure levels and take appropriate action to minimize exposures.
- d. Operators will be knowledgeable of the proper use of radiation work permits (not applicable to the Ltd Demo Test), safe work permits, or inhalation limits, where applicable.
- e. Operators will promptly report protection deficiencies and hazards to the control personnel and/or appropriate protection personnel. In addition, operators should take appropriate immediate actions to reduce or correct the hazards.
- f. Appropriate protection personnel should be informed prior to activities that have a potential to significantly change conditions in the facility.

The operations manager will periodically review exposure trends of operating personnel under their supervision. Emphasis will be placed on determining the adverse factors that contribute to personnel exposures and minimizing those factors to keep exposures as low as reasonably achievable.

3.2.6 Response to Indications

Operators should believe instrument readings and treat them as accurate unless proven otherwise. Ignoring an unusual reading because the operator believes an instrument is faulty can cause abnormal conditions to be undetected. Prompt action should be taken to investigate the cause of abnormal or unexpected indications so that prompt corrective action can occur. When malfunctioning or inaccurate instruments are discovered, they will be appropriately identified to prevent subsequent confusion, and instrument and control personnel should be notified to effect repairs. In situations of operator doubt, operators should be instructed to achieve facility, personnel, and environmental safety above facility production.

3.2.7 Resetting Protective Devices

When protective devices trip (e.g., circuit breakers, fuses, reactor protection channels where multi-channel logic exists), an attempt should be made to understand the cause of the trip before the device is reset. Before action is taken, an operator will ensure no abnormal condition exists that would preclude reset. The operations management will provide the appropriate guidance so that tripped protective devices will be properly addressed. Facility-wide protective device trips and unplanned forced shutdown require a thorough investigation in accordance with the guidance of Chapter 6.

3.2.8 Load Changes

The plant supervisor or the control room operator will approve all power or process rate changes. However, the operator could decrease load or rate without approval, if necessary, to respond to a facility emergency situation in accordance with the facility's emergency procedures.

3.2.9 Authority to Operate Equipment

The operations manager directs the overall operation of the facility. Operations management will ensure that only trained and qualified personnel operate plant equipment. In general, the operator and the operations manager should be aware of all activities affecting equipment. The operations manager will specify those general activities that may normally be performed without informing the supervisor and will amplify these specifications as appropriate. Examples of such activities are pumping certain sumps (plant equipment operators) and the routine minor adjusting of controls necessary for maintaining stable process conditions. However, non-routine operation of controls will not be made without specific approval of the plant supervisor. In addition, during emergencies, operators may take necessary immediate actions required to ensure personnel, plant, and environmental safety without obtaining prior approval; however, the plant supervisor should be promptly informed of these actions. Operators will be instructed that plant safety should be achieved over facility production for off normal and emergency facility conditions.

3.2.10 Shift Operating Bases

The operating base is the facility area where an operator returns when he is not performing in-plant duties. An operating base should be established for each shift position. Each operating base should be equipped with appropriate office equipment for the operator to maintain necessary procedures and references and to conduct administrative duties, and necessary communication equipment should be available at the operating base. Shift turnovers should be conducted within those facility areas assigned to the operations department and typically at the operating base. An operating base should be located at a convenient place within the area of responsibility for that shift position.

3.2.11 Potentially Distractive Written Material and Devices

Written material that does not relate to operation and entertainment devices (such as radios, televisions, tape players, and computer games) are prohibited from use by on-duty operations personnel in order to minimize distractions from their responsibilities. Written material and entertainment devices are not to be brought to work stations. However, operators may read training bulletins, technical manuals, or operating experience information or review other written, audible, or visual materials that relate to operator duties. Judgment will be used to ensure the operators' primary duties are not compromised. The operations manager will provide guidance to the shift crews for the use of potentially distractive materials and devices.

3.3 Chapter 3 Activities in Controlled Areas

The control room is the most critical facility operating base and the coordination point for all important facility activities. Therefore, activities in the control room must be businesslike, and a professional atmosphere conducive to safe and efficient operation must be maintained. Control room access will be limited so that operators will not be distracted from properly monitoring facility parameters.

3.3.1 Controlled Area Access

Controlled area access is limited to those persons on official business only. Access to these areas is normally restricted to persons who need to be in the area. Only the plant supervisor or operations manager may grant entry to these areas.

The principal controlled areas for the Waste Processing Plant are the control room, barrel loading/shredding area, and processed waste discharge area. See Figure 3.3-1 for the Control Area Site Map and Table 3.3-1 for the Site Controlled Zone List.

Facility activities in controlled areas will be conducted in a manner that maintains safe and reliable operation. Site access will be limited to those persons on official business. Vortec Corporation will consider all other persons as visitors, unless the Site Manager classifies them otherwise; all visitors will require an escort. Vortec Corporation will conduct appropriate site access training for visitors at the facility.

Vortec will keep all sign-in/sign-out logbooks at the site office trailer; sign-in/sign-out is mandatory for all personnel and visitors. The Site Manager must be able to account for all personnel on the site; therefore, an accurate count of all individuals at the facility must be maintained.

The plant control area will consist of the entire area inside the fenced project boundary. Employees and individuals within the fenced area must comply with the previously mentioned procedures. Some areas inside the control area may also be determined as Hazardous Operations depending upon the location and current status of operation. Other areas of control awareness include those near the Programmable Logic Controller (PLC). These areas will have limited access, which the Site Manager will determine.

3.3.2 Professional Behavior

Professional behavior should be displayed in controlled areas at all times. Only activities essential to supporting operation and activities authorized by management are permitted. Distracting activities (such as radio listening, game playing, and horseplay) are prohibited. Non-job discussions should be minimized as not to interfere with conduct of the shift or monitoring of key parameters.

3.3.3 Monitoring of the Main Control Panel

Operators need to be alert and attentive to control panel indications and alarms. Frequent monitoring of control panels needs to be accomplished so that prompt action can be taken to determine and correct cause of abnormalities.

3.3.4 Control Operator Ancillary Duties

The plant supervisor should take caution not to assign duties that would interfere with an operator's ability to monitor facility parameters. The administrative workload of operators responsible for monitoring and operating a control board should be minimized.

Table 3.3-1 Site Controlled Zone List

Use this list with Figure 3.3-1 Paducah Control Area Site Map

Location	Zone	Description	Controlled Area	Reason for Control
NW Lot	A	General Area (Open Property)	No	
Propane Storage Area	B	General Area (Open Property)	No	
	B1	Propane Storage Tank (Fenced)	Yes	Hazardous Area
Center Lot	C	General Area (Open Property)	No	
	C1	Propane Delivery Truck (when at filling station)	When Propane Delivery Truck at Filling station	Hazardous Area
NE Lot	D	General Area (Open Property)	No	
	D1	Full Clean Drum Storage	No	
	D2	Full Contaminated Drum Storage	No	
	D3	Empty ST-90 Boxes	No	
SE Lot	E	General Area (Open Property)	No	
	E1	ST-90 Box Storage with processed waste	No	
Processing Lot	F	General Area (Open Property)	No	
	F1	Pad 1, Shredding Tower	Yes	Hazardous Area
	F2	Pad 3, Dust Collection	When removing and replacing filters	Hazardous Area
	F3	Pad 3A, Rotary Dryer, Air Heater, Dryer Inlet Tower	No	
	F4	Pad4, Treated Soil and Metal Collection	Yes	Hazardous Area
	F5	Operations Trailer	Yes	Operational Safety
SW Lot	F	General Area (Open Property with concrete pads)	No	

Figure 3.3-1 Paducah Control Area Site Map

3.3.5 Operation of Control Area Equipment

Only personnel specifically authorized by the administrative procedures of the operations department are permitted to operate control area equipment. When trainees operate said equipment, the operator who normally performs the operations must supervise them.

3.4 Chapter 4 Communication Systems

Audible communications are used to transmit operating and emergency information within the facility. Oral (face-to face), telephone, radio, public address (page) announcements, sound-powered telephones, and special sounds (horns and bells) are examples of audible communications.

Only oral, two-way radios, and vibrating personal pagers will be utilized to communicate with operating personnel during operations.

3.4.1 Emergency Communications Systems

The Operations Manager shall define a personal contact list with persons dedicated to emergency notifications. The current communications systems planned for the Limited Demonstration Facility is oral, two-way radios, and vibrating personal pagers.

In an emergency, effective and rapid communication will be maintained among all elements of the emergency response and control organization and throughout the site. During non-emergency situations, communications will be maintained to efficiently utilize the Vortec operation system.

The PGDP will maintain telephone lines to the Vortec site. These telephone lines will be utilized for operation and for emergency communications.

Plant and operational emergency telephone listings will be posted near all telephones and routinely updated. The PGDP emergency number is 333. Non-emergency communication with the Plant Shift Superintendent (PSS) will be conducted on the 6211 line (441-6211 on a cellular phone).

3.4.1.1 Plant and Local Emergency Signals

Plant and local emergency signals and their descriptions are shown in Table 3-1. All personnel should be familiar with these signals and know the proper action to be taken. Visitors to the site must not be left unattended, and must be easily identifiable during an emergency. Plant personnel will look for visitors during an emergency, and escort them to the proper area.

The Vortec Site Office Trailer will maintain one hand-held air horn and one back-up air horn. As with the Cascade Buildings and local alarms, three blasts from the air horn indicates that immediate communication is necessary and requires that all personnel report to the Vortec office trailer. A single short blast from the air horn does not represent an emergency, but does indicate that communications are necessary and personnel should report to or call the office.

Table 3.4-1. Paducah Gaseous Diffusion Plant Facility and Local Emergency Signals

Signal	Sound	Response
THE ATTACK WARNING	Intermittent 2-second blast of plant horns	This sound means an air attack or tornado is imminent. When you hear this warning, seek shelter in the nearest take-cover area.
THE ALERT SIGNAL	Continuous blast of plant horns	The alert signal means that possible emergency conditions exist. Evacuate the building and follow directions given over the plant public address and radio systems.
THE EMERGENCY RADIATION SIGNAL	Continuous blast of special high-pitched whistle	Upon hearing this sound, rapidly leave the area and report immediately to your designated assembly point.
THE COMMUNITY WARNING SIREN	Continuous wail of off-site sirens	This sound indicates a condition at PGDP may affect both the plant and surrounding community. It currently means to take shelter in place and listen to your Emergency Broadcast System for further instructions.
The information listed below is for information only. No action is required by personnel working at Vortec Corporation's Paducah waste pretreatment and conditioning plant which is outside the PGDP fenced area		
CASCADE BUILDINGS AND LOCAL ALARMS	Three blasts of building horns or howlers	Upon hearing three blasts of horns or howlers, contact or report to your designated control room.
BUILDING EVACUATION C-100, C-360, C-710, AND C-720	Continuous blast of building horns	This sound means evacuate the building and follow instructions of the plant emergency director as given over the plant public address and radio systems.
THE C-720 LOCAL EMERGENCY SQUAD	One 10-second blast of building siren	This sound calls for the assembly of the C-720 local emergency squad.

3.4.1.2 General Emergencies

All emergencies are to be immediately reported to the PGDP's PSS via the fastest route possible. This could be by telephone, by radio, or an emergency call box if one is in the area. Emergency numbers are listed in Table 3-2 and 3-3. All fire, medical, and security emergencies will be reported immediately to the PSS office for emergency response. C-103, DOE Site Office

facility, is the designated safe haven for severe weather hazards. Announcements over the radio of the National Weather Service issuance of a severe weather storm or tornado watch will dictate the need for personnel on the site to immediately evacuate to the safe haven if time and conditions allow. The location and route to this safe haven will be posted in the construction trailer. Other general emergency will have personnel stage in Lot A or Lot B as shown in Figure 3.4-3.

Table 3.4.2 Paducah Plant Emergency Numbers

Contact	Location	Phone No.	Radio Call Sign
PGDP Plant Shift Superintendent	C-300	Emergency: 333 or 334 Non-emergency: 6211	Alpha-one
Ambulance	C-200	Emergency: 333	Alpha-one
Fire	C-200	Emergency: 333	Alpha-one
Guard Shift Personnel	C-200	Emergency: 333 Non-emergency: 6246	Alpha-one

3.4.1.3 Medical Emergencies

If an injury occurs to any person and there is an individual on-site who is trained in First Aid and CPR, then this person will render first responder aid if it is within their capabilities to do so. If the injury is outside their capabilities then the PSS shall be called to coordinate ambulance response. If any injury is life threatening then the PSS shall be called immediately. If the PSS cannot respond immediately, then the PSS will ensure that a local Emergency Response Team with whom a mutual aid agreement exists will provide a response. Injuries or illnesses not requiring immediate medical attention from PGDP should seek medical help from a local physician or hospital. Figure 3.4-2 shows a map showing the route to Lourdes Hospital in Paducah. When time permits, notify the operations manager and the plant supervisor, consideration for the health and safety of the injured employee comes first.

Figure 3.4-1 Vortec Site Location at PGDP

Figure 3.4-2 – Emergency Route to Lourdes Hospital

Figure 3.4-3 – Site Emergency Evacuation Staging

3.4.1.4 Emergency Equipment

A fully stocked first aid kit, in a weatherproof container, will be maintained on site in the Site Operations Trailer. The contents of the first aid kits will be inspected weekly by the Safety and Health Officer (SHO) to ensure that any expended items are replaced. Records will be kept of the weekly inspection. Eyewash stations and/or emergency showers will be provided within the work area where personnel may be exposed to corrosive materials, or when a Material Safety Data Sheet (MSDS) calls for them. The equipment will be maintained in accordance with American National Standard Institute (ANSI) and manufacturer's instructions. Appropriate class and size fire extinguishers, as determined by the SHO, will be located on the job site adjacent to gasoline powered equipment and other appropriate location (e.g. cabs of powered industrial vehicles, refueling stations, welding and cutting locations, etc.). Portable fire extinguishers shall be placed on stands, chained to carts, or mounted on a wall or post. Fire extinguishers will be inspected monthly by the SHO. Current annual and monthly service maintenance tags will be maintained on fire extinguishers.

Table 3.4-3 Paducah Local Area Emergency Numbers

Contact	Phone #
West McCracken County Fire Department	911
Lone Oak Fire Department	911
City of Paducah Fire Department	911
Angel of Mercy Ambulance Service	911
Lourdes Hospital Emergency Room	444-2150
Western Baptist Hospital Emergency Room	575-2180
Kentucky Disaster & Emergency Services (DES)	911
Kentucky State Police, Post 1	444-8228
McCracken County Sheriff's Department	911 or 444-4719
Welborne Baptist Hospital	812-426-8000
Vanderbilt University Hospital	615-322-3211

3.4.2 Public Address System

There is no public address system currently installed in the Limited Demonstration Facility. Procedures for use of the public address system will be defined prior to initiation of the system.

3.4.3 Contacting Operators

Since the operating facility is small in nature, the methods of communicating with operational personnel are by oral, two-way radios, and vibrating personal pagers. When contacting operators, a distinction between routine and emergency notification shall be stated.

3.4.4 Radios

Radios are not permitted in areas where electronic interference with plant equipment might result.

No restrictions for radio use are currently required. The operations manager will assign each radio to operation personnel.

During an emergency, communications will generally occur through two-way radios. A two-way radio will be available at all times at the administration office trailer to call in any emergency situations.

The radio call sign for an emergency is “ALPHA 1.”

The call for help will allow direct communications with the PGDP PSS who is the Plant Emergency Director; the PGDP PSS will be located in the C-300 Building. In addition, the radio will be monitored during all emergency situations within the PGDP and at the Vortec facility.

Vortec operation personnel will utilize hand-held radios, as necessary, for the day-to-day operation of the facility. Plant Shift Superintendent will assign radio call signs on the Maintenance Network. During any Vortec or PGDP emergency, non-emergency communications are not allowed on the radio.

3.4.5 Abbreviations and Acronyms

Only abbreviations and acronyms from Table 3.4-2 are approved for facility communications. The Plant Manager must approve additions to this list.

Table 3.4-2 Abbreviations and Acronyms

Abbreviation /Acronym	Definition
AC	Alternating Current
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ALD	Analytical Laboratory Department
ALRA	As low as reasonably achievable
ANSI	American National Standard Institute
APC	Air Pollution Control
ASME	American Society of Mechanical Engineers
ASTM	American Society for testing Materials
BJC	Bechtel Jacobs Company, LLC
CFR	Code of Federal Regulations
CHO	Chemical Hygiene Officer
COC	Chain of Custody
CPR	Cardiopulmonary Resuscitation
CWA	Clean Water Act
dBA	Decibels Average Weighted
DC	Direct Current
DCC	Design Change Control
DDNO	Danger – Do Not Operate
DES	Disaster & Emergency Services

Table 3.4-2 Abbreviations and Acronyms (Continued)

Abbreviation /Acronym	Definition
DLR	Demonstration Lot Request
DOE	United States Department of Energy
DOT	United States Department of Transportation
E&WM	Environmental and Waste Management
ECR	Engineering Change Request
EM&EF	Environmental Management and Enrichment Facilities
ENGR	Engineer
EPA	Environmental Protection Agency
EPP	Environmental Protection Program
Ft. or ft.	Feet
HASP	Health and Safety Plan
HAZCOM	Hazard Communications
HAZMAT	Hazardous Materials
HEPA	High Efficiency Particulate Air (filter)
Hr. or hr.	Hour
HSC	Vortec Health & Safety Coordinator
IH	Industrial Hygiene
In. or in.	Inches
KPDES	Kentucky Pollution Discharge Elimination System
KV	Kilovolts
M&TE	Measurement & Test Equipment
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
LMES	Lockheed Martin Environmental Services
LMUS	Lockheed Martin Utility Services
LOTO	Lockout/Tagout
MMBTU	Million British Thermal Units
MSDS	Material Safety Data Sheet
NEC	National Electrical Code
NEPA	National Environmental Policy Act
NETL	National Energy Technology Center
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OJT	On-the-Job Training
OM	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSR	Occupational Safety Report
PET	Proficiency Environmental Testing
PCBs	Polychlorinated biphenyls
PGDP	Paducah Gaseous Diffusion Plant
PIP	Performance Improvement Process
PLC	Program Logic Control(ler)
PM	Program Manager
PO	Purchaser Order

Table 3.4-2 Abbreviations and Acronyms (Continued)

Abbreviation /Acronym	Definition
PPE	Personal Protective Equipment
ppm	Parts per million
PR	Purchaser Request
PSS	Paducah Gas Diffusion Plant Shift Superintendent
POM	Plant Operations Manager
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFD	Request for Disposal
SAR	Safety Analysis Report
SE	Safety and Environmental
SHO	Safety Health Officer
SOP	Standard Operation Procedure
SWRV	Surrogate Waste Receipt Verification
VSM	Vortec Site Manager
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
V	Volt
VPDP	Vortec Paducah Demonstration Plant
WBGT	Wet Bulb Globe Temperature
WRV	Waste Receipt Verification

3.4.6 Oral Instructions and Informal Communications

Oral instructions must be clear and concise. The supervisor or person issuing instructions shall ensure the recipient understands the instructions by whatever means necessary. Instructions involving operation of equipment shall be followed with written instructions with a copy filed with the operations manager.

3.5 Chapter 5 Training Procedures

On-shift training is that portion of an operator qualification program where the trainee receives training within the environment and with as much hands-on experience as possible.

3.5.1 Adherence to Training Programs

On-shift training should be conducted in accordance with training programs that specifically identify items the trainees must accomplish on shift. The knowledge items should be defined as well as what the trainee must do. Both the instructor and the trainee should understand what is required for each training item.

3.5.2 On-shift Instructor Qualification

Qualified operators shall conduct on-shift training. This may require the successful completion of appropriate instructor training for on-shift training. The operations manager selects on-shift training instructors. A list of on-shift training instructors will be maintained by the operations manager and made available as required.

3.5.3 Qualified Operator Supervision and Control of Trainees

Whenever trainees operate equipment, a qualified operator serving as an on-shift instructor should observe the trainee to ensure the trainee does not make an error that could adversely impact the facility.

The instructor should always monitor the trainee closely and remain in a position to intervene or assume control if necessary.

When trainees record equipment parameters on official round sheets (as opposed to practice round sheets) or logs, the on-shift instructor should verify that the recorded information is correct. In addition, the trainee and the on-shift instructor should discuss any out-of-specification readings and the consequences of allowing such trend to continue.

3.5.4 Operator Qualification Program Approval

The Operations Manager will approve any operator qualification program. For operating positions requiring certification, qualifications should be based on one-to-one instruction at that station.

3.5.5 Training Documentation

All completed training will be formally documented in writing or with a certificate provided to the trainee and a copy filed with training records. Classroom requirements and written examinations results will be documented and filed with training records.

3.5.6 Suspension of Training

Trainee operation of equipment shall be immediately suspended during anticipated or abnormal events, accident conditions, or whenever operations personnel or the on-shift instructor believes suspension is necessary to ensure safe and reliable facility operation. During abnormal or accident conditions, trainees should provide assistance at the discretion of the qualified operator.

If suspension of training occurs, the shift supervisor shall be notified in writing with the reasons for suspension. The written data will be filed with training records.

3.5.7 Maximum Number of Trainees

The shift supervisor will determine the maximum number of trainees allowed to simultaneously participate in any particular training evolution. A maximum limit for trainee-to-instructor ratio should be considered to permit the most effective instructions to the trainee and ensure that having too many trainees at once does not distract the instructor.

3.6 Chapter 6 Investigation of Abnormal Events

An established and thorough review process will ensure that all significant aspects of an abnormal event are identified, investigated, and resolved. In addition, the investigation of "near miss" situations can identify detrimental conditions that, if left uncorrected, can impact safety and operations.

The plant supervisor has overall responsibility for the event investigation process. However, the shift supervisor may delegate specific investigative tasks to other personnel as appropriate.

Investigator qualifications should be established to ensure competency in technical aspects of operation and investigative techniques. The credibility of the investigation process will depend heavily on the credibility of the event investigators.

Two important products of the event investigation are the identification of the root cause and assignment of corrective action to prevent recurrence.

The abnormal event investigation is needed to thoroughly investigate abnormal events, verify the proper operation of equipment, identify the root cause of events, ensure all necessary notifications are completed, comply with DOE requirements, and ensure appropriate corrective action steps are established to minimize the chance of the event recurring. Operations personnel should recognize this need as well as their obligation to assist in performing thorough investigations.

3.6.1 Events requiring Investigation

Events that occur in the facility and adversely affect operations, personnel safety, or DOE requirements (DOE 5000.3A) should receive a thorough investigation. The following conditions and situations should require an investigation:

- a. Design limits are violated (Tech Specs, Operational Safety Report (OSR), Safety Analysis Report (SAR), or other limits).
- b. Facility system performance is unusual, abnormal or unexplained.
- c. Facility safety conditions are abnormal or unexplained.
- d. Safety or system features are improperly positioned.
- e. Reportability to DOE or other agencies (e.g., EPA) is appropriate.
- f. An unplanned shutdown or significant loss of operation occurs:
- g. A procedural violation or personnel error occurs that caused or could have caused serious personnel injury or equipment damage or could have affected facility safety.
- h. Equipment failure occurs that could affect facility capability or safety.

- i. Radiological or toxic material limits are exceeded or radioactive or toxic material is lost/released.
- j. Actual or attempted sabotage is suspected.
- k. Chemistry or process parameters are out of specification or indicate unexplained trends.
- l. A department head or the facility safety review committee deems an investigation is appropriate.
- m. Loss of Special Nuclear Material.
- n. Repetitive problems occur.

The above list is not intended to be all-inclusive. At the discretion of the operations manager (or other appropriate department head), other specific events should receive a formal investigation.

"Near miss" situations should also receive a formal review at the discretion of the responsible supervisor. It is important to review "near miss" situations to uncover aspects of the situation that, if not identified and corrected, can cause recurrence of the event, possibly with more serious consequences. A "near miss" situation is one in which an inappropriate action occurs (or a necessary action is omitted) but is detected and corrected before an adverse effect on personnel or equipment results.

3.6.2 Investigation Responsibility

The plant supervisor is responsible for event investigations. He/she may delegate specific investigations or portions of investigations to other personnel. Examples of specific tasks of an investigation that may be delegated include gathering necessary records, conducting interviews, recommending restart following an incident, and determining the long-term corrective action to prevent recurrence. However, the overall responsibility for the consistency and thoroughness of event investigations should be the responsibility of the operations manager.

3.6.3 Investigator Qualification

The credibility of the investigative process is highly dependent upon the knowledge and experience of the individuals performing the investigation. It is important that individuals performing an investigation be technically knowledgeable and well respected by the facility staff. Additionally, investigators should not have a bias or a vested interest in the results of the investigation. Investigators should be trained in facility systems and operations and other major disciplines appropriate for the event under investigation. Additionally, investigators should be trained in techniques for conducting an investigation. This can include training in areas such as root-cause determination, diagnostics for plant events, interviewing techniques, and factors affecting human performance.

3.6.4 Information to be Gathered

Sufficient data must be collected to allow the event investigators to perform a reconstruction and analysis of the event. An individual should be assigned responsibility for collecting the required information and assembling the information for review. It is important to collect the necessary

information as soon as possible after the event. This will minimize the possibility of losing information or that observers of the event will be unavailable. Information should be gathered in the following areas:

- a. Initial facility conditions.
- b. Statements of operators and personnel involved in the event (this should be permanently recorded).
- c. Pertinent computed printouts (post-trip log sequence of events) and strip charts.
- d. Pertinent documentation (such as operator logs, radiation work permits, chemistry logs, and radiological surveys) as required establishing conditions prior to and during the event.

As listed above, statements of operators and facility personnel involved in the event should be obtained. This item is particularly useful because personnel observing or participating in an event can provide insights into the facility response during the event and into actions leading up to the event that would not be available from strip charts or other hard-copy data. Methods for collecting this information can vary; however, the event investigation containing relevant information should be permanently recorded for future reference.

When collecting hard copy (such as strip charts), it is important to annotate the data with its source, chart speed (if applicable), and a time mark to aid in coordinating the data during the reconstruction of the event. The collection of data should not interfere with the continued operation of the facility. Temporary interference should occur only if necessary to understand the event.

3.6.5 Event Investigation

Upon completion of the data collection, a structured review of the abnormal event should occur. The format of the investigation will depend upon the significance of the event. Each event investigation should include the following steps, with emphasis placed on each individual step depending upon the severity or potential consequences of the event.

3.6.5.1 Event Reconstruction

The abnormal event should be reconstructed using the collected information. When applicable, this is best accomplished using the sequence of events recorder printout as a basis. If the sequence of events printout is not available (or not applicable) or if the abnormal event was not of sufficient magnitude or nature to impact the sequence of events recorder, then a chronological listing of events should be developed. It is desirable to include the personnel involved in the event in the reconstruction process.

3.6.5.2 Event Analysis and Evaluation

Once the facts of the event have been established, the event should be analyzed to determine the response of equipment and involved personnel. During the analysis, emphasis should be placed on determining the proper response of systems, comparison of actual and expected response,

adequacy of procedures, and factors affecting human performance. When available, the event should be compared with previous event investigations of similar events or transients. During the analysis, a safety evaluation should be performed to ascertain the proper response of equipment and to identify detrimental effects on facility equipment. If the event was a process shutdown, the acceptability of restart may be determined at this time. In some instances, however, root-cause determination (3.6.5.3) and corrective action determination (3.6.5.4) may also be required prior to restart. Supervisors need to be sure no further corrective action is required prior to restart.

3.6.5.3 Root-Cause Determination

The root cause of the event should be determined. The root cause can be defined as those causal factors that, if corrected, would preclude a recurrence of the event.

3.6.5.4 Corrective Action Determination

Appropriate corrective action should be established for each event investigation, and specific personnel should be assigned responsibilities for the corrective action. Corrective action can take the form of procedure changes, training, design modifications, and changes to administrative controls. The operations manager will make the final approval for corrective action.

3.6.6 Investigation Report

An investigative report should be prepared in a timeframe determined by the operations manager. The report should include a description of the event (including pertinent conditions), a discussion of the impact of the event, root cause, the lessons learned, and the proposed corrective action(s). The report should include positive aspects of the event (such as particular effective personnel responses). The investigative report should be approved by the operations manager and reviewed by appropriate supervisors, managers, and the safety review committee.

The lessons learned from an event investigation will be shared with all appropriate personnel who could benefit from the lessons learned. For example, a problem with an operations procedure might also exist in another department's procedures.

3.6.7 Event Training

The operations manager should evaluate in-house events to determine if the event should be included in the training program for operations personnel. In some cases, due to the severity or possible safety consequences of some events, it is appropriate to train shift operations personnel on the event immediately.

3.6.8 Event Trending

Patterns of deficiencies such as operator errors or inadequate procedures should be trended. A periodic summary report of events, causes, and trends should be submitted to shift supervisors, the facility manager, and operations manager. Shift supervisors should ensure training programs include appropriate material from the summary report.

3.6.9 Sabotage

Acts of known or suspected sabotage are a special case of event investigations. If an act of sabotage is discovered or suspected, it is important to begin an investigation immediately and to accomplish the following:

- a. Determine the condition of the affected system(s) and ensure the operability of all safety-related systems;
- b. Decide if continued operation is justified or if systems are available to support safe facility shutdown; and
- c. Minimize the impact of discovered acts of sabotage and deter future acts of sabotage.

3.7 Chapter 7 Notification Procedures

For events that require notification of DOE personnel (and when appropriate, state and local officials), it is essential that information be gathered and transferred in a systematic and controlled method.

3.7.1 Notification Procedures

Patterns of deficiencies such as operator errors or inadequate procedures should be trended. A periodic summary report of events, causes, and trends should be submitted to department heads, the facility manager, and appropriate managers. Department heads should ensure training programs include appropriate material from the summary report.

3.7.2 Notification Responsibility

The operations manager will ensure that all appropriate personnel receive notification when required. Other individuals may accomplish the actual notification of specific individuals or agencies.

3.7.3 Names and Phone Numbers

Names of primary and alternate contacts and current phone numbers and pager codes will be readily available to the person assigned to make the notifications.

3.7.4 Documentation

All notifications will be documented. Fill-in-the-blank forms for different types of situations may be used as a checklist and for providing necessary documentation. A formal record of notifications will be maintained.

3.7.5 Communication Equipment

Adequate communication equipment will be maintained in the main control area to meet the objectives of this section.

3.8 Chapter 8 Control of Equipment and Systems Status

It is imperative that equipment and systems be properly controlled. The operating shift must be aware of how equipment and systems function for operational purposes, and must establish and maintain the proper component, equipment, and system configurations in order to satisfy the design basis and the operational limits,

Control over equipment and system status is established with a formal guidance to ensure that proper configuration is maintained. This guidance includes instructions for system alignments, locking of components, and verification of technical specification compliance prior to plant operating-mode changes, authorization prior to removing or restoring equipment to service, and identification and documentation of equipment deficiencies.

3.8.1 Status Change Authorization and Reporting

The operations manager is responsible for maintaining proper configuration and should authorize status changes to major equipment and systems.

Authorization of status changes to equipment and systems of lesser importance may be delegated by the operations manager to other cognizant shift positions. The plant supervisor should be advised periodically of changes in status of equipment and systems so assigned.

Since the operators must be aware of equipment and system status, the plant supervisor will ensure that all changes in status are communicated to these persons.

Changes in the status of facility equipment and systems will be reported to the governing stations (e.g., control area) or to the individual (or his relief) who authorized the change.

3.8.2 Equipment and System Alignment

Prior to first placing the equipment or system into operation, individual components of facility equipment and systems should be properly aligned or checked for proper alignment. An initial alignment of valves, switches, and breakers establishes a baseline configuration against which further operations may be measured. Once the equipment or system is properly aligned and is operating in accordance with operating procedures, frequent complete alignments of all individual components may not be necessary. Alignment checklists will be used to guide the operator in establishing the correct component positions. The alignment checklists will include provisions for equipment nomenclature that matches the nomenclature placed on the component, a location for individual documentation of the check of each component, the required alignment position for each component, and a location for annotating deviations from the required alignment. The plant supervisor will review and approve completed alignment checklists.

In addition, safety-related equipment and systems will be functionally tested in accordance with surveillance requirements in the technical specifications/operational safety requirements following maintenance and before the equipment or system is considered capable of performing its design function.

Records of equipment and system alignments will be retained for reference by the operating shift.

3.8.3 Equipment Locking and Tagging

Locks and Tags will be used on those components that require special administrative control for safety or other reasons. Locks and Tags provide some security that only authorized facility personnel performing required evolutions in a controlled fashion will operate a component. More detail requirements for Lockout and Tagout are found in Section 3.9.

3.8.4 Operational Limits Compliance

Administrative controls are established to document compliance with requirements of operational limits (limiting conditions for operation). The operations manager will be cognizant of action taken to comply with operational limit requirements and should ensure that the actions taken are appropriate and correct or that they mitigate any adverse consequences to the facility. Logs, status sheets, turnover checklists, or other appropriate documentation will reflect the entry conditions and actions that are taken in response to operational limits requirements. Appropriate operating personnel will be apprised of limiting conditions for operations and actions for which they may be responsible. Responsible personnel will periodically review the limiting conditions for the operation and action statements in effect to ensure that the required actions are met.

3.8.5 Equipment Deficiency Identification and Documentation

Equipment deficiencies will be noted by facility operating personnel and identified in the work control system for correction. Equipment problems will be identified with unique deficiency tags or other appropriate means to ensure deficiencies are communicated to personnel responsible for monitoring and operating the equipment.

3.8.6 Work Authorization and Documentation

The operations manager or his/her designee will authorize all shift activities (including maintenance) on equipment that is important to safety that affect operations, or that change control indications or alarms. This authorization shall be in writing on the document controlling the work. Documentation of the status of work in progress will be available in the control area for review by operating personnel.

3.8.7 Equipment Post-Maintenance Testing and Return to Service

Equipment will be tested following maintenance to demonstrate that it is capable of performing its intended function. The testing will include performance of all functions that may have been affected by the maintenance. The testing will also verify that the maintenance performed served to correct the original problem and that no new problems were introduced. Any testing following maintenance will be specified on the maintenance work order or accompanying documentation. The operations manager will ensure that testing appropriately proves equipment operability.

3.8.8 Alarm Status

The status of control panel and/or local panel alarms will be readily available to appropriate operating personnel. Information that will be available includes alarms that are totally disabled, alarms with individual inputs disabled, alarms with temporarily changed set points, alarms that

are normally lighted during power operation, and multiple input alarms that do not reflash when more than one input is activated.

Appropriate actions will be taken to monitor equipment parameters for abnormal conditions that would be masked by deficient or non-reflashing alarms.

3.8.9 Temporary Modification Control

Administrative control systems are to be established for installation of temporary modifications such as electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators/alarms, mechanical jumpers/bypasses, temporary set point changes, installed or removed block flanges, disabled relief or safety valves, installed or removed filters or strainers, plugged floor drains, and temporary pipe supports. Prior to modification, administrative controls will provide for communicating the installation of temporary modifications to the design authority to allow for technical oversight, an evaluation of the impact on current design activities, and approval of the design modification. These control systems have provisions for safety reviews, installation approval, independent verification of correct installation and removal, documentation of the modification, update of operating procedures and documents, training, marking of installed modifications, and periodic audits of outstanding modifications.

3.8.10 Distribution and Control of Equipment and System Documents

Vortec Corporation's procedure for change control has been established to ensure that the operations personnel receive and utilize the latest revisions of engineering drawings and specifications. Operations personnel will be made aware of all changes to these documents. The document distribution includes all operations related activities such as procedures review groups, maintenance groups, facility safety analysis groups, and testing groups.

3.9 Chapter 9 Lockouts and Tagouts

Lockout is the application of a lock or a control to render a device inoperable. Tagout includes the placement of a Tagout device on an energy-isolating device to indicate that the energy-operating device and the equipment being controlled may not be operated until the Tagout device is removed. Appropriate control over Lockout/Tagout preparation, approval, placement, and removal is consistent with the requirements of 29 CFR 1910. Current Lockout/Tagout procedures are provided in Appendix J.

3.9.1 Lockout/Tagout Use

Locks and Tags will be placed on controls for safety or other special administrative reasons. Lockout is the application of a lock on a control to render the control inoperative. Locks may be built into the switch or be external locks (e.g. padlocks) that will be affixed and or removed when necessary. The operations manager controls keys and/or combinations for Locks. Other devices (such as wiring a control inoperable, placing control defeating devices, etc.) may also constitute a lesser degree of Lockout. Tagout is the application of a danger or warning device on the control, which indicates that the control is not to be used except under conditions indicated by the tag. Tags will be placed on the control that is tagged out, or as close as possible to indicate clearly the condition.

3.9.2 Lockout/Tagout Implementation

- a. If a device (e.g., for energy or toxic material isolation) has the capability of being locked out, it should be locked out.
- b. If the isolating device cannot be locked out, it will be tagged out.
- c. New equipment design and major modifications to existing equipment should be designed to provide the capability of being locked out.
- d. The following administrative guidance is an example that could be established to outline acceptable controls over locked components:
 - (1) A list of components that are required to be locked will be established and approved by the operations manager or appropriate manager. The list will be separate from the standard alignment checklists.
 - (2) Criteria for locking of additional components and necessary authorizations should be provided.
 - (3) When key operated locks are used, access to the keys will be restricted to authorized personnel. Keys should be readily available to appropriate personnel.
 - (4) Specific techniques for verifying the position of locked components will be established. A hands-on physical check of critical equipment or the observation of a reliable position indicator will be used whenever possible.
 - (5) When locked components must be unlocked or placed in a position other than the normal locked position, the deviation should be authorized and documented.
 - (6) Periodic checks of locked components will be performed to ensure that locking devices are properly attached and that the component is in the required position.

3.9.3 Protective Materials and Hardware

- a. Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware should be provided for isolating, securing, or blocking machines or equipment from energy sources.
- b. Lockout and Tagout devices will be singularly identified (i.e., will be the only devices used for controlling energy and not used for other purposes) and meet the following requirements:
 - (1) Durable
 - Will be capable of withstanding the environment to which they are exposed for the maximum period of time for exposure is expected,
 - Will be constructed to minimize deterioration of the tag or the message when exposed to weather conditions,

- Will not deteriorate when used in corrosive environments where acid and/or alkali chemicals are handled and/or stored.
- (2) Lockout and Tagout devices will be standardized within the facility in at least one of the following criteria: color, shape, or size. In addition, Tagout devices will utilize standardize print and format.
- (3) Substantial
 - Lockout devices will be substantial enough to prevent removal, without the use of excessive force or unusual techniques, such as the use of bolt cutters or other metal cutting tools.
 - When used as the sole means of preventing operation of an energy isolating device, Tagout devices, including their means of attachment, shall, in addition to other requirements for their use, be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.
 - Tagout device attachment means should be of a non-reusable type, attachable by hand, self locking, and non-releasable.
- (4) Identifiable

Tagout/Lockout devices will indicate the identity of the personnel and the organization applying the device.
- (5) Warning

Tagout devices will warn against hazardous conditions if the machine or equipment is energized and will include a legend such as the following: Do Not Start, Do Not Open; Do Not Close; Do Not Energize; Do Not Operate.

3.9.4 Lockout/Tagout Program

A Lockout/Tagout program will be established consisting of procedures to control potentially hazardous energy and materials and personnel training. This program will ensure that potentially hazardous energy or toxic material sources are isolated and rendered inoperative during servicing or maintenance or in any case where unexpected energizing, startup, or release of stored energy or toxic material can cause injury.

3.9.5 Procedures for Lockout/Tagout

Procedures will be developed, documented, validated, and utilized for control of potentially hazardous energy or material. Procedures will clearly and specifically state the scope, purpose, authorization, rules, and techniques of the Lockout/Tagout program.

- a. Procedures will include, but not be limited to, the following:
 - (1) Specific statement of intent of use;
 - (2) Specific procedural steps for isolating, blocking and securing machines or equipment for hazardous energy or material;
 - (3) Specific procedural steps for the placement, removal, and transfer of the Lockout/Tagout device(s); and
 - (4) Specific requirements to test machines and to determine and verify the effectiveness of Lockout, Tagout or other control measures.
- b. It is not necessary to document the required procedure for a particular machine or equipment when all of the following elements exist.
 - (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shutdown that could endanger personnel.
 - (2) The machine or equipment has a single energy source that can be readily identified and isolated.
 - (3) The isolation and locking out of that energy source will completely de-energize and de-activate the machine or equipment.
 - (4) The machine or equipment is isolated from that energy source and locked out during servicing or maintenance.
 - (5) A single lockout device will achieve a locked out condition.
 - (6) The lockout device is under the exclusive control of the authorized personnel performing servicing of maintenance.
 - (7) The servicing or maintenance does not create hazards to other personnel.
 - (8) The employer, in utilizing the exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.
- c. Documentation of Lockout/Tagout placement, activation and removal will be recorded including any information relevant to their occurrence. This record should be maintained by the plant supervisor or operations manager to ensure accuracy and completeness. Operations and maintenance personnel will review the Lockout/Tagout record periodically as guidance.

3.9.6 Application of Lockout/Tagout

The established procedure for the application of energy control (implementing Lockout/Tagout) will cover the elements and actions in the following sequence:

a. Preparation for Shutdown

Before a machine is turned off, personnel should be informed of the type and magnitude of the energy, the hazards and the methods of control.

b. Machine or Equipment Shutdown

The equipment will be shut down using the procedures required by this chapter. An orderly shutdown should be utilized to avoid any added hazard.

c. Equipment Isolation

All Lockout/Tagout devices needed for control are physically located and operated in such a manner as to isolate the equipment from the energy source.

d. Affixing Locks/Tags

Lockout or Tagout devices will be affixed to each isolation device by qualified personnel in a manner that will hold the devices in a "safe" or "off" position or clearly indicate that operation of the device is prohibited.

e. Stored Energy

Upon application of Lockout or Tagout devices, all potentially hazardous stored or residual energy should be relieved, disconnected, restrained, or otherwise rendered safe. If stored energy might re-accumulate to a hazardous level, verification of isolation will be continued until the servicing or maintenance is completed.

f. Verification of Installation

Prior to starting work on equipment that has been locked or tagged out, personnel will verify that isolation and de-energization have been accomplished.

g. Release from Lockout/Tagout

Before Lockout or Tagout devices are removed and energy restored to the equipment, procedures will be followed and actions taken by personnel to ensure the following:

- (1) Equipment/workspace. The machine or equipment is operationally intact. The area has been inspected to ensure that nonessential items have been removed. The individual authorizing tag removal should specify the final component position and, when appropriate, the sequence in which components should be positioned. In addition, the need to check the positioning of other components that were not locked, or tagged, but are related to the operation of the Lockout/Tagout component, should be determined at this time and appropriate instructions should be developed. These checks should be done when necessary to ensure that components within the Locked/Tagout boundaries are correctly aligned to support operation.

- (2) Personnel. The workspace will be checked to ensure that all personnel have been positioned safely or removed from the area. Before Lockout/Tagout devices are removed and equipment energized, affected personnel will be notified that equipment will be energized.
- (3) Lockout/Tagout Device Removal. The person who applied the device will remove each Lockout/Tagout device from each energy-isolating device. He/she will reposition the components in the sequence specified and check the positioning as deemed necessary. The removal of Locks or Tags will be documented. Tags will be returned to the operations manager or authorizing manager. The supervisor/manager will be satisfied that all tags and safety devices associated with this Lockout/Tagout are removed and are accountable.

When the person who applied the Lockout/Tagout device is not available to remove it, that device may be removed under the direction of the appropriate supervisor/manager, provided that specific procedures and training for such removal have been developed and incorporated into the facility program. The supervisor should demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized personnel who applied it. The specific procedure should include the following elements:

- Verification by the supervisor/manager that the person who applied the device is not available.
- Assurance that all reasonable efforts are made to inform him/her that the device has been removed.
- Ensuring that all relevant personnel have this knowledge before he/she resumes work at the facility.

3.9.7 Testing or Positioning of Equipment or Components

Temporary removal of Lockout/Tagout devices are be discouraged. However, in situations where Lockout/Tagout devices must be temporarily removed and the equipment energized, the following sequence of operations will be followed:

1. Clear the equipment of tools and materials.
2. Remove personnel from the equipment area.
3. Remove the Lockout/Tagout device as procedures indicate.
4. Energize and proceed with testing or positioning.
5. De-energize all systems and reapply the lockout/tagout.

3.9.8 Periodic Inspections

Periodic inspections will be conducted by authorized personnel, supervisor, or appropriate manager, to determine whether procedures are being followed and to correct any deviations or inadequacies observed. Inspections will include a review of the responsibilities of personnel and supervisors. The supervisor or appropriate manager will certify that the periodic inspections have been performed, documenting the equipment and procedures involved, dates of inspection, personnel participating in the inspections, and personnel performing the inspections.

3.9.9 Caution Tags

Caution tags will not be used for personnel protection (i.e., caution tags will not be used where it is appropriate to use a Lockout or Tagout device). Administration of caution tags could, however, be accomplished as part of the Lockout/Tagout program. The use of caution tags is restricted to those situations in which a component or system is functional, but when some precaution or item(s) of information is necessary prior to operation. In addition, the following elements will be followed:

- a. Caution tags will be uniquely identifiable and different in appearance from other station tags. The following information will be included on the tags as an aid in administering the program:
 - (1) Caution tag number;
 - (2) Component name and number;
 - (3) Effective date;
 - (4) Precaution or information applicable to the particular situation and/or component or system; and
 - (5) Signature of authorizing individual and organization.
- b. Situations that require special operator or maintenance precautions or amplifying information will be brought to the attention of the plant supervisor or operations manager. The supervisor or operations manager will ensure that issuing a caution tag is necessary and that the tag is not being used in place of more appropriate administrative action (such as a temporary procedure change, placing an operator aide, use of the work control system, or issuance of a safety Lockout or Tagout). The supervisor review will also ensure that any instruction contained in the caution tag does not deviate from established facility procedures, technical specifications, or OSR's.
- c. A record of all active caution tags and associated amplifying information will be available to the appropriate personnel. Qualified personnel will review this record and associated tags periodically. This review will verify the continued need and applicability for each caution tag and ensure that the caution tag index accurately reflects all active caution tags. This review will be documented. Any caution tags remaining in an active status for extended periods (e.g., longer than three months, as appropriate) will be brought to the attention of the

plant supervisor or operations manager. The plant supervisor or operations manager will determine what action is needed to resolve the continued use of the caution tag.

- d. Caution tags will be placed in such a way that they do not interfere with or obscure indications, switches, or other control devices but are readily apparent to an individual prior to the operation of the tagged device. Placement of caution tags will be documented.

3.9.10 Training and Communication

- a. Training will be provided and documented to ensure that all personnel understand the purpose and function of the Lockout/Tagout program and that they have the knowledge and skills required for safe application, use, and removal of Lockouts and Tagouts. Training will include the following:
 - (1) Recognition of applicable hazardous energy sources, type and magnitude of energy or materials involved, and methods to isolate and control.
 - (2) Personnel involved will be instructed in the purpose and use of the Lockout/Tagout procedures.
 - (3) All personnel who may enter the area will be trained to recognize the Lockout/Tagout and to understand the procedure and prohibition relating to attempts to restart or re-energize machines or equipment.
- b. Personnel will be trained regarding limitations of tags, specifically the following:
 - (1) Tags are essentially warning devices and do not provide physical restraint on those devices as are provided by a lock.
 - (2) When a Tag is attached, it is not to be removed without authorization of the person responsible for it; it should not be bypassed, ignored, or otherwise defeated.
 - (3) Tags must be legible and understandable by all personnel.
 - (4) Tags and their means of attachment should be able to withstand the environmental conditions encountered in the workplace.
 - (5) Tags may evoke a false sense of security and their meaning needs to be understood.
 - (6) Tags must be securely attached so they cannot be inadvertently or accidentally detached during use.
- c. Personnel will be trained regarding limitations of Locks, especially concerning the following:
 - (1) Operation of the facility may be hindered.

- (2) Locks and chains installed on small instrument line isolation valves can contribute to seismic loading and may not have been considered during safety analysis.

d. Retraining

Retraining will be provided for all authorized or affected personnel whenever there is a change in job, procedures, machines, equipment or processes that presents new hazards or whenever periodic inspection determines it is needed.

3.9.11 Lockout/Tagout Implementation

Lockout or Tagout will be accomplished by authorized, qualified personnel only.

3.9.12 Notification of Personnel

A supervisor or operations manager will notify affected personnel of the application and removal of Lockout/Tagout devices. Notification will be given before the devices are applied and after they are removed.

3.9.13 Outside Contractors

Whenever outside servicing personnel are to be engaged in activities covered by the scope of the Lockout/Tagout program, the facility and the outside contractor will be instructed to inform each other of their respective Lockout/Tagout procedures and should ensure that their personnel are aware of the changes.

3.9.14 Group Lockouts or Tagouts

When a crew performs servicing or maintenance, they will utilize an equivalent procedure that provides for safety as provided by the personal Lockout or Tagout device.

3.9.15 Shift or Personnel Changes

Specific communication will be utilized during shift or personnel changes to ensure the continuity of Lockout or Tagout protection, including provision for the orderly transfer of Lockout or Tagout devices between personnel or shifts.

3.10 Chapter 10 Independent Verification

Independent verification is the act of checking that a given operation conforms to established operational criteria, as well as checking a component's position independently of activities related to establishing the component's position.

Because the possibility of mispositioning may be quite remote, or because the effect of a mispositioning may not be significant to safe and reliable operation, not all components require independent verification.

Independent verification recognizes the human element of component operation; that is, an operator, no matter how proficient, can make a mistake.

Independent verification at the Vortec demonstration site will provide a high degree of reliability in ensuring the correct and safe operation of the system. Independent verification is defined as the act of checking that any given operation within the production facility along with associated components, equipment and instrumentation conforms to the established criteria and procedures. All valves, switches, and circuit breakers must be set in the proper positions to maintain operational safety. The Site Manager, with input from the operators and engineers, will establish when the project's independent verifications will take place.

3.10.1 Components Requiring Independent Verification

The Plant Manager will direct independent verifications that are critical to the operation of the facility. At the discretion of the Plant Manager, personnel assigned to specific plant operations may conduct independent verification of the equipment skid or process of concern. Examples of when independent verification will take place include the following:

- When the equipment has been returned to service following testing and routine and non-routine maintenance,
- When equipment has been removed from service or replaced,
- When the system is beginning start-up or shutdown,
- When the system begins treatment of a different waste material, and
- After any unusual upset or disturbance in the system.

3.10.1.1 Safety-Related Systems

All components in systems that have safety-related functions should be considered for independent verification. However, if the following criteria have been met, some components might not need independent verification:

- (1) Mispositioning would not affect system performance.
- (2) The mispositioning would be known immediately to an operator.
- (3) Significant radiation exposure would be received by the person(s) performing the independent verification.

The operations manager will approve variances from independent verification requirements in accordance with the above criteria.

3.10.1.2 Systems Not Related to Safety

Independent verifications should be performed for certain components that are not related to safety which, if mispositioned, could lead to unplanned shutdowns, challenges to safety systems, or (through interfaces with safety-related systems) cause radioactive or toxic material release.

3.10.2 Occasions Requiring Independent Verification

Components will receive independent verification when the equipment they serve must be available and when a reasonable possibility exists that the components might have been mispositioned. The following guidelines describe situations where independent verification would be appropriate:

3.10.2.1 Returning Equipment to Service Following Maintenance or Testing

Independent verifications will be performed to ensure that systems are properly aligned when equipment is returned to service. After maintenance activities, it is appropriate to verify independently the positions of components that have been tagged to establish an isolation boundary for the work. Also, additional components that could have been mispositioned during maintenance should be selected for verification on a case-by-case basis by the individual authorizing equipment for return to service.

Such additional items requiring verification would include any component(s) that had been worked on and might also include instrument stop valves, bypass valves, switches, and isolation valves located within the work boundary. Selected components should be independently verified during, or after, surveillance tests. Surveillance tests are normally performed in strict adherence to detailed procedures that specifically address each operating component. Components not addressed by the test procedure would not be likely to be mispositioned as a result of tests, and independent verification would be necessary only for components that had been positioned during tests.

3.10.2.2 Removing Equipment from Service

To ensure that only the specific items of equipment intended to be removed from service are affected by Tagouts, independent verifications will be performed when equipment is removed from service.

3.10.2.3 System Lineups

During extended shutdowns, it is often impractical to completely restore systems to their normal operating alignment immediately after maintenance is completed. Therefore, restoration of systems not needed for shutdown activities until shortly before startup can be delayed to an appropriate time. At that time, all systems whose status is questionable will be checked.

3.10.2.4 Periodic Checks During Facility Operation

In order to verify that all associated equipment is fully functional, routine, periodic verifications of certain critical components may be accomplished during normal operations. Since this check is independent from any activity that might have caused a component to be mispositioned, it can be considered an independent verification.

3.10.3 Verification Techniques

Operators should be trained in the appropriate techniques for verifying the positions of all facility components. In addition, a reference document should be provided explaining what an operator should do when verifying a component position. Because of the large variety of components in use in DOE facilities, it is not feasible to provide specific instructions for verification of individual component positions without facility-specific knowledge. Each facility should use its most experienced personnel to develop these instructions, using applicable manufacturer's recommendations where available. The instructions should describe the techniques for verifying manual valves, motor- and air-operated valves, solenoid-operated valves, circuit breakers, blank flanges, removable links and fuses, and the availability of control power. These instructions will help to ensure that operator's use approved methods when verifying component positions and will help provide uniformity in operator performance. The following general guidelines apply to component verification techniques:

3.10.3.1 Independence

Independent verifications will be conducted in a manner such that each check constitutes an actual identification of the component and a determination of both its required and actual positions. To be independent, the integrity of the checks must be maintained by minimizing interaction between the personnel operating components and those performing the independent verifications.

3.10.2.2 Remote Position Indicators

Independent verification should be performed locally unless ALARA or other overriding factors preclude it.

3.10.2.3 Process Parameters

The observation of process parameters, combined with a physical check of a component's position, can constitute an independent verification. However, care must be exercised when using process parameters because alternate flow paths or other factors could cause them to be misleading indicators of component position. Process parameters normally should not be used as the only indication of a component's position. Facility procedures will specify where and when process parameters are acceptable indicators of component position.

3.10.2.4 Throttle Valves

Position indicators, scribe marks, or other officially recognized and designated indicators will be used to determine throttle valve positions.

3.10.2.5 Surveillance Testing

In some cases, surveillance testing may be substituted for normal verification techniques. Surveillance testing will not be used as independent verification, unless it can be shown that the test conclusively proves the position of the components in question. The operations manager will approve the applicability of surveillance testing to satisfy independent verification requirements beforehand.

3.10.2.6 Operations Self-Appraisal and Verification

Programmatic operations appraisals will be independently conducted and/or verified to ensure that environment, safety, and health considerations, and operations functions (such as training) are being conducted in accordance with established operational criteria.

3.11 Chapter 11 Logkeeping

Operation logs are established for all key-operating positions in order to record fully the data necessary to provide an accurate history of facility operations. Operators will record events in a timely fashion in order to ensure the accuracy of the entry. This includes documentation of actions taken, activities completed, transfer of information among operators, and data necessary for event reconstruction.

3.11.1 Establishment of Operating Logs

The Site Manager will establish narrative logbooks for all key positions. As a minimum, the operations supervisor will maintain a narrative log. For those shift positions that are manned on a part-time basis (e.g., radwaste operator, makeup plant, etc.) a log will be established to ensure that pertinent information is passed from operator to operator.

3.11.2 Timeliness of Recordings

Information will be promptly recorded in the logs. Delaying the recording of activities or events often leads to incomplete or inaccurate entries.

3.11.3 Information to be Recorded

The operations manager will provide written guidance to define thoroughly the type and scope of entries for each log and the format for making entries. The following information will be recorded in at least one station log, although any one log might not contain all these items:

- a. Facility mode or condition changes (e.g., shutdown, operations, run, startup, refueling, etc.);
- b. Abnormal facility configurations;
- c. Status changes to safety-related and other major facility equipment;
- d. Occurrence of any reportable events;

- e. Initiation and completion of surveillance tests;
- f. Entering and exiting operational limit actions;
- g. Security incidents;
- h. Out-of-specification chemistry or process results; and
- i. Shift reliefs.

To aid in event reconstruction, as much significant information as possible should be logged during emergencies and abnormal or unexpected events. However, log keeping should not take precedence over controlling and monitoring the facility.

3.11.4 Legibility

Log entries will be made in a manner such that they can be easily read and understood. Additionally, the log entries should be readily reproducible with standard photocopy machines. For these reasons, black, waterproof ink is recommended.

3.11.5 Corrections

A standardized method for correcting any erroneous entries will be established. The method chosen will not obscure the incorrect entry. Log entries shall not be erased or covered up. Corrections can be made by placing a single line through the incorrect entry and writing the correct entry in a nearby space. All corrections should be initialed and dated.

3.11.6 Log Review

The operations manager will review control area logs periodically, and the control area operator or the plant supervisor will review logs kept by operators outside the control area. These reviews should ensure that entries are accurate and adequate.

3.11.7 Care and Keeping of Logs

Management will provide written guidance on the disposition of completed logs. This guidance will address the following:

- a. Making the logs available for operators who return after periods of absence from their regular duties;
- b. Storing the completed logs to ensure preservation for the expected life of the facility; and
- c. Retrieving stored logs should this become necessary

3.12 Chapter 12 Operations Changeover

Shift changeover is a critical part of facility operation. Personnel should not assume operational duties unless they are physically and mentally fit to do so and until they and the off-going personnel have a high degree of confidence that an appropriate information transfer has taken place. (The Ltd Demo test will operate with only one shift per day)

Shift changeovers are guided by a checklist in Appendix L and a thorough review of appropriate documents describing important aspects of the facility status and inspection of appropriate facility instrumentation, followed by a discussion between off-going and oncoming operators.

Operation shift turnovers will provide oncoming operators and other Vortec personnel with an accurate picture of the facility status. The objective of this section is to provide guidance for the shift turnover process for all personnel performing a critical shift position responsibility. A critical position is one that requires the proper transfer of information to protect against system failure or personnel injury.

3.12.1 Turnover Checklists

On-coming shift personnel will review the system's current status through a briefing from the off-going shift personnel. This verbal briefing, which will include a review of the checklist to ensure that there are no misunderstandings or miscommunications. If appropriate, the review may include daily logbook(s), maintenance check sheets, and any other information that is pertinent to the safe and effective operation of the facility during the next shift. Operators will focus on operation problems encountered when reviewing documentation. Therefore, it is imperative that all records are complete, legible, and accurately represent the status of the facility. If required, on-coming and off-going personnel will walkdown the work area at the beginning of each shift. Discussion and observations of the facility status may include, but are not limited to, the following:

- Equipment condition;
- Flow process equipment on/off status;
- Electrical switching arrangements;
- Maintenance conducted;
- Welding, brazing, and cutting;
- Operational status of subsystems;
- Radiological work permits issued;
- Lockout/tagout permits issued;
- Confined space permits issued;
- Safety issues;

- General announcements;
- PLC panel status;
- Problems and unusual occurrences; and
- Unusual readings or trends in gauge readings such as pressure, temperature, etc.

3.12.2 Document Review

Oncoming operators and supervisors will review documents specified on their checklists prior to assuming responsibility for their shift position. Document review should be as intensive as necessary for the oncoming personnel to understand important history, present status, and planned events. Normally, narrative log entries for the previous 24-hour period or since his/her last shift should be reviewed. Status logs should be reviewed so that the operator and supervisors are familiar with all currently active entries, with an emphasis on what has changed since he/she last had the shift.

3.12.3 Control Panel Walkdown

Each shift operator will conduct walkdowns of appropriate control panels. The purpose of a panel walkdown is to determine plant status through observation of system lineups, switch positions, lighted annunciators, chart recorders, and status lights. Oncoming plant supervisors will walk down the main control panels before, during, or shortly after shift turnover. Oncoming and off-going control area operators should walk down their unit's main control panel together. Equipment operators will review all pertinent local control panels, (e.g., fuel supplies, lubrication levels, makeup water treatment, and ventilation) during their tour early in the shift.

3.12.4 Discussion and Exchange of Responsibility

Off-going operating personnel will not leave the work area until the on-coming crew is fully aware of the existing production conditions. If there are no on-coming or off-going personnel, the facilities' conditions will be fully documented before operation ceases or commences.

3.12.5 Shift Crew Briefing

The Site Manager or designee will be responsible for conducting shift change briefings. The briefing may coincide with the daily site safety meetings. All occurrences that have transpired since the present shift will be discussed. The briefing will include a review of the status, problems with equipment, and evolutions in progress or planned during the shift. In addition to shift operators, personnel from support groups (e.g., contractors, vendors, and test groups) will also attend briefings when their activities can directly affect operations. This provides for a better understanding of shift priorities and objectives among operations and support personnel.

3.12.6 Relief's Occurring During the Shift

Relief's occurring during the shift (e.g., exchange of control supervisory function) will have a turnover to ensure that the oncoming person is at least as knowledgeable of the conditions as

he/she would have been had a complete shift turnover process been conducted. For example, control panel walkdowns and log reviews may or may not be necessary, depending on the on-coming person's familiarity with the current conditions.

3.13 Chapter 13 Timely Orders to Operators

The changing needs and requirements of operations necessitate that information disseminate to operations personnel in a timely manner. To insure information is current, periodic reviews to remove outdated information are required.

All personnel are expected to provide any concerns regarding operations in a reasonable amount of time. It is the responsibility of the Site Manager to ensure that all applicable special information is provided to operations personnel. Special information may include administrative direction, new or revised operator aids or memoranda, changes in treatment processes, and revisions in data collection requirements. The Site Manager will be responsible for ensuring that the information is current, posted, and undergoes periodic review to ensure its accuracy.

Operations personnel will be trained to correctly interpret the operation process. If required, personnel will be capable of taking immediate action to correct operational problems. When corrective action is not needed immediately, personnel will take reasonable action to consult with the Operations manager and the Site Manager for assistance before implementing corrections or revisions to the operation process.

Timely notification of problems or events of concern should be exercised in a common-sense manner. Operations personnel will follow the chain of command and document events in the logbook.

3.13.1 Content and Format

Information such as special operations, administrative directions, special data-collection requirements, plotting process parameters, and other similar short-term matters can be included in operator orders. Examples of orders could include instructions on the need for and performance of specific evolutions or tests; it could also include work priorities, announcements of policy information, and administrative information. Orders will be clearly written, dated, and maintained in the control room. Information and policies intended as permanent will be incorporated into appropriate administrative procedures. The operator orders program will not be used to change operating procedures, because a procedure user might miss the changes noted in the operator orders. Additionally, operator orders may not receive the approval appropriate for a procedural change. Therefore, information intended to supplement operating procedures will be promptly incorporated into the appropriate procedure.

3.13.2 Issuing, Segregating, and Reviewing Orders

Operator orders will be issued by the operations supervisor or his/her designee whenever necessary to communicate instructions to the shift personnel. Shift personnel will segregate

operator orders into daily and long-term orders in order to facilitate review. Daily orders that are postponed or prolonged should have daily review or updates. Reviews of long-term orders may not be required on a daily basis but will be made periodically and when changes occur. Appropriate operations personnel should review the orders early in the shift and document their review by initialing the log or notebook.

3.13.3 Removal of Orders

Orders that are no longer applicable or are outdated will be promptly removed or cancelled. The operations supervisor will periodically review the operator orders to ensure that only applicable and current orders remain effective.

3.14 Chapter 14 Equipment and Piping Labeling

A good labeling program, understood and maintained by operating and maintenance personnel, enhances training effectiveness and reduces operator and maintenance error due to mislabeling.

Because equipment labels may be continually misplaced or damaged, an ongoing effective labeling program is required.

3.14.1 Components Requiring Labeling

The following components will be labeled:

- a. Valves;
- b. Major equipment (e.g., tanks, pumps, and compressors);
- c. Switches;
- d. Circuit breakers (4.16KV, 480V, 120VAC/DC, etc.);
- e. Fuse blocks or fuse locations;
- f. Instruments and gauges;
- g. Busses and motor control centers;
- h. Cabinets (including internal components such as relays, terminals, etc.);
- i. Room doors;
- j. Emergency equipment (such as fire alarm stations, sound powered headsets, etc.); and
- k. Fire protection systems.

3.14.2 Label Information

Information on labels will be consistent with the information found in facility procedures, valve lineup sheets, and piping and instrument diagrams. Abbreviations and nomenclature used will be standardized and should be understood by facility personnel. Labels will be permanent, securely attached, and have distinguishable, easy-to-read information. Each component label will list a unique component number. The accompanying component noun name or description and power supply, if applicable, will also be provided. Labels may be color coded for unit, system, and/or train designation. If color-coding is used, the colors will be applied consistently and have only one meaning per color or combination. Piping will be labeled to indicate the fluid contained and the normal flow direction. OSHA color-coding for pipes will be used, and pipes containing potentially radioactive fluids, toxic fluids, or explosive gases will be uniquely marked. Labels will be made from materials that are compatible with their particular application.

3.14.3 Label Placement

Labels will be placed on or as near as practicable to the equipment to be labeled. The label will be oriented in a manner that is easy to read and so that the correct component is easy to identify. For example, labels for switches, indications, and breakers on control or power panels should be placed closer to the identified component than any other component so that the label clearly identifies the correct component. Label placement should not interfere with equipment operation or obscure indicators.

3.14.4 Replacing Labels

a. Identifying Lost or Damaged Labels

Procedures will be established to ensure that misplaced or damaged labels are replaced. Since labels are often missing after maintenance, the post-maintenance test could require a check to ensure that the appropriate labels are attached. Operators should also look for missing or damaged labels during their normal tours and during other routine activities. They should become especially observant for situations where a black marking pen has been used for labeling (and then sometimes crossed out and re-labeled) and should replace these informal labels with the proper labels.

b. Providing New Labels

A labeling machine is available for producing labels. The machine and its stock are located at the Site Office Trailer. Operators may make labels on their own, or operators fill out a request forms and forward them to the Site Office trailer to have labels made. In either case, a temporary label should be attached to the component until the replacement label can be made. The replacement label must be approved by the operations manager (or higher authority). The attachment of temporary and/or replacement labels to correct components will be verified.

3.15 Chapter 15 Operating and Maintenance Plan

3.15.1 Initial Start-up Procedures (Shakedown)

This section includes a summary of procedures for start-up, control, and familiarization of the Vortec waste pretreatment and conditioning system demonstration during the system shakedown period. The following items will be completed prior to beginning operation:

- Install all mechanical and electrical systems;
- Test and check instrumentation for proper operation and installation;
- Perform complete system review, including hydrostatic testing of the pipelines, tanks, vessels, and operating equipment;
- Start up and successfully operate the demonstration facility equipment and systems;
- Complete all system performance testing and verification that the treatment system gauges, valves and controls as well as all other auxiliary equipment are calibrated and in proper operation;

- Conduct technical and formal training to ensure that the facility personnel fully understand proper operation and maintenance of all equipment and systems.

Additional items which must be checked during start-up and shakedown include, but are not limited to, the following:

- Piping to ensure that there are no gaps, cracks, or leaks;
- All rotating equipment to ensure that it is rotating in the proper direction;
- All couplings to ensure proper alignment;
- All guards and other personnel protection devices to ensure that they are in-place; and
- All seal systems to ensure that the flush systems are operational.

In many cases, detailed information on start-up can be found in the equipment Operation and Maintenance Manuals that vendors provide and are filed at the site office trailer.

3.15.1.1 Start-up and Shakedown Objectives

The overall objective of the system shakedown period is to ensure

- That all equipment and systems operate as designed;
- That the equipment gauges are checked, calibrated and adjusted prior to initial start-up of the facilities; and
- Responsible operations personnel are trained on equipment operation and maintenance.

The general equipment contractors may be present during this period to make necessary equipment repairs and system adjustments as well as meet any warranty or service agreements or requirements provided as part of the equipment purchase.

3.15.1.2 Pre-Start-Up Checks

Operations personnel who conduct the system inspections will be trained in, and familiar with, plant operations, maintenance, and health and safety procedures (such as lockout/tagout, confined space entry, etc.) and use them whenever the inspections warrant. Prior to start-up of the Vortec Soil Pretreatment and Conditioning demonstration, operations personnel with contractors or technicians, where appropriate, will conduct the system inspections and ensure the following:

- Power to all electrically energized equipment is connected and sufficient amperage and voltage are available to operate the equipment, in accordance with its respective equipment manual;
- All instruments and gauges are checked for proper operation and calibrated for accuracy;
- Chemicals for operation and proper storage for such chemicals are available along with current and complete Material Safety Data Sheets (MSDSs) filed onsite;

- Chemicals, lubricants, oils, etc. for maintenance and proper storage for such materials are available along with current and complete already defined MSDS's filed onsite;
- The equipment is installed in accordance with the manufacturer's recommendations;
- Sanitary facilities, water supply, diesel fuel, propane, office trailers, and other infrastructure items required for operation of the system are installed and operational;
- Fire protection systems are installed and tested, and meet the requirements of United States Department of Energy (DOE) Orders and local fire codes;
- Pipes and valves are labeled accordingly;
- Compressed-air systems and high-pressure vessels and lines, including relief valves, have been tested accordingly;
- Heating, ventilation, and air conditioning systems are operational and in proper working order;
- Vortec personnel health and safety policies are documented and available for inspection by workers;
- Site lighting is operational;
- All tanks are properly plumbed and vented;
- All pipes, tanks, and vessels have been hydrostatically tested per the design specifications and records have been maintained;
- Vortec Corporation has reviewed all purchased equipment and factory testing records;
- All valves have been installed per the design and specifications, including manual hand valves and pneumatically operated control valves;
- Valves are in the correct positions;
- All process air ducts are clear of any obstructions,
- All on-site monitoring and analytical testing equipment is available; and
- All additional start-up checks are completed in accordance with the readiness review information in the subsections that follow.

The Vortec Soil Pre-treatment and Conditioning System Demonstration will undergo an informal operational readiness review prior to shakedown of the system. The Vortec Project Team will present the readiness review to the Executive Assistance Committee. The Executive Assistance

Committee will consist of DOE, Vortec Corporation and Bechtel-Jacobs Environmental Management Team personnel that the DOE will deem necessary. However, other DOE and prime contractor personnel may also be present at the review meeting for additional support and verification. The meeting will ensure that personnel and the equipment are prepared for initial shakedown and operation of the demonstration.

The committee will review the start-up criteria identified in Table 3.15-1 before operations begin. The demonstration will not proceed until deficient matters are addressed.

3.15.1.3 System Start-up and Initial Operation

After all pre-start-up checks are completed, the Vortec system components will be started manually in accordance with the Limited Demonstration Test Plan BFA-4110-904-004.

3.15.1.4 System Checkout

During both manual and automatic start-up phases, all mechanical, electrical, instrumentation, and control systems will be checked for proper installation and conformance to the design criteria as specified in the contract plans and specifications. Following manual start-up of the individual equipment sub-systems and systems, each will be shut down and any necessary repairs will be made before the initial operation begins.

3.15.1.5 System Performance Check

The first Waste Pre-treatment and Soil Conditioning demonstration run will use clean soil. This period will be the integrated test portion of the project; however, the components of the system will be operated as though hazardous waste is being treated. The process should be deliberately interrupted to verify that the interlocks and PLC are operating effectively.

3.15.2 Equipment/ Subsystem Procedures

The Waste Conditioning system design should be capable of processing 10 barrels per hour. For the demonstration test, processing will be accomplished during a 10-hour day with the waste processed in accordance with the test plan.

Equipment processing procedures are shown below for each major subsystem.

Table 3.15-1. Readiness Review Checklist

Yes	No	Start-up Criteria
		Contractual requirements, including subcontracts, completed.
		Equipment supply list completed and schedule identified.
		Equipment calibrations completed.
		Personnel met medical monitoring and completed training requirements.
		Badges for all authorized personnel obtained.
		Identified and completed reading requirements for applicable personnel and provide copies. Reading requirements include the following at a minimum: Operation and Maintenance (O&M) Manual, including standard operating procedures (SOPs); As-built plans and specifications.
		Construction completed.
		Telephone services installed.
		Local contracts arranged through Vortec site manager.
		Security control for gates and site arranged.
		Operator training completed.
		Office trailer and change-house trailers installed and operational.
		Water supply available.
		Sanitary facilities available.
		Hazardous assessment and safety evaluation completed.
		Laboratory support available.
		Equipment labeling completed.
		Fire protection water available.
		Electrical power available.
		Systematic review of Vortec Corporation's conformance to applicable United States Department of Energy Orders completed.
		Conduct-of-operations review completed.
		National Environmental Policy Act concerns addressed.
		Medical assistance available.
		Final O&M Manual with procedures approved.
		Operator aids completed.
		Permits obtained and approved with all parties.
		Health and safety plan reviewed and approved.
		Shakedown testing completed.
		Project quality assurance project plan (QAPP) reviewed and signed by QA Manager.
		Training session by equipment vendors to plant technicians, engineers, and technical specialist accomplished.
		Chemical hygiene plan completed.
		Standard operating procedures and equipment manuals not in operator manuals completed.
		Material safety data sheet for all chemicals available.
		Logbook(s) for project obtained.

Table 3.15-1. Readiness Review Checklist (Continued)

Yes	No	Start-up Criteria (Continued)
		Document control number for the logbook obtained.
		As-built drawings of facility completed.
		Emergency telephone numbers available.
		Copies of the emergency plan and procedures posted and accessible.
		Walk-through of SOPs conducted.
Equipment		
		Necessary equipment identified, ordered, shipped to the site, and recorded.
		Spare parts procured and delivered.
		Necessary materials supply inventory list completed and supplies delivered to the site.
		Health and safety equipment procured including: Fall protection equipment; Radiological protection (if required); Lockout/tagout equipment; Portable radiological meters (if required); and Monitoring instruments.
		Personal protective equipment (PPE) delivered and stored properly.
		Equipment delivered and installed on-site.
		Toolbox procured (specific tools to be determined).
		Radios available.
		Waste disposal boxes (ST-90) delivered and in place.
		Fire extinguishers at facility per the emergency plan available.
		Hazardous material shelter(s) for chemical storage i.e. flammable storage cabinets delivered and in place.
		Forklifts available on site and operational.
		Portable or permanent eyewash installed and operational.
		Spill containment/response equipment available.
		Storage shed for tools and lubricants available.
		Equipment decontamination pad and supplies available and in place (if required).
		Vehicles available on site and operational.
		Specialized maintenance tools procured and available on site.
		First aid kit and other needed emergency equipment available.
		Chairs and general office supplies procured and in place.
		Computer workstation (computer, printer, monitor) procured and assembled.
		Waste management equipment in place and operational.

3.15.2.1 Surrogate Waste Receiving

Flow diagrams in Figures 3.15-1 through 3.15-4 illustrate the procedures according to which Vortec will request and receive surrogate waste from the Site Waste Management and the material movement within the plant.

Soil Conditioning test stream approval or rejection plan.

The PGDP will prepare drums from specific test streams per the test plan. Vortec Corporation will submit a waste information summary sheet to PGDP identifying the test stream and the number of drums in the test stream.

All forms and sheets referred to in this section can be found in Appendix L.

Requests for delivery of the surrogate waste stream to the Pretreatment and Conditioning site.

Vortec will request delivery of a demonstration lot by submitting the Demonstration Lot Request (DLR) form to the PGDP which specifies the surrogate waste stream identification, number of containers included in the lot, and the identification number of each container included in the lot.

The PGDP will prepare and deliver the packaged surrogate drums to Vortec Corporation's soil conditioning site.

The PGDP will transport the requested demonstration lot to a staging area at the Pretreatment and Conditioning Plant. Upon delivery to the plant, Vortec will verify the following: (1) the surrogate waste streams are as specified on the DLR, (2) the number of containers for each waste stream is as specified on the DLR, (3) the container identification numbers concur with the waste stream list, and (4) containers are not significantly damaged and labels and markings are readable. If a drum is not on the DLR form, Vortec will not accept that drum and the PGDP will remove the drum from the Pretreatment and Conditioning Plant. If a drum that is on the DLR form is not included in the delivered lot, then Vortec will resolve the discrepancy with PGDP. If there are no discrepancies between the DLR and the delivered lot, Vortec will accept the lot from the PGDP and sign a surrogate waste receipt verification (SWRV) form. Any discrepancies that can be resolved at the time of lot delivery should be resolved immediately. Vortec will log in the drums and enter the data into their Data Management System.

The PGDP will deliver waste material to the pre-treatment and conditioning plant during one eight-hour shift, five days per week or as negotiated between organizations.

Staging area demonstration lot.

Vortec will store the demonstration lot in the staging area of the pre-treatment and conditioning plant until it is prepared to process the lot. Vortec will transfer the demonstration lot from the waste receiving area to the storage area in such a manner as to facilitate removal of the drums in the lot for Soil Conditioning on a first-in/first-out basis. The location of the lot in the storage area will be entered into the Data Management System to facilitate removal and transfer to the Soil Conditioning process, when appropriate. The storage area can hold a four-day supply of waste for the Soil Conditioning process.

3.15.2.2 Waste Conditioning System operation

The Pre-Treatment and Conditioning System consists of a manipulating arm, skip hoist, primary shredder, secondary shredder, waste dryer/homogenizer, ferrous metal separator, dust control

assembly, dryer air heater, and 2 conveyors for transporting waste throughout the system. The Pre-Treatment and Conditioning System operator will start the system from a local control panel. A PLC controls the system and will sequentially start system components in accordance with a pre-programmed schedule, with interlocks to protect system components. For example, operation of the dust control system must be initiated prior to waste dryer operation, which in turn must be initiated before engaging shredding and conveying assemblies upstream of the dryer, etc.

In accordance with a waste-processing schedule, which the Site Manager/ Demonstration Test Manager issues, the Vortec fork truck operator will move drums of surrogate waste from the waste storage area to the Waste Conditioning staging area.

Drum Dump/Shredding Operation.

For wastes contained in steel drums inside overpacks, the Waste Conditioning operator raises the overpack, using an articulated arm equipped with a drum grip, to a position over the skip hoist bucket. The operator will place the overpack into the bucket, which feeds the primary shredder.

For waste contained in steel drums only, the operator will use an articulated arm equipped with a drum grip, place the drum with its contents into the bucket. The primary shredder equipment will shred drum(s) and waste to a maximum size of about 5 inches; material from the primary shredder will then drop directly into the secondary shredder which will reduce their size to that acceptable for drying, approximately 2 inches.

Waste material, which enters Waste Conditioning, takes less than one hours to process; the amount of the material in process when the Waste Conditioning system is full is approximately 5 tons. During operation of the Waste Conditioning System, a signal will notify the operator when to terminate waste loading into the system; the notification will enable the operator to run the Waste Conditioning System empty of material prior to the end of a shift.

Waste Drying/Homogenization.

The drum and waste material from the secondary shredder are mechanically conveyed via belt conveyors to the rotary dryer/homogenizer for reduction in moisture content to approximately 1 percent and mixing with material from other drums. The dryer is a direct contact device where the drying medium (hot air) comes in direct contact with the shredded drum and waste materials; the dryer removes moisture from the waste via evaporation. The drying air is heated using a directly fired, propane heater before delivery to the waste dryer. The moisture-laden air from the waste dryer first passes through two stages of dust collection, including a primary filter and a HEPA filter to remove particulate matter.

Metal Separation.

Dried waste and drum materials are mechanically conveyed from the dryer to the metal separation equipment. Magnetic separators are used to remove ferrous metal from the dried material. The separated metals discharge to a chute that connects to a ST-90 box and conditioned waste material discharge to a separate chute that connects to a ST-90 box. When the ST-90 box is full, a forklift truck operator will remove the box and move it to the staging area for shipment to the PGDP. The operator will then place an empty ST-90 box at the chute discharge point.

Dust Control.

An induced draft fan draws dust-laden air from the system and transports it to the nuisance dust air pollution control assembly and maintains a negative pressure in all equipment in the Pre-Treatment and Conditioning System including belt conveyors. The air pollution control assembly for the feed conditioning system contains a primary filter and high-efficiency particulate air (HEPA) filter. Interlocks in the Pre-Treatment and Conditioning system PLC prevent operation of the system if the air pollution control assembly is not operating sufficiently to prevent fugitive dust emissions from the system.

3.15.3 Conditioned Product Handling System

A conditioned product handling system consists of a container loading chute, ST-90 Containers (furnished by DOE), and product weigh scales.

Two ST-90 containers are placed adjacent to each other in the conditioned product loading area with a chute over each box. A diverter valve directs the conditioned waste from the conveyor to one of the two chutes to load one of the boxes. When one box is full, the yard forklift truck operator adjusts the valving from a local control panel to direct the conditioned material to the chute over the empty adjacent box. The ST-90 lid is placed on the full container and ready for removal. The forklift operator then moves the full box to a staging area for subsequent transport to a product storage area where it will be shipped to PGDP for disposal. Upstream of the diverter gate is an automatic sampling device to collect mutable small plug flow samples for one ST-90 container. The representative sample is characterized by lab analysis and the resulting data is the characterized identity of that particular ST-90 container. The staging area can accommodate all boxes filled during one ten-hour shift; therefore, movement of the boxes to the storage area can occur during one eight-hour second shift.

3.15.4 Air Pollution Control System

The Air Pollution Control System (APCS) removes pollutants from the bleed air from the Waste Conditioning System. The APCS consists of primary, and HEPA filters. The APCS must be operating prior to start-up of the Waste Conditioning System.

The HEPA filter assembly consists of eight sections. Each section contains four primary filter elements and two secondary elements. The system is cleaned automatically based on pressure drop. Individual sections are automatically isolated and the primary elements are pulsed clean with compressed air. Each section has a dust hopper connected to a line to convey the dust to the filter receiver. The main PLC controls the automatic cleaning sequence. Should a filter element require replacement, the operation will be performed under the direction of the site Health Physicist and according to an appropriate Radiological Work Order. Spent filters will be placed in waste containers and returned to the PGDP.

A variable speed induced draft fan in the APCS controls the negative pressure in the pre-treatment and conditioning system.

3.15.5 Process Instrumentation and Control System

Critical process parameters will be measured and transmitted to the PLC, which will control the operation of the process to meet performance specifications. The PLC will be located in the Control Room with critical parameters displayed on the main control panel. The control room operator will monitor the critical parameters, log any unusual conditions, and take whatever action is required to prevent unsafe operation of the system.

3.15.6 Utilities Systems

The PGDP will supply electrical power (1,500 KVA; 480/277 volts, 60 hertz, 3 phase) to the Vortec Pre-Treatment and Conditioning Plant operation. An emergency diesel power generator will be available to supply electricity to some portions of the facility and will activate automatically in the event of a power failure.

3.15.6.1 Water Utilities

The PGDP will supply non-potable water to the Vortec facility for cleanup and fire protection. The Vortec facility will utilize water for fire protection. The LMES Fire Hazard Analysis (LMES, 1996b) addressed the fire protection needs and requirements for the Vortec demonstration. Potable water will be supplied by a vendor service providing bottled water. Sanitary water will be trucked in and pumped into water tanks located beneath each sanitary trailer.

3.15.6.2 Fuel Utilities

The Vortec Test Demonstration will utilize propane as the fuel for the dryer air heater. The system will consist of a propane tank located near the northern portion of the site, with piping leading to air heater controls. The LMES Fire Hazard Analysis (LMES, 1996 b) addressed propane loading and unloading procedures. In addition to the 1996 LMES Fire Hazard Analysis, the IUOE had a Process Hazards Analysis (PHA) of the Pre-Treatment and Conditioning System in December 2000. The Procedure for Propane Unloading and Storage is in Appendix B.

Figure 3.15-1 Demo Testing Incoming Waste Evaluation and Delivery Process

Figure 3.15-2 Demo Testing Waste Process and Disposal

BFA-4110-904-005 Limited Demonstration Operational Plan Appendices

<u>Appendix</u>	<u>Description</u>	<u>Page</u>
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APPENDIX A

Vortec Corporation Procedure for Logbook Documentation

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Vortec Corporation
Procedure for Logbook Documentation

Prepared by: Steve Miller, PE (SMS)/ R.K. Hnat (Vortec)

Approved by:

Effective Date: 7/5/01

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A1. PURPOSE

This procedure establishes criteria and guidelines for site logbook content and control.

A2. APPLICABILITY

This procedure is applicable to the Vortec Paducah demonstration facility personnel. The Site Manager must approve any deviations from this procedure.

A3. RESPONSIBILITIES

The Site Manager or appointed representative is responsible for coordinating and scheduling daily activities. The Site Manager is also responsible for ensuring the training of personnel in the use of this procedure.

The operators are responsible for ensuring the logbook entries are complete, accurate, and in accordance with this procedure.

A4. ACTION STEPS

A4.1 INTRODUCTION

The Site Manager will assign logbooks to employees in key positions. The facility will have one site logbook and specific activity requirement logbooks. All logbooks will be bound with lined and consecutively numbered pages. All pages will be renumbered or manually numbered before initial use of the logbook.

A4.2 LABEL REQUIREMENTS

The front cover of the logbook will contain the following information:

- Project name;
- Logbook number;
- Activity; and
- Start and finish date.

A4.3 CUSTODY AND CONTROL

The individual assigned to the logbook becomes responsible for the proper documentation. Custody and transfer of the logbook will be documented in the logbook.

A4.4 GENERAL LOGBOOK DOCUMENTATION GUIDELINES

The following requirements should be followed when using a logbook:

- Complete all entries in ink;
- Precede all entries with the time (in military units) of the observation;
- Record the date and location;
- Indicate any deletions or changes by marking through the material with a single line. Do not erase, blot out, or use correction fluid on any entry;
- Do not start a new page until the previous page is full or has been marked with a single diagonal line. Use both sides of the logbook and do not skip pages;
- Record as much relevant information as possible;
- Do not remove pages from the logbook; and
- Logbooks should remain in the site office and be stored as directed by the Site Manager.

A4.5 SITE LOGBOOK ENTRY GUIDELINES

The site logbook is the master reference document for the facility's activities and documents the daily activities. The following are suggested entries for each shift:

- The date, time, names and titles of personnel, and organizations onsite;
- The name of the individual responsible for logbook entries;
- A summary of the activities completed and details of technical information;
- Details of equipment failure;
- Changes in the treatment process;
- Documentation of important correspondence; and
- Documentation of health and safety issues and health monitoring.

A4.6 VERIFICATION

The Site Manager or his/her appointed representative will perform periodic verification of the logbook to ensure adherence to this procedure.

APPENDIX B

Vortec Corporation Procedure for Propane Tank Unloading and Storage

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Vortec Corporation
Procedure for Propane Unloading and Storage

Prepared by: R. Jaeger / R.K. Hnat
Approved by:
Effective Date: 7/5/01

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Propane Tank Unloading Procedure at Vortec

B1. PURPOSE

The purpose of this document is to describe the methods and procedures for transferring liquid propane from cargo tank motor vehicles into the 10,000-gallon propane storage tank located at the Vortec site. Access to the Vortec facility shall not be granted until the LP-Gas vendor has completed this procedure.

B2. APPLICABILITY

This procedure is applicable to the owner/operator of the transport vehicle, site supervisor, and all designees associated with the transfer of propane at Vortec.

Vortec Corporation and the United States Department of Energy must approve any changes to or deviations from this procedure prior to the start of any transfer.

B3. ACRONYMS

- A. DOE - The United States Department of Energy
- B. DOT - The United States Department of Transportation
- C. C.F.R. - Code of Federal Regulations

B4. REFERENCES

National Propane Gas Association LP-Gas Safety Handbook.

National Fire Protection Association Code 58 Liquid Petroleum - Gas Code.

49 C.F.R. 391, Qualifications of Drivers.

49 C.F.R. 171-178, Hazardous Materials: Cargo Tank Motor Vehicles in Liquefied Compressed Gas Service Final Rule; Safety Standards for Unloading Cargo Tank Motor Vehicles in Liquefied Compressed Gas Service.

29 C.F.R. 1900-1910, Occupational Safety and Health Administration, Department of Labor.

B5. PRECAUTIONS, MARKINGS, AND LIMITATIONS

B5.1 Precautions

B5.1.1 Only those personnel that are properly trained by their employer for the specific purpose of delivering and transferring liquid propane will be allowed to perform such duties at the Vortec facility.

B5.1.2 Persons conducting transfer operations will develop a comprehensive written emergency operating procedure. The written procedures will be displayed prominently in each cargo tank motor vehicle.

B5.1.3 Any liquid propane gas (LP-Gas) stored or used in any system within the Vortec complex should not contain ammonia. If such a possibility exists (i.e., resulting from the dual use of transportation equipment), the LP-Gas will be tested prior to being transferred into the Vortec holding tank.

B5.1.4 The site manager or designee prior to entering the loading station will inspect transfer vehicles visually. The visual inspection will include checking for any leaks from the vehicle with the driver in the cab and the engine running. Should any minor drips be observed, the site manager will determine if the vehicle should deliver the propane as scheduled or be repaired prior to entering the Vortec site. An absorbent pad or pan could be used to contain any oil drips, under direction of the site manager.

B5.2 Markings

In-service cargo tank motor vehicles will be marked and retain inspection documentation as required by 49 C.F.R. § 180.415. New cargo tank markings are required for new (unused) cargo tank motor vehicles with the following statement added to the certification documentation required by 49 C.F.R. § 178.337-18: "Emergency excess flow control performance not established for this unit." The marking that is required by 49 C.F.R. § 171.5(b) to be displayed on a cargo tank motor vehicle used or represented for use under this section includes the following: the letters must be white and the background black; the letters must be 1.5 cm in height and the marking must be 6 cm x 15 cm. These markings are in excess of typical 49 C.F.R. Transportation labeling and placards that apply to the transportation of LP-Gas on public highways.

B5.3 Limitations

Only equipment that has been properly tested and accompanied by documentation of the testing, as specified in this procedure, can be used in the transfer of liquid propane at the Vortec facility.

B6. PREREQUISITES

B6.1 All Vortec and LP-Gas personnel tasked with oversight of the tank filling operation must be knowledgeable of this procedure and those applicable requirements are outlined in this document.

B6.2 The procedure will be in compliance with all applicable 49 C.F.R. DOT regulations concerning the transportation of LP-Gas to the Vortec site.

B6.3 All LP-Gas will be odorized prior to delivery by the addition of a warning agent of such character that the gases are detectable by a distinct odor to a concentration in air of not over one fifth the lower limit of flammability. Documentation as to the application of an odor to the LP-Gas will be completed and provided to the Vortec staff prior to any transfer of each load.

B6.4 The following requirements are specified in 49 C.F.R. § 171.5(1)(i) through 171.5(3)(b).

B6.4.1 Prior to the transfer of product from a cargo tank motor vehicle, the person performing the unloading function should verify that each component of the discharge system is of sound quality and is free of leaks and that all connections are secure. All transfer hoses must be subjected to full transfer hose pressure prior to the first transfer of product each day.

B6.4.2 Before the transfer of product is initiated from a cargo tank motor vehicle using a new or repaired transfer hose, or a modified hose assembly for the first time, the hose assembly must be subjected to a pressure test at no less than 120% of the design pressure or maximum allowable working pressure marked on the cargo tank motor vehicle, or the pressure the hose is expected to be subjected to during product transfer, whichever is greater. This test must include all hose fittings and equipment arranged in the configuration to be employed during transfer operations. Any hoses or associated equipment that shows signs of leakage, significant bulging, or other defects cannot be used. An acceptable procedure for maintenance, testing, and inspection of hoses is outlined in publication RMA/IP11-2, "Manual for Maintenance, Testing, and Inspection of Hoses," 1998 edition, published by the Rubber Manufacturers Association.

B6.4.3 In the event of an unintentional release to the environment during transfer, the person attending the unloading operation must activate promptly the internal self-closing stop valve and shut down all motive and auxiliary power equipment. This requirement can be accomplished by meeting the requirements in 49 C.F.R. § 178.337-11(a)(1)(i); through the use of a qualified person positioned within an arm's reach of the mechanical means of closure throughout the unloading operation, except during the short period of time necessary to engage or disengage the motor vehicle power take-off or other mechanical, electrical, or hydraulic means used to energize the pump and other components of a cargo tank's discharge system; or through the use of a fully operational radio-controlled system that is capable of stopping the transfer of loading by use of a transmitter carried by a qualified person unloading the cargo tank.

B6.4.4 The attendance requirements of 49 C.F.R § 177.846(i)(3) are satisfied when the qualified person unloading the cargo tank carries a radio transmitter that will activate the closure of the internal self-closing stop valve; remains within the operating range of the transmitter; and has an unobstructed view of the cargo motor vehicle at all times when its internal stop-valve is open.

B7. TEST EQUIPMENT, TOOLS, AND SUPPLIES

- A. Driver logbooks.
- B. Indelible black ink pens.
- C. Each tank truck or tractor will be provided with at least one approved portable fire extinguisher having a minimum capacity of 18 lb. dry chemical with a B:C rating.
- D. Each tank truck or tractor will carry chock blocks that will be used to prevent rolling of the vehicle whenever it is being loaded, unloaded, or parked.
- B. The truck engine exhaust system will comply with Federal Motor Carrier Safety Regulations.
- F. Any hoses that are to be used for conveying LP-Gas liquid or vapor at pressures that exceed 5 psi will be designed for a working pressure of 350 psi with a safety factor of 5 to 1 and will be marked continuously with LP-CAS PROPANE 350 PSI WORKING PRESSURE, and with the manufacturer's name and trademark. This marking is in addition to the DOT required markings that apply to the truck and the LP-Gas.

B8. ACTION STEPS

B8.1 Vortec Site Manager or Designee

B8.1.1 The Vortec Site Manager, or his designee, will notify the Plant Shift Superintendent (PGDP) the day of delivery, prior to the actual delivery of LP-Gas to the Vortec site.

B8.1.2 The Vortec Site Manager or designee will contact the propane supplier and arrange for delivery of propane.

B8.1.3 The Vortec Site Manager or designee will meet the driver of the LP-Gas transfer vehicle, review the associated paperwork, and inspect the vehicle.

B8.1.4 Upon approval and arrival of the LP-Gas transfer vehicle, both the driver and Site Manager or designee shall inspect the area for any items that could produce a spark.

B8.1.5 Once the area has been determined safe to initiate the LP-Gas transfer, the Site Manager or designee shall oversee the transfer operation, being ready to assist the driver in the event of any release of LP-Gas. The driver, Site Manager, or a designee, shall implement the pre-determined emergency response actions and any additional personnel required to contain the release and ensure the safety of the workers and work place.

B8.1.6 Once the transfer of the LP-Gas has been completed the Site Manager shall instruct the driver to return his vehicle to the site trailer where all appropriate paperwork shall be completed.

8.2 Driver

B8.2.1 Upon arrival at the Vortec complex, the driver will park the vehicle (turn off engine, apply the parking brake, exit the vehicle, and place chock blocks to the rear wheels) at the designated delivery truck location next to the office trailer. The driver will enter the site trailer and inform the Site Manager, or his designee, of his arrival. All paperwork will be presented to the Site Manager or designee at this time for review. A site map is posted in the site trailer and the driver must review it to become familiar with the LP-Gas tank location and other structures associated with the Vortec facility. The driver and Site Manager or designee then will visually inspect the truck for any leaks or defects. Upon approval from the Site Manager or designee to enter the Vortec site, the driver will remove his chocks, release the parking break, and drive to the designated filling station as directed.

B8.2.2 Upon arrival at the designated filling station, as indicated on the plant map, the driver will park the vehicle, turn off the motor, set the parking brake, exit the vehicle, and apply the chocks to the rear wheels on each side of the vehicle.

B8.2.3 The driver will check the area for hazardous conditions and possible sources of ignition. Should any be found, further operation will be delayed until the situation is corrected. In accordance with DOT regulations for vehicles containing LP-Gas, no person shall smoke or carry smoking materials within 25 ft of the vehicle with the appropriate, required placarding.

B8.2.4 Before connecting to the Vortec storage tank, the driver will check the nameplate on the tank to be sure it is the proper type tank. For LP-Gas, the tank must have a minimum design pressure of 250 psig.

B8.2.5 All hand tools used in the transfer of the LP-Gas will be manufactured from non-sparking materials.

B8.2.6 All dust caps or plugs will be removed from the valve assemblies on both the transfer vehicle and the Vortec storage tank. All valves will be inspected for

obstructions such as insects, nests, paint, etc. The hoses that will be used in the transfer operation will be inspected as well. Following the inspection, the hoses will be connected to their designated valve assembly points. The driver shall observe that the "No Smoking" signs are posted and in good condition. Then the driver shall place the "Tanker Connected" signs in plain view prior to connecting hoses to the tank.

B8.2.7 The pressure regulator will be inspected to verify that insects, nests, paint, etc do not plug the vent. In addition, the inspection will determine that the vent is in the correct position and that the rain cap is on the pressure relief valve.

B8.2.8 Operational valve assembly, truck operation requirements, and sight glass procedures are per the propane supplier's standard delivery procedures.

B8.2.9 Once the LP-Gas transfer has been completed, all valves should be returned to their previous positions. All hoses will be disconnected and returned to the transport vehicle without release. The driver will remove the chocks only when the truck is ready to return to the office.

B8.2.10 Upon approval by the Site Manager or designee, the driver shall then proceed to the Vortec site office to complete the required company billing and Vortec paperwork and to receive the final approval signature for the completion of the LP-Gas delivery transfer.

B8.2.11 Should any product be released, the driver and Vortec Site Manager will implement immediate action. The driver will close the appropriate valves and shut off the truck immediately. Dike materials will be present at the filling station and will be used immediately in the event of any release to maintain the affected area. The spill response plan will be implemented, and the PGDP Plant Shift Superintendent will be notified.

B9. ACCEPTANCE CRITERIA

The Site Manager will sign the driver's logbook when the vehicle has been inspected, when approving the driver's initiation of the liquid propane transfer, and when accepting the transfer as being completed in accordance with this procedure.

B10. POST-PERFORMANCE WORK ACTIVITIES

Visually check the area to see if all connections are located in their proper position.

B11. RECORDS

B11.1 Quality

The driver and his employer will generate the following quality records:

- A. Driver's logbook
- B. Certification that the LP-Gas has had an odorant added.
- C. Documentation that all hoses have been tested in accordance with this procedure.
- D. Documentation of all testing of vehicles used for any use other than transferring LP-Gas. This documentation will be presented to the Site Manager upon arrival at the site.
- E. Completed checklists as detailed in Figure B-1 and B-2.

B11.2 Non-Quality

None Required

Figure B-1 Vortec LP-Gas Cargo Tank Truck Inspection Check List

Item	Description	Frequency	Check for	Note
1	Nameplate and test inspection decal	Semi-annually	Compliance	
2	Fire extinguishers	Monthly	Availability	

Figure B-2 Vortec LP-Gas Bulk Storage Inspection check List

The LP-storage tank has an 18,000 gallon capacity

Item	Description	Frequency	Check for	Note
1	Hoses	Monthly	Cracks	
2	Shutoff Valve	With fillup	Operation	
3	Emergency Valve	Bi-monthly	Operation	
4	Backflow check valve	Bi-monthly	Operation	
5	Grounding	Semi-annual	Conductivity	
6	Fire Protection	Semi-annual		
7	Tank	Semi-annual	Rust, Fitting connection leaks	
8	Curbing or Diking	Semi-annual	Cracks	
9	Fire Extinguisher	Bi-monthly	Pressure	
10	Tank Area Clutter	Semi-annual	Debris clutter	Clean-up as required

APPENDIX C

Vortec Corporation Procedure for Start-Up and Shutdown of the Process Instrumentation and Control System

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Vortec Corporation
Procedure for Start-up and Shutdown
Of the Process Instrumentation and Control System

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

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This procedure has been verified for adequacy.

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C1. PURPOSE

This procedure defines the required actions necessary to start up and shut down of the Process Instrumentation and Control System at the Vortec facility.

C2. APPLICABILITY

This procedure applies to all activities associated with start-up and shutdown of the Process Instrumentation and Control System at the Vortec facility.

C3. REFERENCES AND DEFINITIONS

BFA-4110-906-001 Operational Control Logic
BFA-4110-907-003 Instrument List
BFA-4110-905-004 Process Description
BFA-4110-907-007 Motor list
BFA-4110-907-008 Equipment List
Section 514.4 Process Instrumentation and Control System

C4. RESPONSIBILITIES

The Control Room Operator is responsible for start-up and shutdown.

C5. ACTION STEPS

Start-up and shutdown sequences are shown below.

C5.1 Conditioning System Start-up Sequence

Walk around systems to look for any visual leaks or damage.

- 1.0 Start Air Compressor Skid.
- 2.0 Start Nuisance Dust Collection System (NDC Blower and NDC Filter).
- 3.0 Start Dryer Dust Collection System (Dryer Blower, Dryer HEPA, and Dryer Filter).
- 4.0 Start Pneumatic Conveyor System.
- 5.0 Start Product Handling System.
- 6.0 Start Conveyor C-4 and the Tramp Iron Magnet.
- 7.0 Start Rotary Dryer System.
- 8.0 Start Propane Supply System (actually, only opening a valve).
- 9.0 Start Air Heater System.
- 10.0 Start Conveyor C-3.
- 11.0 Start Shredder System.
- 1.0 Start Skip Hoist Loading System.

Operator can now load barrels into skip hoist bucket.

C5.1 Conditioning System Shut-down Sequence

Sequence is in reverse order of the start-up sequence.

Operator insures that no barrels are loaded into the skip hoist.

- 1.0 Stop Skip Hoist Loading System.
- 2.0 Stop Shredder System.
- 3.0 Stop Conveyor C-3.
- 4.0 Stop Air Heater System.
- 5.0 Stop Propane Supply System (actually, only closing a valve).
- 6.0 Stop Rotary Dryer System.
- 7.0 Stop Conveyor C-4 and the Tramp Iron Magnet.
- 8.0 Stop Product Handling System.
- 9.0 Stop Pneumatic Conveyor System.
- 10.0 Stop Dryer Dust Collection System (Dryer Blower, Dryer HEPA, and Dryer Filter).
- 11.0 Stop Nuisance Dust Collection System (NDC Blower and NDC Filter).
- 12.0 Stop Air Compressor Skid.

Walk around systems to look for any visual leaks or damage.

C6. RECORDS

See 3.11 Chapter 11, Logkeeping

See 3.12 Chapter 12, Operations Changeover

See Appendix L-14, Shift Changeover Checklist

INSTRUMENT & CONTROL EQUIPMENT

ID/Tag No.	Description	Supplier	Model No	Specification
ECP-800	COMPUTER	GATEWAY	P5-166	S-4100-810
ECP-801	COMPUTER	GATEWAY	P5-166	S-4100-811
ECP-802	COMPUTER	GATEWAY	P5-166	S-4100-812
ECP-804	PRINTER	HEWLETT PACKARD		S-4100-814
ECP-805	PLC EQUIPMENT	RUMSEY		S-4100-816
ST-800A	PROCESS CONTROL SHELTER, 20'	RUMSEY		S-4100-800
ST-800B	PROCESS CONTROL SHELTER, 40'	RUMSEY		S-4100-800

APPENDIX D

Vortec Corporation Procedure for Start-up and Shutdown of the Utilities System

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Vortec Corporation
Procedure for Start-up and Shutdown of the
Utilities System

Prepared by: Bill Osburn (SMS) / R.K. Hnat (Vortec)
Approved by:
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D1. PURPOSE

This procedure defines the required equipment and actions necessary to start up and shut down of the Utilities System.

D2. APPLICABILITY

This procedure applies to all activities associated with start up and shut down of the Utilities System.

D3. REFERENCES AND DEFINITIONS

BFA-4110-906-001	Operational Control Logic
BFA-4110-907-003	Instrument list
BFA-4110-905-004	Process Description
BFA-4110-907-007	Motor list
Bfa-4110-907-008	Equipment List

D4. RESPONSIBILITIES

The Control Room Operator is responsible for start-up and shutdown of the emergency generator.

The Propane System is manually controlled. The plant supervisor is responsible for the manual settings on the propane tank.

D5. ACTION STEPS

See information with each equipment item that follows.

D6. RECORDS

See 3.11 Chapter 11, Logkeeping.

See 3.12 Chapter 12, Operations Changeover.

See Appendix L-14, Shift Changeover Checklist.

D7. VORTEC CORPORATION SUPPLIED INSTRUMENTATION

The following instrumentation are supplied by Vortec Corporation on the interconnection piping:

ID	Description	System	Mfg	Mfg ID
PSLL 708A	Plant air low low pressure alarm	Air Compressor	See BFA-4110-907-003	See BFA-4110-907-003
PSL 708B	Plant air low pressure alarm	Air Compressor.	See BFA-4110-907-003	See BFA-4110-907-003

Process System:	UTILITIES, COMPRESSED AIR	Equipment Name:	AIR COMPRESSOR
ID/Tag No.:	ME-700	Model No.:	GA-160
Supplier:	A.B.E. BERKLEIGH PUMP AND COMPRESSOR CO.	Drawing No.:	-
Manufacturer:	ATLAS COPCO COMPRESSORS INC.		
Specification No.:	S-4100-702	Vendor Comp. No.:	-

DETAILED INFORMATION ON START-UP, SHUTDOWN AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-702-001	-	A	36	Operators Log
-	VOM-4100-702-002	-	A	48	Instruction Book for Stationary Compressors
-	VOM-4100-702-003	-	A	38	Parts Book for Stationary Compressors
-	VOM-4100-702-004	-	A	38	User Manual for Elektronikon Regulator
1310251722	VOM-4100-702-005	-	A	6	GE Motor Installation and Maintenance
N/A	D-4110-502-008	D	D	1	Compressed Air Utility P&ID

* Document revision may be superseded by subsequent change, check with document control for current revision.

INITIAL START-UP:

- (1) The compressor element supports and motor supports are secured to the frame, immobilizing the vibration dampers during transport. Remove the stud and nuts (VOM-4100-0702-002, p35 1-Fig. 14a and 14b) of both compressor element supports as well as the bushing (VOM-4100-0702-002, p27 1-Fig. 10) of the motor support.
- (2) Check that the electrical connections correspond to the local codes. Check the connections for correct tightness. An isolating switch must be installed near the compressor.
- (3) Check transformer (VOM-4100-0702-002, p14 T1-Fig.6a) for correct connection, the settings of the drive motor overload relay (VOM-4100-0702-002, p14 F21-Fig. 6a). See section 6.3 (VOM-4100-0702-002, p37).
- (4) Check oil level. Consult section 3.4 (VOM-4100-0702-002, p29). Remove filler plugs (VOM-4100-0702-002, p8-11 FC2-Fig. 4a and 4b) from each element. Pour 1 quart of oil into each compressor element. Reinstall the plugs. Do not mix the oils.
- (5) Fit the air outlet valve (VOM-4100-0702-002, p6 AV-Fig. 3). Close the valve. Connect the air system to the valve.
- (6) Connect the manual condensate drain valve (VOM-4100-0702-002, p6 Dma-Fig. 3). Close the valve. Connect the valve to the drain hole.
- (7) Connect the automatic condensate drain outlet (VOM-4100-0702-002, p6 Daa-Fig. 3) to the drain collector.
- (8) Labels are delivered with the compressor, warning the operator that:
 1. The compressor automatically restarts after voltage failure (See VOM-4100-0702-002, p7 section 1.3.2).
 2. The compressor is automatically controlled and may be restarted, even after manually stopping (See VOM-4100-0702-002, p7 section 1.3.2)

Stick these labels in an obvious plane neat the control panel. Read the warnings.

- (1) Switch on the voltage. Start the compressor and stop it immediately. Check the rotation of the drive motor, and on air-cooled units, the rotation of the fan motors. When facing the drive end shaft of the motors, the correct rotation is counter-clockwise for both the compressor motor and fan motors(s).
- (2) Check the programmed settings (See VOM-4100-0702-004 **“User manual for Elektroniko® Regulator 4x40 display”**, section **“Modify settings”** 0 submenus.)
- (3) Open the air outlet valve (VOM-4100-0702-002, p6 AV-Fig. 3).
- (4) Start and run the compressor for a few minutes. Check that the compressor acts normally. Consult the user manual, **“Modify Settings”** sub-menus.

START-UP:

Before Starting (Reference VOM-4100-0702-002, p12 Fig. 5a)

Safety.

The operator must apply all relevant safety precautions, including those mentioned in VOM-4100-702-002.

- (1) Switch on the voltage. The “voltage on” LED (2) lights up, and the message “**compressor off**” appears on the display (4);
- (2) Close the condensate drain valve (VOM-4100-0702-002, p6 Daa-Fig. 3);
- (3) Open the air outlet valve (VOM-4100-0702-002, p6 AV-Fig. 3);
- (4) Check the oil level (VOM-4100-0702-002, p8-11 LI41-Fig. 4a and 4b). The pointer should register in the green range or in the orange range.

Starting (Reference VOM-4100-0702-002, p12 Fig. 5a)

- (5) Press the start button (8). The compressor should start running in the unloaded condition. The “automatic operation” LED (1) should light up. For **wye-delta starting**, ten seconds after pressing the start button (8), the drive motor switches over from wye to delta. At the same time, the compressor starts running loaded. The message on the display (4) changes from “**auto unloaded**” to “**auto loaded**”. For direct on-line starting, the drive motor starts immediately after pressing the start button (8).

SHUTDOWN (Reference VOM-4100-0702-002, p12 Fig. 5a):

- (1) Press the stop button (9); the LED (1) should go out. The message “**Programmed stop**” appears. The compressor should run unloaded for 30 seconds and then stop.
- (2) Close the air outlet valve (VOM-4100-0702-002, p6 AV-Fig. 3) and switch off the voltage.
- (3) Open the condensate drain valve (VOM-4100-0702-002, p6 Dma-Fig. 3).

EMERGENCY STOP (Reference VOM-4100-0702-002, p12 Fig. 5a):

To stop the compressor in the event of an emergency;

- (1) Press button (S2). The “Alarm” LED (3) should blink.

- (2) After remedying the fault, unlock the button by turning it counter-clockwise and press the **“Reset”** key. The message **“All protection functions are OK”** will appear, after which the compressor can be restarted.
- (3) Press the keys **“Menu”** and **“Main Screen”** to return to the main display (Fig. 5b).

MAINTENANCE:

For Preventative Maintenance, see VOM-4110-0702-002 p31.

For Stationary Compressor Maintenance, see VOM-4100-0702-002 (back cover inside page).

For Motor Maintenance, see VOM-4100-0702-005 page 4.

INSTRUMENTATION:

An independent local control panel, ECP-700, operates the air compressor. ECP-700 is tied into the PLC in the Control Trailer. There is no instrumentation with ME-700 Air Compressor.

Process System:	UTILITIES	Equipment Name:	AIR DRYER
ID/Tag No.:	ME-704	Model No.:	EH-1000
Supplier:	ABE Berkleigh		
Manufacturer:	Pneumatech, Inc	Drawing No.:	-
Specification No.:	S-4100-702	Vendor Comp. No.:	-

DETAILED INFORMATION ON START-UP, SHUTDOWN AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-702-013	-	A	6	Heatless Air Dryer Installation Operation & Maintenance
OM-A-10	VOM-4100-702-016	-	A, B	23A 1B	Regenerative Air/Gas Dryers Installation, Operation, Start-up, & Maintenance Manual
N/A	D-4110-502-008	D	D	1	Compressed Air Utility P&ID

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

- (1) Leave power switch in the **OFF** position.
- (2) Keeping the outlet valve closed, slowly pressurize both absorbent chambers to the line pressure.
- (3) Check for any leaks in the system.
- (4) Turn the power switch to **ON**.
- (5) One of the purge valves should open and depressurize the chamber on that side.
- (6) Run the dryer through one or two cycles before opening the outlet valve.
- (7) Once the system has been pressurized, check the system for any leaks.

SHUTDOWN:

Per PLC Logic

MAINTENANCE:

General

- (1) Clean or replace the pilot air filter element during the first month of operation. Repeat periodically.
- (2) Every three months, close the purge adjusting valve momentarily to check for any leaks in the inlet and/or purge check valves. A leak is indicated by air coming through the exhaust mufflers.
- (3) **NOTE:** No lubrication is required for this system.

Daily

- (1) Check auto drain on blowdown prefilter every shift.

Weekly

- (1) Check the shifting, purge, and re-pressurization operation.
- (2) Check the operating conditions: inlet pressure, inlet temperature and the flow rate.
- (3) Check the moisture indicator: **BLUE** color indicates **DRY** conditions. If the color is **PINK**, refer to the moisture indicator chart on alarm conditions for probable cause.
- (4) Check the purge mufflers for blockage. One indicator is back pressure on the tower under regeneration. Replace if necessary.
- (5) Check the pressure drop across prefilter and after filter. Replace the elements if the pressure drop exceeds 7 PSI.

Monthly

- (1) Check the air pilot filter element. Replace if necessary.

Quarterly

- (1) Check the prefilter and afterfilter elements for excessive clogging or possible damage. Replace as necessary.
- (2) Blow down relief valves.
- (3) Check outlet dew point conditions.

Annually

- (1) Close the inlet and outlet valves on the dryer, or bypass the dryer and completely depressurize the dryer system. Open the desiccant fill port and check visually. If desiccant is contaminated with oil or broken, replace the desiccant.
- (2) Remove the outlet check valves. Repair or replace as necessary.
- (3) Remove the inlet switching valves and purge the exhaust valves. Clean and replace worn-out seats and seals.
- (4) Inspect the pilot air cylinders for leaks or worn-out seals. Repair or replace as necessary. Check pilot air solenoid valves for possible defects.
- (5) Check re-pressurizing control valve. Repair or replace as necessary.
- (6) Check pilot air solenoid valves for possible defects.
- (7) Recalibrate the dew point monitor sensor probe.

INSTRUMENTATION:

A local control panel, ECP-704, operates the air dryer. ECP-704 is tied into the PLC in the Control Trailer. Instrumentation for the ME-704 Air Dryer are shown below:

ID	Description	Supplied By	Mfg	Mfg ID
PSV 725A	Pressure switch valve	PneumaTech, Inc.		
PSV 725B	Pressure switch valve	PneumaTech, Inc.		
PI 725A	Pressure Indicator	PneumaTech, Inc.		
PI 725B	Pressure Indicator	PneumaTech, Inc.		
FI 725	Flow rate indicator	PneumaTech, Inc.		
PDI 724	Pressure differential indicator	PneumaTech, Inc.		
PDI 726	Pressure differential indicator	PneumaTech, Inc.		

Process System:	UTILITIES	Equipment Name:	DRY AIR RECEIVER
ID/Tag No.:	T-703	Model No.:	
Supplier:	ABE Berkleigh		
Manufacturer:	Brunner Engrg. and Mfg., Inc.	Drawing No.:	-
Specification No.:	S-4100-702	Vendor Comp. No.:	-

DETAILED INFORMATION ON START-UP, SHUTDOWN AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-702-021	-	A	3	Vessel Installation and Maintenance Recommendations
N/A	D-4110-502-008	D	D	1	Compressed Air Utility P&ID

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

VESSEL MAINTENANCE:

General

1. Maintaining a pressure vessel includes proper inspection. Many states have adopted the National Board Inspection Code (NB-23), for rules concerning Post-Construction Activities. Check with local authorities having jurisdiction over pressure vessels installations and operations.
2. The N.B.I.C may be obtained by calling the National Board of Boiler and Pressure Inspectors at (614) 888-8320.

Monthly

1. Manually drain condensate from the receiver.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
PSV 727	Pressure switch valve	A.B.E. Berkliegh	-	-
PI 727	Pressure Indicator	A.B.E. Berkliegh	-	-

Process System:	UTILITIES	Equipment Name:	EMERGENCY DIESEL GENERATOR
ID/Tag No.:	ME-710	Model No.:	D250FRZ4
Supplier:	Katolight Corporation	Drawing No.:	-
Manufacturer:	CUMMINS		
Specification No:	S-4100-900	Vendor Comp. No:	-

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev	Size	No. Sh.	Description
-	VOM-4100-0900-001	-	A	>200	Katolight Corporation Operators Manual

START-UP:

INSTALLATION CHECKLIST

Prior to initial startup refer to the following installation checklist, Table 10.1 (page 10-1) of the Katolight Corporation Installation Guide, to ensure that the generator set is installed properly.

ENGINE SHUTDOWN:

1. Allow the engine to idle three to five minutes before shutting it off after a full load of operation. This allows adequate cool down of pistons, cylinders, bearings, and turbocharger components.
2. Shutters **must** operate in the same temperature range as the thermostat with which they are used.

NORMAL STARTING PROCEDURE (Above 32°F):

Caution: To prevent damage to the starter, do not engage the starting motor more than 30 seconds. Wait two minutes between each attempt to start (electrical starting motors only)

1. Disengage any driven accessories and put the transmission in neutral.

2. Activate the ignition switch to open the fuel pump shutoff valve.
3. Start the engine with the throttle in the idle position.
4. Engines equipped with air starters require a minimum of 480kPa [70psi].
5. The engine must have adequate oil pressure within 15 seconds after starting. If the warning light indicating low pressure has gone out, or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level in the oil pan.
6. Idle the engine three to five seconds before operating with a load.
7. Increase the engine speed (RPM) slowly to provide adequate lubrication to the bearings. And to allow the oil pressure to stabilize.

COLD WEATHER STARTING PROCEDURE (Below 32°F):

Using Starting Fluid With Mechanical or Electrical Metering Equipment

3. Set the throttle at idle.
4. Disengage any driven accessories and put the transmission in neutral.
5. Activate the ignition switch to open the fuel pump shutoff valve.

Caution: Do not use excessive amounts of starting fluid when starting an engine. The use of too much starting fluid will cause engine damage.

6. While cranking the engine, inject a metered amount of starting fluid.

Caution: Starting fluid is highly flammable and explosive. Keep flames, sparks, and arching switches away from starter fluid.

Due to increased safety hazards and potential for engine damage, do **not** use starting fluid without metering equipment.

7. The engine **must** have adequate oil pressure within 15 seconds after starting. If the warning light indicating low pressure has not gone out, or there is no oil pressure indicated on a gauge within 15 seconds, shut off the engine immediately to void engine damage. Confirm the correct oil level in the oil pan.
8. Do not increase the engine speed above low idle until the coolant temperature gauge needle starts to move or 10 minutes have elapsed. This will ensure adequate lubrication to the bearings.
9. Monitor the oil pressure after normal operation is initiated,

TOOL REQUIERMENTS:

Most of the maintenance operations can be performed with common hand tools (metric, and S.A.E. wrenches, sockets, and screwdrivers)

Special tools may be required for some maintenance operations. Contact the nearest Cummings Authorization Repair Location for the required service tools listed below:

Tool Part No.	Description
3375044	Torque Wrench
3375049	Oil Filter Wrench
3376592	Torque Wrench (Valve and Injector Adjustment)
3376807	Engine Coolant and fuel Filter Wrench
3823024	Injector Puller
3822524	Belt Tension Gauge, Click Type (v-belts and v-ribbed with 4 or 5 ribs)
38922525	Belt Tension Gauge, Click Type (v-belt ribbed with 6 to 12 ribs)
ST-537	Dial Depth Gauge
ST-669	Torque Wrench Adapter (Used with 3376592 Torque Wrench)
ST-1138	Thermostat Seal Mandrel
ST-1272-11	Chip Removing Tool
ST-1293	Belt tension Gauge (v-ribbed belts)

MAINTENANCE:**Maintenance Manual Page References for Maintenance Instructions****Time for Maintenance****Specific Instructions****Daily (if operated)**

1.	Inspect belts.	O& M Manual L10, P3-4
2.	Check Engine oil level.	O& M Manual L10, P3-3
3.	Check Engine Coolant level	O& M Manual L10, P3-3
4.	Inspect fan.	O& M Manual L10, P3-4
5.	Drain fuel-water separator.	O& M Manual L10, P3-3

Weekly (if operated)

1.	Check air intake system	O& M Manual L10, P4-6
2.	Check air cleaner restriction.	O& M Manual L10, P4-2
3.	Check and clean Air Cleaner Element.	O& M Manual L10, P4-3
4.	Drain air tanks.	O& M Manual L10, P4-8

Every 250 hours or 6 months

2.	Change lubricating oil.	O& M Manual L10, P5-4
3.	Change lubricating oil filters.	O& M Manual L10, P5-4
4.	Replace fuel filter.	O& M Manual L10, P5-3
5.	Check Coolant Additive Concentration (DCA4).	O& M Manual L10, P5-8
6.	Replace coolant filter.	O& M Manual L10, P5-7

Every 1,500 hours or 1 year

7.	Adjust valves and injectors.	O& M Manual L10, P6-3
8.	Steam clean engine.	O& M Manual L10, P6-12
9.	Check torque on turbocharger mounting nuts.	O& M Manual L10, P6-11
10.	Check torque on engine mounting bolts.	O& M Manual L10, P6-12
11.	Check and replace hoses as required.	O& M Manual L10, P6-10
12.	Check shutters and thermatic fan (if equipped).	O& M Manual L10, P6-11

Every 6,000 hours or 2 years

1.	Clean cooling system.	O& M Manual L10, P7-3
2.	Change coolant and antifreeze.	O& M Manual L10, P7-3

Every 6,000 hours or 3 years

1.	Clean and calibrate injectors.	O& M Manual L10, P8-3
2.	Clean and calibrate fuel pump.	O& M Manual L10, P8-13
3.	Inspect turbocharger.	O& M Manual L10, P8-16
4.	Inspect air compressor.	O& M Manual L10, P8-18
5.	Inspect fan hub.	O& M Manual L10, P8-16
6.	Inspect idler pulley assembly.	O& M Manual L10, P8-16
7.	Inspect external vibration damper.	O& M Manual L10, P8-3

SAFETY PRECAUTIONS:

1. HANDLING SAFETY PRECAUTIONS

Do not use lifting devices with marginal capacities when lifting or moving the unit. Observe the center of gravity of the equipment to be lifted and do not allow the generator set to swing if suspended. Make certain the supporting structure is adequate to support the unit. **Failure to observe this warning may result in equipment damage and serious or fatal injury.**

2. ELECTRICAL SAFETY PRECAUTIONS

Remove all electrical power before removing protective shields for maintenance. Exercise extreme caution when working on or around electrical components. Open or poorly insulated conductors are extremely dangerous during operation. A severe, possibly fatal, shock may result. Make certain that all conductors are properly insulated or guarded, all grounds are made and that the area is dry. Do not tamper with interlocks.

In the event of an accident from electrical shock, shut down the set immediately. If the set cannot be shut down, free the victim from contact with a dry nonconductor, avoiding direct contact with victim until free of the conductor. Use a dry rope, dry board or any nonconducting tool to free victim. If the victim is unconscious, apply artificial respiration and seek medical help immediately.

Follow all electrical codes when installing the equipment. Have all equipment installing performed by a licensed electrical contractor.

Do not smoke or use an open flame when servicing batteries. Batteries generate an explosive gas during charging.

3. VENTILATION SAFETY PRECAUTIONS

Make certain the area is well ventilated to dissipate any flammable vapors which may collect from fuels. When servicing any part of the electrical system or making any connections, be sure the main switch is OFF and disconnect the battery ground cable or remove the fuse in the DC system. Clean or service the generator set only when the engine is shut down. If the unit stops because of an engine safety device, do not attempt to restart until the cause for shut down has been corrected.

The engine exhaust is toxic as it contains carbon monoxide which is colorless and odorless. Make certain that the extended exhaust piping is plumbed properly and that the exhaust is not near an intake ventilator. Increase the exhaust pipe diameter as necessary to reduce back pressure. Use a minimum number of fittings and elbows to prevent back pressure in the engine exhaust system. Be sure the enclosure has proper ventilation to accommodate the engine cooling system.

4. FUEL SAFETY PRECAUTIONS

Do not fill fuel tanks while the engine is running unless the fuel tank is located outside and away from the engine compartment. Do not smoke or use open flame at any time when fuel is being handled. Fuel vapors are both toxic and flammable.

Where local codes are more stringent than the suggestions in this manual, the local codes must be given priority.

These safety suggestions apply to service of any engine using liquefied petroleum gas fuel regardless of the work to be performed. When servicing the engine, ensure that there is adequate ventilation. This is to avoid the accumulation of gas/air mixtures in and about the engine caused by undetected leaks.

Do not service the engine when any ignition source such as an open flame is present. "DANGER" signs must be placed to warn of the fire hazard. No work may be performed on the engine involving an ignition source such as open flames, cutting welding, grinding, etc.

A fire extinguisher [dry chemical or carbon dioxide, (CO₂)] must be immediately available to the mechanics when working. Careful ventilation of the area is mandatory in the event of a fuel leak.

After completing service work and before starting the unit, ventilate thoroughly to remove any possible accumulation of fuel vapors.

Any service performed on the fuel system requires that:

- All threaded connections should be sealed with a proper pipe thread compound. Replace defective fittings and reseal all connections.
- Check the fuel system for leaks. Leaks are not permissible.
- A green soap solution applied with a soft brush will bubble to indicate leaks. Never use an open flame to check for leaks. All leaks must be sealed.
- Check all flexible fuel connections, metallic and neoprene, with the soap solution.

It is important to remember that all fuel systems are pressurized. Again, be certain that the fuel valves are tightly closed and all fuel has been vented before starting any repair work on the fuel system.

Before proceeding with any service, be certain that all switches are in the OFF position, disconnect the battery ground cable and remove the fuses in direct current (DC) systems.

CAUTION: For proper unit operation, battery minus (-) terminal must always be connected to ground. Reverse connection of the battery will severely damage or destroy the battery charging alternator, regulator and other polarity sensitive devices.

Pay specific attention to see that all power leads and control connections are properly insulated before starting the set. Neglecting this may result in extensive damage to equipment and personal injury. This problem arises if the unit is started before electrical installation is completed.

5. GENERAL PRECAUTIONS

Observe all warnings found on the equipment. Ensure that warning labels are easily legible and not obstructed by dirt, grease, or other equipment.

Never remove the radiator cap when the engine is running or immediately after operation. Allow the system to cool and bleed pressure before removing cap.

Ensure that all tools and rags are removed from the equipment after servicing.

Keep fire extinguishers in accessible locations. Use appropriate fire extinguishers as recommended by NFPA.

SERVICE REQUIREMENTS:

1. GENERAL

Generator sets should be located in easy-to-clean, dry areas. When installed outdoors, the set should be a housed unit, or an enclosure should be built to protect it from weather. Do not overlook the possibility of flooding or high-water level during storms if the set is to be located in a low area such as a waterfront or basement installation.

Screens or other protection should be provided to safeguard against potential fire hazards and operational problems which can be caused by rodents, insects, birds, etc. They have been known to live or build nests inside enclosures and even inside generators. Ensure that any added protection does not interfere with unit operation or air flow.

Whenever possible, install the set in an area which can be quickly reached for repair in case of malfunction. Service entrances should be large enough to permit service of components such as the engine, radiator, or generator in the event major overhaul or replacement is needed.

Service items that are difficult to reach will not be properly maintained. Make certain ample room is provided around the set, especially at points requiring regular attention.

Common locations of items requiring service on typical liquid-cooled diesel generator sets are shown in the suppliers O&M Manual. The actual location, which varies from model to model, of all service items should be known by the maintenance personnel and considered when planning the installation. An item requiring daily attention must, of course, be made more accessible than one requiring service every 5,000 hours. Service frequency specified for common items are shown in the service schedule, Table 1.

NOTE: For standby units it is important that servicing is performed on a calendar basis, once a year or every 100 hours, since it may take years to accumulate any significant number of hours. Failure to do this may result in the set not starting or operating properly when the unit is most needed.

Table 1. Typical Service Schedule**INSPECTION:**

Thorough inspection at regular intervals will save money and prevent minor troubles arising at inconvenient times. ANY NEW or OVER-HAULED ENGINE should always be checked over for unusual conditions at the end of the first week of operation. For example, cylinder head gaskets, base pan and gear-cover gaskets, and so on, should be examined for tightness. Re-torque cylinder-head hold down nuts in order to ensure top performance henceforward. The following table embraces a practical inspection routine that may be adapted as needed to suit individual variations in operating schedules. It is suggested that the operator consider the requirements of accessory maintenance and other features of the installation so as to fit these details into the regular inspection schedule. Refer to Operator Manual for details on individual units.

INSPECTION AT TEST INTERVAL:**(RECOMMENDED WEEKLY)**

1. **Water Temperature and Oil Pressure.** Observe both before shutting down.
2. **Oil Level and Quality.** Check engine oil level. If engine is operating for the first time, examine oil after 10 hours.
3. **Coolant.** Examine condition and adequacy of supply. Rusty, scummy, or oily coolant may indicate the need for cleaning the coolant may indicate the need for cleaning the cooling system or other servicing.
4. **Fuel Supply.** Measure fuel in main tank and day tank if supplied. Drain sump traps and strainers.
5. **Air Cleaners and Breathers.** Inspect for cleanliness. Under some operating conditions, these units may require cleaning several times each day.
6. **Water, Fuel, and Lubricant Lines.** make a visual examination for indications of leaks, damaged tubing or bad joints.
7. **Accessories.** Service in accordance with the manufacturer's recommendations.
8. **Electrical.** Examine engine for any worn or frayed wiring and replace or repair as necessary.

MONTHLY INSPECTION:

1. **Noises.** Any noises that may indicate need for repair or service should be traced to their source and corrected.
2. **Engine Exterior.** Clean thoroughly using a suitable solvent such as kerosene or mineral spirits. Use care not to wash grit and dirt into inaccessible locations, around the injection nozzles, for example, where it might fall into engine later on.
3. **Fuel Injection Pump.** Change oil if dilution is apparent, also change each time main engine oil is changed. Not applicable on most engines.
4. **Mating Surfaces.** Examine for indications of leaking gaskets; test for loose cap screws, nuts, and engine hold-down bolts. Torque nuts, in areas where leaks are indicated, to specified values. Replace gaskets and retorquer evenly if leakage continues.
5. **Fan Belt.** Inspect this and other belt drives for proper tension, incipient breakage, fraying or other damage.
6. **Waterpump.** Examine for evidence of leakage.

Table 1. Typical Service Schedule (Continued)

ANNUAL INSPECTION:

Refer to engine operators manual for following inspections and maintenance interval.

1. **Engine Oil.** Change engine oil and filter.
2. **Battery.** Replacement recommended annually.
3. **Belt Tension.** Check fan and alternator belt tension and adjust properly.
4. **Injection Nozzles.** If proper equipment is available, a check of the spray characteristics and pressures may be made. If the equipment is not available and the engine is operating normally, do not disturb them.
5. **Compression.** Check each cylinder. Be sure fuel control is in "Stop" position. Uneven compression or pressures lower than those given under ENGINE DATA call for further investigation. When preceding inspection has been completed, it may be necessary to decide on valve re-grinding, bearing adjustment or other overhaul.

GENERATOR INSPECTION:

1. **Inspection.** A systematic inspection at least once a week is necessary to insure the best operation of the generator; therefore, the following plan should be given special attention and consideration.
2. **Cleanliness.** The exterior of the machine should be kept free of water, oil, dirt and grease. Clean and inspect the ventilation opening daily.
3. **Lubrication.** Katolight engine-generator sets use permanently sealed single bearing generators and normally do not need to be lubricated.

INSTRUMENTATION:

No Process Instrumentation.

Process System:	UTILITIES/PROPANE	Equipment Name:	PROPANE TRUCK UNLOADING SKID
ID/Tag No.:	SK-702	Model No.:	
Supplier:	CHESMONT	Drawing No.:	-
Manufacturer:	ELY ENERGY INCORPORATED		
Specification No:	S-4100-703	Vendor Comp. No:	

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-703-001	-	A	>100	Propane System Operation Manual
N/A	D-4110-502-009	E	D	1	Propane Utility P&ID

* Document revision may be superseded by subsequent change, check with document control for current revision

START-UP:

Not Applicable.

SHUTDOWN:

Not Applicable.

MAINTENANCE:

Normal preventative maintenance.

INSTRUMENTATION:

No Instrumentation, manual operation. The propane truck unloading skid is equipped with a pull cord for the emergency vapor shutoff valve.

Process System:	UTILITIES / PROPANE	Equipment Name:	LIQUID PROPANE TANK
ID/Tag No.:	T-700	Model No.:	
Manufacturer:	CHESMONT ENGINEERING COMPANY, INC.	Drawing No.:	-
Manufacturer:	ELY ENERGY INCORPORATED		
Specification No.:	S-4100-703	Vendor Comp. No.:	

Physical Properties of Propane	
BTU per Gallon	91,300
Cubic Feet Gas per Gallon	36.2
BTU/Cubic Ft. of Gas @ 60°F	2,500
BTU/Cubic Ft. of Gas @ 60°F	92 PSI
BTU/Cubic Ft. of Gas @ 100°F	172 PSI
Specific Gravity of Liquid @ 60°F (water -1.0)	.509
Specific Gravity of Liquid @ 60°F (air -1.0)	1.522
Boiling Point of Liquid @ Sea Level When Release to Air:	-44°

DETAILED INFORMATION ON START-UP, SHUTDOWN AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-703-001	-	A	>100	Propane System Operation Manual
N/A	D-4110-502-009	E	D	1	Propane Utility P&ID

* Document revision may be superseded by subsequent change, check with document control for current revision.

INITIAL START-UP:

For LP Tank filling procedure see Appendix B

START-UP:

Manually turn on valve located at Air Heater Skid SK-108

SHUTDOWN:

Manually turn off valve located at Air Heater Skid SK-108

EMERGENCY STOP:

There are two manual pull chord located at 20-100 feet from the propane truck unloading station. One will turn of gas supply from the propane tank to the air heater and the other will turn of the gas supply from the tank fill station to the propane tank.

MAINTENANCE:

Monthly:

1. Leak test “soap bubble test” complete LPG system while system is on-line for monthly running.
2. Plant Operators should be given the opportunity to operate the plant monthly for a 1-2 hour operation to check out equipment and keep their skills tuned.

Every Six Months:

1. Calibrate leak detection system. (if applicable)

Annually:

1. Check cathodic protection at test station. (if applicable)
2. Open all position, pressure and temperature switches, enclosures and inspect for corrosion and termination. Perform necessary maintenance.
3. Verify all field position, pressure and temperature switches operate at their correct set points. Calibrate as necessary.
4. Calibrate pressure, temperature, and level transmitters for zero and span, verify high and low trip points as necessary.
5. Calibrate all pressure and temperature gauges.
6. Inspect all equipment and piping supports for condition (cracking, heaving, etc.).
7. Inspect all plant piping and metal supports for condition; prep, prime and paint as necessary.
8. Inspect and operate all plant manual valves, maintain as necessary.

Storage Tank:

1. Every 5 years, test tank relief valves through a “VR” stamped National Board Shop.
2. Inspect tank pressure, temperature and level gauging, replace as necessary.

INSTRUMENTATION:

Liquid Propane Tank equipped with internal excess flow valves per National Fire Protection Agency (NFPA) Codes and regulations.

ID	Description	Supplied By	Mfg	Mfg ID
PCV 929A	Gas Pressure Regulator	Chesmont Engrg Co. Inc.	Rego	630-140/78
PCV 929B	Gas Pressure Reguator	Chesmont Engrg Co. Inc.	Rego	630-140/78
PRV 728A	Press. Recording Valve	Chesmont Engrg Co. Inc.		
PRV 728B	Press. Recording Valve	Chesmont Engrg Co. Inc.		
PI 728	Pressure Gage	Chesmont Engrg Co. Inc.	Marsh	P0158
TI 728	Thermometer	Chesmont Engrg Co. Inc.	Trend	30
LI 728A	Magnetl Float Gage (Located inside Tank)	Chesmont Engrg Co. Inc.	Rochester	6342-11-108
LI 728B	Rotary Liquid Level Gage	Chesmont Engrg Co. Inc.	Rego	A909R5RS

APPENDIX E

Vortec Corporation Procedure for Start-up and Shutdown of the Dust Collection System

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Vortec Corporation
Procedure for Start-up and Shutdown of the
Dust Collection System

Prepared by: Kevin Barber (SMS) / R.K. Hnat (Vortec)
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

E1. PURPOSE

This procedure defines the required equipment and actions necessary to start up and shut down the dust collection system. There are two dust collection systems, one for nuisance dust and the second for the dryer. Each dust collection system has primary filters and HEPA secondary filters.

E2. APPLICABILITY

This procedure applies to all activities associated with start-up and shutdown of the dust collection system.

E3. REFERENCES AND DEFINITIONS

BFA-4110-906-001	Operational Control Logic
BFA-4110-907-003	Instrument list
BFA-4110-905-004	Process Description
BFA-4110-907-007	Motor list
Bfa-4110-907-008	Equipment List

E4. RESPONSIBILITIES

The Control Room Operator is responsible for start-up and shutdown of the Dust Collection System.

E5. ACTION STEPS

See information with each equipment item that follows.

E6. RECORDS

See 3.11 Chapter 11, Logkeeping.
See 3.12 Chapter 12, Operations Changeover.
See Appendix L-14, Shift Changeover Checklist.

Process System:	AIR POLLUTION CONTROL	Equipment Name:	PROCESS ID BLOWER
ID/Tag No.:	B-501	Model No.:	67X1-1-1/4 RB1806-5
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg. No.:	D-4110-502-005
Manufacturer:	ROBINSON INDUSTRIES		
Specification No:	S-4100-500	Vendor Comp. No:	DA-66RB1806-109

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0500-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-500-001 Section 7, Robinson Industries, Inc Operation and Maintenance Instructions.

At least once every six months the fan should be shut down for inspection. Carefully inspect all anchor bolts for tightness, grouting for loosening or cracking. Repair any deficiencies. Check the rotor for wear – especially near the inlet piece and along the center web plate. Any significant decrease in thickness of structural parts (i.e. less than 90% of the original material thickness) remaining should be reported. It may be necessary to repair these areas – contact the supplier.

Drain a sample of lubricant from the bearings. Any milkiess may indicate the presence of water contamination. Remove the top half of the bearing housing and inspect the surface condition for damage or scars. Be sure to reassemble using proper procedure. Drain oil and change. (See bearing operation instructions and assembly drawings for type of oil.)

Check coupling bolts, bearing pedestal bolts, and bearing mounting bolts for tightness. Check mounting pad hole clearance (on center supported housing) to be sure ample clearance exists for expansion and that the hold-down bolts are properly torqued.

Supplier recommended spare parts:

SIZE 67" x 1 1/4" Robinson Type RB1806-5 Fan					
1780 RPM, 250° F Operation Temperature, Clockwise Rotation					
Shipment 8-10 weeks From Receipt of Order					
Critical Compt	Item	Qty	P/N	Description	Unit Price (Ref)
	1	1	-	Fan Wheel and Shaft Assembly	\$14,300 ea
x	2	1 pr	-	Fan Bearings	\$780.00 ea

INSTRUMENTATION:

The Blower has a manual safety switch.

ID	Description	Supplied By	Mfg	Mfg ID
HS-501D	Dryer Dust Collector Blower JOG Off Auto Switch	General Contractor.	Allcn-Bradley	800H

Process	AIR POLLUTION	Equipment Name:	DRYER HEPA
System:	CONTROL		FILTER CONTROL
			PANEL
ID/Tag No.:	ECP-505	Model No.:	
Supplier:	MAC	P&ID Dwg. No.:	D-4110-502-005
	ENVIRONMENTAL		
Manufacturer:			
Specification	S-4100-500	Vendor Comp. No:	D83299
No:			

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0500-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See ME-506A and ME-506B

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
HS-536-1	HEPA Filter Module 1 Enabled	MAC Environmental.		
HS-536-2	HEPA Filter Module 2 Enabled	MAC Environmental		
HS-536-3	HEPA Filter Module 3 Enabled	MAC Environmental		
HS-536-4	HEPA Filter Module 4 Enabled	MAC Environmental.		

Instrumentation (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
HS-536-5	HEPA Filter Module 5 Enabled	MAC Environmental		
HS-536-6	HEPA Filter Module 6 Enabled	MAC Environmental		
HS-536-7	HEPA Filter Module 7 Enabled	MAC Environmental		
HS-536-8	HEPA Filter Module 8 Enabled	MAC Environmental		

Process System:	AIR POLLUTION CONTROL	Equipment Name:	PROCESS OFFGAS HEPA FILTER MODULE
ID/Tag No.:	ME-506A, ME-506B	Model No.:	4M8S SPECIAL
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg No.:	D-4110-502-005
Manufacturer:	MAC ENVIRONMENTAL		
Specification No:	S-4100-500	Vendor Comp. No:	D29100

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0500-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

PRE-START-UP:

See VOM-4100-0500-001 Section 8.

START-UP:

Also see VOM-4100-500-001 Section 8.

1. Start Filter controls: Begin by proofing valves on filter—close discharge valves, open outlet and inlet valves (exception is taken for a module that is switched off-line). Check static pressure in compressed air manifold.
2. Start Blower: Turn on fan to specified rpm for proper airflow. Allow 30 to 60 seconds for fan to reach designated speed and airflow patterns to stabilize.

SHUTDOWN:

On a normal system shutdown, the skid shut off sequence is as follows:

1. Halt up-line equipment operation.
2. Monitor gas stream temperature until it falls below 120° F and then shut off fan.
3. After a time delay of 3 to 5 minutes, place the filter valves on their off-line (closed) position.

At this point, all skid package components are off and the skid controls are in a hold state.

MAINTENANCE:

Also see VOM-4100-0500-001 Section 9.

Routine Maintenance

1. It is recommended that one individual be assigned to monitor the operation of the dust collection system. The individual assigned should have all manufacturers maintenance manuals readily available. He should be thoroughly familiar with the manuals so as to be able to pinpoint trouble should it occur. He should also be aware of any hazardous aspects of the material being filtered.
2. The individual responsible for the system should follow a regular schedule of inspection and maintenance. The exact schedule will depend on the particular system and the number of hours it operates per day or week. However, a sample maintenance is shown below.
3. Sample Maintenance Schedule.

Daily

1. Check magnehelic gauge readings on all filters. Adverse operating conditions can be detected by a change in pressure drop.
2. Check for dust in clean-air outlet from filter. This may not be feasible due to the physical configuration of the system.
3. Check Dust containers through sight port for material level.
4. Open petcock to check for moisture in the compressed air header.

Weekly

1. Check and record magnehelic-gauge readings of all filters.
2. Check fan and motor bearings for excessive heat or vibration.

Monthly (or at manufacturer's recommended intervals)

1. Check oil in gearmotors. Do not overfill.
2. Drain condensation from compressed air supply reservoir. Check the compressed air dryer and filter for proper operation.

Six Months

1. Check belt tension on all V-belt drives.
2. Check the operation of solenoids and diaphragm valves.

3. Check condition of filter cartridges.

Filter Cartridge Maintenance

Review and follow all safety precautions printed in VOM-4100-0500-001 manual and on the safety decals on the equipment. Never open the access doors to the filter unless the system fan has been de-energized and the power supply to it has been locked out.

Follow the procedure by MIASMACT Cartridge Dust Collector Bag-In/Bag-Out contained in VOM-4100-0500-001 Section 9 when inspecting or replacing the filter cartridges.

Cleaning Air System Maintenance

- A. The diaphragm valve requires no periodic service. Should a valve malfunction, the cause is usually dirt or foreign material from the compressed air system becoming lodged between the diaphragm and the valve seat. Also, a leak in the pilot solenoid valve or the connecting pilot tubing or fittings will cause the valve to appear to be stuck open. If the valve appears to be stuck open, first check the operation of the pilot solenoid valve and look for leaks in the connecting tubing. If a diaphragm valve fails to open, check to see if the pilot solenoid valve is opening, or check for obstructions in the pilot system tubing.
- B. If the pilot solenoid is malfunctioning, replace it with a spare. If the pilot tubing or fittings are leaking or obstructed, replace or repair as required.
- C. If the pilot system appears to be functioning properly, service the diaphragm as follows:
 - 1) Depressurize the compressed air header by shutting off the supply valve and opening the bleed/drain valves on the bottom of the header, behind the leg.
 - 2) Remove the bonnet bolts and bonnet from the diaphragm body.
 - 3) Remove spring and diaphragm and check for dirt or other foreign objects that may be restricting operation or blocking passages.
 - 4) If dirt was the problem, clean and reassemble the valve.
 - 5) If diaphragm is frayed or broken, or spring is broken, clean valve and reassemble using both a new spring and diaphragm from a factory supplied repair kit. See spare parts section listed below.

Supplier recommended spare parts:

MAC Model 48S MIASMACT FILTER					
Serial #96-HEPA-07-001					
Shipment 2 weeks From Receipt of Order					
Critical Comp- onent	Item	Qty	P/N	Description	Unit Price (Ref)
	1	1	112895	2", 30 PSI ¼" Back Gauge	\$17.60 ea
	2	1	192759	2", 0-16 PSI ¼" BTM Gauge	\$17.00 ea
x	3	48	304445	Filter Cartridge	\$376.00 ea
	4	1	307140	¼" Filter Regulator	\$121.00 ea
x	5	8	307153	Material Containment Bag	\$13.50 ea
	6	1	307158	14 ¼" ID x 8" Long Stock	\$13.50 ea
	7	1	335657	¾" Filter Regulator	\$42.00 ea
	8	2	338575	Diaphragm Valve	\$136.00 ea
x	9	2	342246	3/8" NPT Uni-Muffler Filter	\$110.35 ea
	10	1	348643	Relief Valve	\$82.00 ea
	11	110'	368700	Extruded Door Gasket	\$3.30 ft
x	12	8	368770	Secondary In/Out Door Bag	\$22.00 ea
x	13	8	368780	Primary In/Out Door Bag	\$39.00 ea
x	14	32	165948	Solenoid Valve	\$38.00 ea
x	15	32	175838	1 ½" Diaphragm Valve Repair Kit	\$48.00 ea
MAC Process Control Equipment					
Serial #N/A					
Shipment 2 weeks From Receipt of Order					
Critical Comp- onent	Item	Qty	P/N	Description	Unit Price (Ref)
	1	4	169840	Hand Knob	\$11.70 ea
x	2	2	111090	Magnehelic Gauge	\$82.00 ea
BUTTERFLY VALVE					
Serial #N/A					
Shipment 2 weeks From Receipt of Order					
Critical Comp- onent	Item	Qty	P/N	Description	Unit Price (Ref)
	1	3	304444	Model F393, 8" Butterfly Valve	\$1,853.00 ea
	2	6	-	Replacement Solenoid Valve	\$224.00
	3	6	-	Re[placement 8" EPDM Seat	\$164.00

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
PDT-528	Secondary Chamber Differential Pressure	Vortec Corporation	Rosemount	1151DP4S22B1
PDT-529	Primary Chamber Differential Pressure	Vortec Corporation	Rosemount	1151DP4S22B1
PT-543	HEPA Filter Compressed Air Header Pressure	MAC Environmental	Wilka	891.12.5008341995
TE-530	Outlet Header Temperature Element	MAC Environmental		
PDI-534	Secondary Differential Pressure Indicator	MAC Environmental		
PDI-535	Primary Differential Pressure Indicator	MAC Environmental		
ZSO-531-1	Module 1 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-2	Module 2 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-3	Module 3 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-4	Module 4 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-5	Module 5 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-6	Module 6 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-7	Module 7 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-531-8	Module 8 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-1	Module 1 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-2	Module 2 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-3	Module 3 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-4	Module 4 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-5	Module 5 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-6	Module 6 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-7	Module 7 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-531-8	Module 8 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
ZSO-532-1	Module 1 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-2	Module 2 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-3	Module 3 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-4	Module 4 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-5	Module 5 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-6	Module 6 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-7	Module 7 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-532-8	Module 8 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-1	Module 1 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-2	Module 2 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-3	Module 3 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-4	Module 4 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-5	Module 5 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-6	Module 6 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-7	Module 7 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-532-8	Module 8 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-1	Module 1 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-2	Module 2 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-3	Module 3 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-4	Module 4 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-5	Module 5 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-6	Module 6 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSO-533-7	Module 7 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
ZSO-533-8	Module 8 Outlet Valve Open Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-1	Module 1 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-2	Module 2 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-3	Module 3 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-4	Module 4 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-5	Module 5 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-6	Module 6 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-7	Module 7 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
ZSC-533-8	Module 8 Inlet Valve Closed Limit Switch	MAC Environmental	Accutak Switch	2004
XY-531-1	Energize Module 1 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-2	Energize Module 2 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-3	Energize Module 3 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-4	Energize Module 4 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-5	Energize Module 5 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-6	Energize Module 6 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-7	Energize Module 7 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-531-8	Energize Module 8 Outlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-1	Energize Module 1 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-2	Energize Module 2 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-3	Energize Module 3 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-4	Energize Module 4 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-5	Energize Module 5 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-6	Energize Module 6 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
XY-532-7	Energize Module 7 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-532-8	Energize Module 8 Inlet Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-1	Energize Module 1 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-2	Energize Module 2 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-3	Energize Module 3 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-4	Energize Module 4 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-5	Energize Module 5 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-6	Energize Module 6 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-7	Energize Module 7 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-533-8	Energize Module 8 Solids Discharge Solenoid Valve	MAC Environmental	Goyen Controls	RCA3-5V4
XY-543-1A	Energize Bank 1 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-1B	Energize Bank 1 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-1C	Energize Bank 1 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-1D	Energize Bank 1 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-2A	Energize Bank 2 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-2B	Energize Bank 2 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-2C	Energize Bank 2 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-2D	Energize Bank 2 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-3A	Energize Bank 3 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
XY-543-3B	Energize Bank 3 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-3C	Energize Bank 3 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-3D	Energize Bank 3 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-4A	Energize Bank 4 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-4B	Energize Bank 4 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-4C	Energize Bank 4 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-4D	Energize Bank 4 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-5A	Energize Bank 5 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-5B	Energize Bank 5 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-5C	Energize Bank 5 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-5D	Energize Bank 5 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-6A	Energize Bank 6 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-6B	Energize Bank 6 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-6C	Energize Bank 6 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-6D	Energize Bank 6 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-7A	Energize Bank 7 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-7B	Energize Bank 7 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-7C	Energize Bank 7 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-7D	Energize Bank 7 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-8A	Energize Bank 8 Purge Solenoid Valve A	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-8B	Energize Bank 8 Purge Solenoid Valve B	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-8C	Energize Bank 8 Purge Solenoid Valve C	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"
XY-543-8D	Energize Bank 8 Purge Solenoid Valve D	MAC Environmental	Goyen Controls	40 MMP Size 1-1/2"

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
XV-531-1	Module 1 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-2	Module 2 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-3	Module 3 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-4	Module 4 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-5	Module 5 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-6	Module 6 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-7	Module 7 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-531-8	Module 8 Outlet Valve	MAC Environmental	Ultraflow	390"
XV-532-1	Module 1 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-2	Module 2 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-3	Module 3 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-4	Module 4 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-5	Module 5 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-6	Module 6 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-7	Module 7 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-532-8	Module 8 Inlet Valve	MAC Environmental	Ultraflow	390"
XV-533-1	Module 1 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-2	Module 2 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-3	Module 3 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-4	Module 4 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-5	Module 5 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-6	Module 5 Solids Discharge Valve	MAC Environmental	Ultraflow	390"
XV-533-7	Module 7 Solids Discharge Valve	MAC Environmental	Ultraflow	390"

INSTRUMENTATION (Cont'd)				
ID	Description	Supplied By	Mfg	Mfg ID
XV-533-8	Module 8 Solids Discharge Valve	MAC Environmental	Ultraflow	390"

Process System: AIR POLLUTION CONTROL	Equipment Name: PROCESS EXHAUST STACK
ID/Tag No.: ST-500	Model No.:
Supplier: TBD	P&ID Dwg No.: D-4110-502-005
Manufacturer: TBD	
Specification No: S-4100-300	Vendor Comp. No:

DETAILED INFORMATION ON START-UP, SHUTSOWN AND MAINTENANCE NOT YET AVAILABLE, SUPPLIER NOT SELECTED

START-UP:

No Start-up procedures required

SHUTDOWN:

No Start-up procedures required

MAINTENANCE:

TBD after selection of supplier

INSTRUMENTATION:

No current instrumentation. Planned future instrumentation is listed below:

ID	Description	Supplied By	Mfg	Mfg ID
AT-110A	Opacity Analyzer			

Process System:	AIR POLLUTION CONTROL	Equipment Name:	NUISANCE DUST COLLECTOR STACK
ID/Tag No.:	ST-103	Model No.:	
Supplier:	TBD	P&ID Dwg No.:	D-4110-502-004
Manufacturer:	TBD		
Specification No:	S-4100-103	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTSOWN AND MAINTENANCE
NOT YET AVAILABLE, SUPPLIER NOT SELECTED

START-UP:

No Start-up procedures required

SHUTDOWN:

No Start-up procedures required

MAINTENANCE:

TBD after selection of supplier

INSTRUMENTATION:

No current instrumentation. Planned future instrumentation is listed below:

ID	Description	Supplied By	Mfg	Mfg ID
AT-103C	Opacity Analyzer			

Process	DUST FILTATION	Equipment Name:	NUISANCE DUST
System:	SYSTEM		COLLECTOR FAN
ID/Tag No.:	B-103	Model No.:	BC300, CLASS 4, ARRG.9
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg. No.:	D-4110-502-004
Manufacturer:	TWIN CITY FAN		
Specification No:	S-4100-103	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

SYSTEM START-UP:

See VOM-4100-0103-001 Section 7.4, p 1

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001 Section 6, Twin City Fan & Blower Co., Engineering Supplement ES-52, Installation, Operation and Maintenance Manual.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
HS-103D	Nuisance Dust Collector Blower JOG Off Auto Switch	General Contractor.	Allen-Bradley	800H

Process	DUST FILTATION	Equipment Name:	NUISANCE DUST COLLECTOR DISCHARGE SCREW FEEDER
System:	SYSTEM		
ID/Tag No.:	ME-134	Model No.:	
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg. No.:	D-4110-502-004
Manufacturer:			
Specification No:	S-4100-103	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

SYSTEM START-UP:

See VOM-4100-0103-001

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-120B	Screw Feeder ME-134 Low Speed Alarm	Mac Environmental	Electro-Sensors	M100

Process System:	DUST FILTATION SYSTEM	Equipment Name:	NUISANCE ROTARY AIRLOCK
ID/Tag No.:	ME-137	Model No.:	EMD 40
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg. No.:	D-4110-502-004
Manufacturer:			
Specification No:	S-4100-103	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

SYSTEM START-UP:

See VOM-4100-0103-001

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-120H	Screw Feeder ME-137 Low Speed Alarm	Mac Environmental	Electro-Sensors	M100

Process	DUST FILTATION	Equipment Name:	NUISANCE DUST
System:	SYSTEM		COLLECTOR FILTER
ID/Tag No.:	ME-120	Model No.:	4MTF48
Supplier:	MAC	P&ID Dwg. No.:	D-4110-502-004
	ENVIRONMENTAL		
Manufacturer:			
Specification	S-4100-103	Vendor Comp.	
No:		No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

INITIAL START-UP:

See VOM-4100-0103-001 Section 7.4, p. 1.

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001 Section 8 for Daily, Weekly, Monthly, and Six Months Maintenance Schedule.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
XY-120A-1	Relay	Mac Environmental	Goyen	RCA3-8V6

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XY-120A-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-7	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120A-8	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-1	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-7	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120B-8	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-1	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-7	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-120C-8	Relay	Mac Environmental	Goyen	RCA3-8V6

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XV-120A-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-7	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120A-8	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-7	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120B-8	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-120C-7	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XV-120C-8	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
KY-120J	Run Nuisance Dust Collector Bag Cleaning Timer Board	Mac Environmental	National Controls Corporation	DNC-T2032- A10
PDIT-120E	Bag Differential Pressure	Mac Environmental	Dwyer	3020SGT- TAMP-LT
PDIT-120F	HEPA Filter Differential Pressure	Mac Environmental	Dwyer	3020SGT- TAMP-LT
LSH-120C	Discharge High Level Alarm	Mac Environmental	Bindicator	RA-2
HS-120K	Screw Conveyor and Rotary Air Lock JOA Switch	General Contractor	Allen Bradley	800H
PT-120G	ME120 Inlet Pressure	Vortec Corporation	Rosemount	3051CG2A22A1 AB4

Process	DUST FILTATION	Equipment Name:	DRYER DUST COLLECTOR
System:	SYSTEM		
ID/Tag No.:	ME-111	Model No.:	3MTF36
Supplier:	MAC ENVIRONMENTAL	P&ID Dwg. No.:	D-4110-502-004
Manufacturer:			
Specification No:	S-4100-103	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

INITIAL START-UP:

See VOM-4100-0103-001 Section 7.4, p. 1.

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001 Section 8 for Daily, Weekly, Monthly, and Six Months Maintenance Schedule.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
XY-111A-1	Relay	Mac Environmental	Goyen	RCA3-8V6

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XY-111A-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111A-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111A-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111A-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111A-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-1	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111B-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-1	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-2	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-3	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-4	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-5	Relay	Mac Environmental	Goyen	RCA3-8V6
XY-111C-6	Relay	Mac Environmental	Goyen	RCA3-8V6
XV-111A-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111A-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111A-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111A-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111A-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111A-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XV-111B-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111B-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111B-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111B-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111B-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111B-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-1	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-2	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-3	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-4	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-5	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
XV-111C-6	Diaphragm Valve	Mac Environmental	Goyen	RCA25DD
KY-111G	Run Dryer Dust Collector Bag Cleaning Timer Board	Mac Environmental	National Controls Corporation	DNC-T2020-A10
PDIT-111E	Bag Differential Pressure	Mac Environmental	Dwyer	3020SGT-TAMP-LT
LSH-111C	Discharge High Level Alarm	Mac Environmental	Bindicator	RF9000
HS-111J	Screw Conveyor and Rotary Air Lock JOA Switch	General Contractor	Allen Bradley	800H
PI-111F	ME111 Inlet Pressure	Vortec Corporation	Rosemount	3051CG2A22A1 AB4

Process	DUST FILTATION	Equipment Name:	DRYER DUST
System:	SYSTEM		COLLECTOR SCREW
			CONVEYOR
ID/Tag No.:	ME-132	Model No.:	
Supplier:	MAC	P&ID Dwg. No.:	D-4110-502-004
	ENVIRONMENTAL		
Manufacturer:			
Specification	S-4100-103	Vendor Comp.	
No:		No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

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-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

SYSTEM START-UP:

See VOM-4100-0103-001

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-111B	Screw Feeder ME-132 Low Speed Alarm	Mac Environmental	Electro-Sensors	M100

Process	DUST FILTATION	Equipment Name:	DISCHARGE
System:	SYSTEM		ROTARY AIRLOCK
ID/Tag No.:	ME-110	Model No.:	EMD 40
Supplier:	MAC	P&ID Dwg. No.:	D-4110-502-004
	ENVIRONMENTAL		
Manufacturer:			
Specification	S-4100-103	Vendor Comp.	
No:		No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0103-001	-	-	>200	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

SYSTEM START-UP:

See VOM-4100-0103-001

START-UP:

Per PLC Control Logic

SHUTDOWN:

Per PLC Control Logic

MAINTENANCE:

See VOM-4100-0103-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-111H	Screw Feeder ME-110 Low Speed Alarm	Mac Environmental	Electro-Sensors	M100

APPENDIX F

Vortec Corporation Procedure for Normal and Emergency Shutdown of the Plant

Vortec Corporation
Procedure for Start-up and Shutdown of the

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02

F1. PURPOSE

This procedure defines the required equipment and normal actions necessary to shut down the Vortec Pre-Treatment and Conditioning System and the procedures for emergency shutdown.

F2. APPLICABILITY

This procedure applies to all activities associated with emergency, normal, and long-term shutdown of the Vortec system, and the placement of the facility in a deactivated condition.

F3. PRECAUTIONS AND LIMITATIONS

All field personnel will be required to have appropriate personal protective equipment (PPE) to minimize exposure to hazardous substances. See Appendix M for PPE

F4. PREREQUISITES

The procedure user must complete the following actions and/or the following requirements must be met and verified before the execution of this procedure:

F4.1 TRAINING PREREQUISITES

Supporting documents that pertain to the operation of the Vortec system include the following:

- Operation and Maintenance Manual for the Vortec Soil Preparation and Conditioning System;
- Equipment manuals; and
- Programmable Logic Controller Manual.

F4.2 SPECIAL TOOLS, EQUIPMENT, PARTS, AND SUPPLIES

No special tools, equipment, or supplies will be required to shut down the Vortec system.

F4.3 APPROVALS AND NOTIFICATIONS

Obtain the permission of the Vortec Site Manager or designee prior to the implementation of this procedure, unless the shutdown is an emergency.

F5. SHUT-DOWN SEQUENCE

F5.1 EMERGENCY SHUTDOWN

Emergency shutdown will be conducted when the condition or the status of the Vortec system could cause personnel injury or equipment damage. The following shut-down steps interrupt the power at the facility.

- (1) Push the main Emergency Shut-down button on the main control panel. E-Stop's are also located on ECP-100 Shredder Loading Station Control Panel and ECP -197 Product Discharge Control Panel.
- (2) Notify the Vortec Site Manager or designee.
- (3) Initiate normal shut-down procedures when ready.
- (4) Record event and sign log.

F5.2 NORMAL (SHORT-TERM) SHUT-DOWN SEQUENCE

Maintenance shut down sequence is a situational requirement and will be determined by the Operations Manager.

The normal, short-term shutdown sequence is as follows:

Step	Description	Short Term Process	Total Long Term (may be left unattended)
(1)	Stop feeding drums into the Skip Hoist	X	X
(2)	Secure and shut down the Manipulating Arm	X	X
(3)	Secure the Skip Hoist at its bottom position	X	X
(4)	Shut down the Primary Shredder	X	X
(5)	Shut down the Secondary Shredder	X	X
(6)	Shut down the Conveyor C-3	X	X
(7)	Shut own the Rotary Dryer	X	X
(7a)	Shut down the Air Heater	X	X
(7a1)	Close propane supply valve to Air Heater	X	X
(7b)	Shut Down the Dryer Inlet Airlocks	X	X
(7c)	Shut down the Rotary Dryer shell	X	X
(7d)	Shut down the dryer Outlet Airlocks	X	X

Step	Description	Short Term Process	Total Long Term (may be left unattended)
(8)	Shut down the Conveyor C-4	X	X
(9)	Shut down the tramp iron magnet	X	X
(10)	Close the Attemperating Air Inlet Valve		X
(11)	Shut down Pneumatic Conveying System		X
(11a)	Shut down the Filter Screw Feeders and Rotary Airlocks		X
(11b)	Shut down the Filter Receiver		X
(11c)	Shut down the Filter Receiver Discharge Airlocks		X
(11d)	Shut down the Pneumatic Conveyer Blower		X
(12)	Secure all Product-Loading Hoods		X
(13)	Shut down the Dust Collector		X
(14)	Secure and shut down the Dryer HEPA Filter		X
(15)	Shut down the Dryer Blower		X
(16)	Shut down the Nuisance Dust Collector		X
(17)	Shut down the Nuisance Dust Collector Fan		X
(18)	Shut down the air compressor		X
(19)	Shut down the Air Dryer		X
(20)	Bleed off air pressure from the Dryer Air Receiver		X
(21)	Shut down control room PLC's		X
(22)	Shut down HMI terminals		X
(23)	Shut off power		X
(24)	Record event and sign Log	X	X

F6. VALVE ALIGNMENT FOR SHUTDOWN

Valve alignment for shut down is divided into subsystems. Each individual equipment skid also has a specific valve and operating alignment associated with this procedure. The valve alignments will change depending upon the process operation at any given time. Normal valve alignment for the shutdown is as follows:

PRE-TREATMENT and CONDITIONING SYSTEM

Valve	Valve Name	Position	Verification *
ME-105A	Dryer Feed Airlock Gate A	Closed	HMI
ME-105B	Dryer Feed Airlock Gate B	Closed	HMI
ME-117A	Dryer Discharge Airlock Gate A	Closed	HMI
ME-117B	Dryer Discharge Airlock Gate B	Closed	HMI
XV-151	Valve, Attemperating Air Inlet	Closed	Manual Valve
-	Dryer Cleanout	Closed	Manual Valve

DUST COLLECTION CONTROL SYSTEM

Valve	Valve Name	Position	Verification*
XV-120A - x	Valve, Nuisance Dust Primary Filter	Closed	Solenoid Valve
XV-120B - x	Valve, Nuisance Dust Primary Filter	Closed	Solenoid Valve
XV-120C - x	Valve, Nuisance Dust Primary Filter	Closed	Solenoid Valve
XV-111A - x	Valve, Dryer dust Primary Filter	Closed	Solenoid Valve
XV-111B - x	Valve, Dryer dust Primary Filter	Closed	Solenoid Valve
XV-111C - x	Valve, Dryer dust Primary Filter	Closed	Solenoid Valve
XV-533 - x	Valve, HEPA to Conveyors	Closed	HMI
XV-531 - x	Valve, HEPA Filter Outlets	Open	HMI
XV-532 - x	Valve, HEPA Filter Inlets	Open	HMI
XY-543 - xA	Valve, HEPA Primary Filter	Closed	Solenoid Valve
XY-543 - xB	Valve, HEPA Primary Filter	Closed	Solenoid Valve
XY-543 - xC	Valve, HEPA Primary Filter	Closed	Solenoid Valve
XY-543 - xD	Valve, HEPA Primary Filter	Closed	Solenoid Valve
XV-128B - x	Valve, Filter Receiver	Closed	Solenoid Valve
ME-131A	Pneumatic Product Air Lock	Closed	HMI
ME-131B	Pneumatic Product Air Lock	Closed	HMI

UTILITIES SYSTEM

Valve	Valve Name	Position	Verification*
-	T-703 Dry Air Receiver Drain Valve	Open	Manual Valve
-	Propane Supply Valve for Heater	Closed	Manual Valve

*** Verification Note**

HMI – Indication on Operator Screen

Manual Valve – Operator inspects valve

Solenoid valve – No indication, but no control power will close valve

F7. RECORDS

The implementation of this procedure shall be documented in the appropriate logbook. Difficulties or deviations from the procedure shall be recorded, along with any suggested modifications to the procedure.

APPENDIX G

Vortec Corporation Procedure for Start-up and Shutdown of the Pre-Treatment and Conditioning System

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Vortec Corporation
Procedure for Start-up and Shutdown of the
Pre-Treatment and Conditioning System

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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G1. PURPOSE

This procedure defines the required equipment and actions necessary to start up and shut down of the Pre-Treatment and Conditioning System. This system consists of a drum scale, manipulating arm, skip hoist, primary shredder, secondary shredder, conveyor C-3, rotary homogenizer/dryer, conveyor C-4, ferrous metal separator, and product discharge/handling.

G2. APPLICABILITY

This procedure applies to all activities associated with start up and shut down of the Pre-Treatment and Conditioning System.

G3. REFERENCES AND DEFINITIONS

BFA-4110-906-001	Operational Control Logic
BFA-4110-907-003	Instrument list
BFA-4110-905-004	Process Description
BFA-4110-907-007	Motor List
BFA-4110-907-008	Equipment list

G4. RESPONSIBILITIES

The Control Room Operator is responsible for start-up and shutdown of the Pre-Treatment and Conditioning System.

G5. ACTION STEPS

See information with each equipment item that follows.

G6. RECORDS

See 3.11 Chapter 11, Logkeeping.
See 3.12 Chapter 12, Operations Changeover.
See Appendix L-14, Shift Changeover Checklist.

BFA-4110-904-005 (0) Ltd Demo Operational Plan

Process System: **FEED CONDITIONING** Equipment Name: **BELT CONVEYOR**

ID/Tag No.: **ME-102 (CONVEYOR C-3)** Model No.: -
ME-114 (CONVEYOR C-4)

Supplier: **CONTINENTAL SCREW CONVEYORS.** Drawing No.: **CONVEYOR C-3**
VP-4110-0108-001
VP-4110-0108-002
VP-4110-0108-003

CONVEYOR C-4
VP-4110-0108-004
VP-4110-0108-005
VP-4110-0108-006
VP-4110-0108-007

Manufacturer: **CONTINENTAL SCREW CONVEYORS.**

Specification No.: **S-4110-108** Vendor Comp. No.: -

DETAILED INFORMATION ON START-UP, SHUTDOWN AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VL-4110-0108-001	-	A	5	Model RS, Cable Operated Safety Stop Switch for Conveyors
-	VL-4110-0108-002	-	A	4	Recoat Epoxy Primer
-	VL-4110-0108-003	-	A	2	High Solids Acrylic Enamel
-	VL-4110-0108-004	-	A	3	Flexco® Bolt Solid Plate Splice Patterns
-	VL-4110-0108-005	-	A	6	Model CT Tilt Level Control
-	VL-4110-0108-006	-	A	1	Model CMS Compact motion Switch
-	VL-4110-0108-007	-	A	1	Model TA, Belt Alignment Switch
-	VL-4110-0108-008	-	A	4	Belt Cleaners
-	VOM-4110-108-xxx	-	A	TBD	Operation and Maintenance Manual (Not Yet Available)
N/A	D-4110-502-002	E	D	1	Drying System P&ID (Conveyor C-3)
N/A	D-4110-502-003	E	D	1	Metal Separation P&ID (Conveyor C-4)

* Document revision may be superseded by subsequent change, check with document control for current revision.

INITIAL START-UP:

Not Yet Available, O&M Manual from supplier to be furnished at TBD subsequent date.

START-UP:

Per PLC Logic

SHUTDOWN:

Per PLC Logic

EMERGENCY STOP:

See Appendix F

MAINTENANCE:

Not Yet Available, O&M Manual from supplier to be furnished at TBD subsequent date.

INSTRUMENTATION:

Conveyor C-3

ID	Description	Supplied By	Mfg	Mfg ID
SSL-102E	Speed Low Alarm Switch	Continental Screw Conveyor		
HS-102A	Pull Chord Switch	Continental Screw Conveyor		
HS-102B	Pull Chord Switch	Continental Screw Conveyor		
ZS-102C	Alignment Switch	Continental Screw Conveyor		
ZS-102D	Alignment Switch	Continental Screw Conveyor		
LSH-102F	Plugged Chute Alarm	Continental Screw Conveyor		
HS-102H	Jog/Off/ Automatic Switch	General Contractor	Allen-Bradley	800H

Conveyor C-4

ID	Description	Supplied By	Mfg	Mfg ID
SSL-114E	Speed Low Alarm Switch	Continental Screw Conveyor		
HS-114A	Pull Chord Switch	Continental Screw Conveyor		
HS-114B	Pull Chord Switch	Continental Screw Conveyor		

Conveyor C-4 Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
ZS-114C	Alignment Switch	Continental Screw Conveyor		
ZS-114D	Alignment Switch	Continental Screw Conveyor		
LSH-114F	Discharge Chute High Level Alarm	Continental Screw Conveyor		
HS-114H	Jog/Off/ Automatic Switch	General Contractor	Allen-Bradley	800H

Process System:	DRUM RECEIVING AND SHREDDING	Equipment Name:	DRUM SCALE
ID/Tag No.:	ME-186	Model No.:	HI FS 330233S
Supplier:	HARDY INSTRUMENTS	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	MULTI-MEASUREMENTS	Capacity:	2,000 LBS
Specification No:	S-4100-310	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0310-003	-	-	22	Installation and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Not connected to PLC, independent operation. Place load on scale.

SHUTDOWN:

Not connected to PLC, independent operation. Remove load from scale.

MAINTENANCE:

See VOM-4100-0310-003.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
WI-186	Weight Indicator			

Process	DRUM RECEIVING	Equipment Name:	MANIPULATING
System:	AND SHREDDING		ARM
ID/Tag No.:	ME-196	Model No.:	TYPE MB650
Supplier:	GEORGE HEIM CO.	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	EGROTECH AB	Capacity:	1,200 LBS
Specification	S-4100-123	Vendor Comp. No:	
No:			

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
15.105.1995	VOM-4100-0123-001	-	-	6	Users Manual
-	VOM-4100-0123-002	-	-	66	Ergolift MB Spec NR 736

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Not connected to PLC, manual independent operation. Turn on power switch.

SHUTDOWN:

Not connected to PLC, manual independent operation. Turn off power switch..

MAINTENANCE:

See VOM-4100-0123-001 page 4.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
HS-196A	Local on/off switch	Vortec Corporation	Allen-Bradley	800H

Process	DRUM RECEIVING	Equipment Name:	SKIP HOIST
System:	AND SHREDDING		
ID/Tag No.:	ME-184	Model No.:	
Supplier:	BEAUMONT BIRCH	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	BEAUMONT BIRCH	Capacity:	10 DRUMS/HR 1,200 LBS
Specification No:	S-4100-121	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VL-4100-0121-005	-	A	-	Dodge Maxum Reducers Installation, Maintenance, and Repair
-	VL-4100-0121-006	-	A	-	Limit Switches – Types AW & C-Lever Arms
-	VC-4100-0121-007	-	A	-	Baldor Electric Motor Data
-	VOM-4100-0121-011	-	A	77	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

The skip hoist has a control panel (ECP-184)

START-UP:

Per PLC Logic

SHUTDOWN:

Per PLC Logic

MAINTENANCE:

For Skip Hoist Winding Machine Maintenance Instructions, See VOM-4100-0121-011 page 2-2.

For Skip Hoist Cable Maintenance Instructions, See VOM-4100-0121-011 page 2-3.

For Skip Hoist Bucket & track Maintenance Instructions, See VOM-4100-0121-011 page 2-4.

For General Lubrication Guidelines, See VOM-4100-0121-011 page 2-16 thru 2-19.

For Component Lubrication Information, See VOM-4100-0121-011 page 2-26.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
ZSO-184A	Position Switch at High	Beaumont Birch	Allen-Bradley	802T-ATP
ZSO-184B	High Overtravel Switch	Beaumont Birch	Allen-Bradley	802T-ATP
ZSO-184C	Position Switch at Low	Beaumont Birch	Allen-Bradley	802T-ATP
ZSO-184D	Low Overtravel Switch	Beaumont Birch	Allen-Bradley	802T-ATP
ZSO-184G	Gate Open limit Switch	Vortec Corporation		

Process System:	DRUM RECEIVING AND SHREDDING	Equipment Name:	PRIMARY DRUM SHREDDER
ID/Tag No.:	ME-101	Model No.:	2400-H
Supplier:	SSI	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	SSI	Capacity:	3,000 LB/HR (200HP)
Specification No:	S-4100-104	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VL-4100-0104-006	-	A	2	2400H Instrument List
-	VOM-4100-0104-002	-	A	90	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

The Shredder Station has a shredder control panel (ECP-101) that controls both the primary shredder (ME-101) and the secondary shredder (ME-154A). The primary shredder includes a Shredder Ram (ME-130) and a Hydraulic power Unit.

INITIAL START-UP:

See VOM-4100-0104-002 page 11.

For Ram Hopper Start-up, see VOM-4100-0104-002 page 12.

START-UP:

Per PLC Logic. Also see VOM-4100-0104-002 page 13.

SHUTDOWN:

Per PLC Logic. Also see VOM-4100-0104-002 page 15.

MAINTENANCE:

For Preventative Maintenance Instructions, see VOM-4100-0104-002 page 17.

For Maintenance Schedule, see VOM-4100-0104-002 page 18 thru 21.

For Maintenance Procedures, see VOM-4100-0104-002 page 22.

For Service Instructions, see VOM-4100-0104-002 page 30 thru 35.

For other component maintenance such as the Dennison Vane Type Double Pump and the Lincoln Motors see Operating Instructions included in VOM-4100-0104-002.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
ZSC-101M	Receiving Hopper Inspection Door Closed Switch	SSI	Allen-Bradley	802-T

Also see VL-4100-0104-006

Process System:	DRUM RECEIVING AND SHREDDING	Equipment Name:	SECONDARY DRUM SHREDDER
ID/Tag No.:	ME-154	Model No.:	M85-H
Supplier:	SSI	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	SSI	Capacity:	3,000 LB/HR (100HP)
Specification No:	S-4100-104	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VL-4100-0104-007	-	A	2	M85-H Instrument List
-	VOM-4100-0104-001	-	A	159	Installation, Operation, and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

The Shredder Station has a shredder control panel (ECP-101) that controls both the primary shredder (ME-101) and the secondary shredder (ME-154A).

INITIAL START-UP:

See VOM-4100-0104-001 page 11.

START-UP:

Per PLC Logic. Also see VOM-4100-0104-001 page 13.

SHUTDOWN:

Per PLC Logic. Also see VOM-4100-0104-001 page 15.

MAINTENANCE:

For Preventative Maintenance Instructions, see VOM-4100-0104-001 page 17.

For Maintenance Schedule, see VOM-4100-0104-001 page 18 thru 21.

For Maintenance Procedures, see VOM-4100-0104-001 page 21.

For Service Instructions, see VOM-4100-0104-001 page 22 thru 33.

For other component maintenance such as the RHL Hydraulic Motors, Sauder Sunstran Pumps and the Lincoln Motors see Operating Instructions included in VOM-4100-0104-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
ZSC-154A	Transition Chute Assess Door Closed Switch	SSI	Allen-Bradley	802-T

Also see VL/4100-0104-007

Process	DRUM RECEIVING	Equipment Name:	SHREDDER
System:	AND SHREDDING		LOADING STATION
			CONTROL PANEL
ID/Tag No.:	ECP-100	Model No.:	
Supplier:	VORTEC CORPORATION	P&ID Dwg. No.:	D-4110-502-001
Manufacturer:	SSI	Capacity:	
Procurement Package:	P-4100-1002-A	Vendor Comp. No:	

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

TBD

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
XT-100G	Shredder Video Camera	Vortec Corporation		
YL100E	OK to Load Drum Light	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL184H	Skip Hoist motor (Up) Running Indic. Light	Vortec Corporation	Allen-Bradley	800H-PRL16R
YL 184J	Skip Hoist motor (Down) Running Indic. Light	Vortec Corporation	Allen-Bradley	800H-PRL16R

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
HMS-100	Horn Silence Button	Vortec Corporation	Allen-Bradley	800H-AR1D1
HMS-100A	Skip Hoist Start Push Button	Vortec Corporation	Allen-Bradley	800H-AR1D1
HMS-100D	Raise Skip Hoist Switch (Manual)	Vortec Corporation	Allen-Bradley	800H-AR1D1
HMS-100F	Lower Skip Hoist Switch (Manual)	Vortec Corporation	Allen-Bradley	800H-AR1D1
HS-100B	Emergency Stop	Vortec Corporation	Allen-Bradley	800H-FRXT6A5
HS-100C	Slip Hoist Auto/Manual Switch	Vortec Corporation	Allen-Bradley	800H-HR2A
XA-100	Alarm Horn	Vortec Corporation	Federal Signal	350-WB
XI-100G	Shredder Video Display	Vortec Corporation		

Process	DRYING	Equipment Name:	HOMOGINIZER/ DRYER
System:		Model No.:	
ID/Tag No.:	ME-106		
Supplier:	L&L PROCESS INDUSTRIES. INC	P&ID Dwg. No.:	D-4110-502-002
Manufacturer:	L&L PROCESS INDUSTRIES. INC	Capacity:	6' ID X 50' LONG
Procurement Package:	S-4100-101	Vendor Comp. No:	

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0101-028	16.1	A	11	Global Electric Vibrator Model Installation and Operations Manual
-	VOM-4100-0101-050	16.1	A	31	Rotary Dryer Installation Instructions and Maintenance Manual
-	VOM-4100-0101-051	16.1	A	33	PEBCO Gates and Valves Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

This includes ME-105A Inlet Gate, ME-105B Inlet Gate, ME-117A Discharge Gate, and ME-117B Discharge Gate. There is an Emergency Shutdown Push Button, HS106H, for Pad 3/3A where the dryer is installed.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

See VOM-4100-0101-028, VOM-4100-0101-050, and VOM-4100-0101-051.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-106A	Dryer Rotational Speed Switch	L&L	Telemecanique	Emitter-XULM0600
TE-106C	Rotary Dryer Exit Temperature	Vortec Corporation	Pyromation	R1T285H3-SL6E1508-8HN31-
TE-106E	Rotary Dryer Exit Temperature	Vortec Corporation	Pyromation	R1T285H3-SL6E1508-8HN31-
LSH-106D	Rotary Dryer Exit Chute High Level Alarm			
HS-106F	Rotary Dryer JOG/Off/Auto Switch	General Contractor	Allen-Bradley	800H
XY-105C	Energize Inlet Air Lock Slide Gate A Air Solenoid Valve	L&L (ME-105A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
XY-105F	Energize Inlet Air Lock Slide Gate B Air Solenoid Valve	L&L (ME-105B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
XY-117C	Energize Outlet Air Lock Slide Gate A Air Solenoid Valve	L&L (ME-117A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
XY-117F	Energize Outlet Air Lock Slide Gate B Air Solenoid Valve	L&L (ME-117B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSC-105A	Inlet Air Lock Slide Gate A Closed limit Switch	L&L (ME-105A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSC-105E	Inlet Air Lock Slide Gate B Closed limit Switch	L&L (ME-105B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSC-117A	Inlet Air Lock Slide Gate A Closed limit Switch	L&L (ME-117A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSC-117E	Inlet Air Lock Slide Gate B Closed limit Switch	L&L (ME-117B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSO-105B	Inlet Air Lock Slide Gate A Open limit Switch	L&L (ME-105A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZSO-105D	Inlet Air Lock Slide Gate B Open limit Switch	L&L (ME-105B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZCO-117B	Inlet Air Lock Slide Gate A Open limit Switch	L&L (ME-117A)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
ZCO-117D	Inlet Air Lock Slide Gate B Open limit Switch	L&L (ME-117B)	Pebco	PGRSDP-18-PA-CS-A4-RS-M
HS106H	Emergency Shut Down Button (Pad 3/3A)	General Contractor	Allen-Bradley	800H-FRXT-6A5
Instrumentation				
PLC Control (Data in Process)				
ID	Description	Supplied By	Mfg	Mfg ID
TBD	TBD	TBD	TBD	TBD

Process System: ID/Tag No.:	DRYING SK-108 MODIFIED	Equipment Name: Model No.:	AIR HEATER SKID
Supplier:	PROCESS COMBUSTION CORPORATION	P&ID Dwg. No.:	D-4110-502-002
Manufacturer:	PROCESS COMBUSTION CORPORATION	Capacity:	
Procurement Package:	S-4100-102	Vendor Comp. No:	

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VL-4100-0102-004	A	A	4	Sequence of Operation ME-108 Air Heater
NDR-0659-8/E	VOM-4100-0102-001	-	A	>200	PEBCO Gates and Valves Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

Note: SK-108 has been modified by Vortec Corporation to support the Pre-Treatment and Conditioning System Design. The SK-108 Skid includes ME-108 Air Heater and ECP-102 Combustion Control Panel.

ME-108 AIR HEATER INITIAL START-UP:

See VOM-4100-0102-001 Section 4 located on p 8 of Tab Section 2-6.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

See VOM-4100-0102-001 Section 6 located on p 15 of Tab Section 2-6.

General maintenance instructions for air heater components are contained in VOM-4100-0102-001.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
BE-108D	Air Heater Flame On	Process Combustion	Honeywell	C7012E1112
TE-108T				
TE-108G	Air Heater Exit Gas RTD	Vortec Corporation	Pyromation	R1T285H3-SL6E1808-8HN31-
FLS-108H	Air Heater Low Air Flow	Vortec Corporation	FCI	1B-1A106C-1AA40-00
FQIT-108S	Propane to Air Heater	Vortec Corporation	FCI	AE3-A-2FA-00
PI-108K	Air Heater Main Gas Pressure Gauge	Process Combustion	Ashcroft	45-1188-S-04L
PI-108Q	Air Heater Burner Gas Pressure Gauge	Process Combustion	Ashcroft	45-1188-S-04L-5
PI-108R	Air Heater Pilot Gas Pressure Gauge	Process Combustion	Ashcroft	45-1188-S-04L
PSH-108N	Air Heater High Gas Pressure Switch	Process Combustion	Ashcroft	B422TXFSFMNHTA
PSL-108L	Air Heater Low Gas Pressure Switch	Process Combustion	Ashcroft	B422TXFSFMNHTA
PCV-108J	Air Heater Gas Pressure Regulator	Vortec Corporation	Fisher	99 Series
TY108P	Temperature Relay			
TCV-108A	Air Heater Natural Gas Control Valve	Process Combustion	Asco	8210G94
FI-108M	Air Heater Sight Flow Indicator	Process Combustion	Anderson-Midwest	SFI-model No. 300
HS-108U	Air Heater E-Stop Button (located in Control Room)	General Contractor	Allen-Bradley	800H-FRXT6A5

Process	METAL	Equipment Name:	TRAMP IRON
System:	SEPARATION		MAGANET
ID/Tag No.:	ME-129	Model No.:	SE-7310
Supplier:	ERIEZ	P&ID Dwg. No.:	D-4110-502-003
	MAGNETICS		
Manufacturer:	ERIEZ	Capacity:	
	MAGNETICS		
Procurement	S-4100-115	Vendor Comp. No:	
Package:			

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
Publication No. 130	VOM-4100-0115-001	-	A	1	Instructions for Bulletin 2210 & 2220 Speed Response Switches (Hubbell Industrial Controls, Inc.)
SB620D/SM-620C	VOM-4100-0115-002	-	A	7	Powertrol DC Power Supplies and Installation, Operation, and Maintenance Instructions
SB-233E/Sm-320J	VOM-4100-0115-003	-	A	11	Series 7000 Suspended Electromagnets and Installation, Operation. And Maintenance Instructions,
SB-240K/SM-240B	VOM-4100-0115-006	-	A	10	Magnetic Pulleys, Permanent and Electric; and Installation. Operation, and Maintenance Instructions
-	VOM-4100-0115-007	-	A	8	Instruction Manual for Dodge® Torque-Arm™ Speed Reducers, Straight Bore and Tapered Bushed

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

No Scheduled Maintenance for Powertrol Silicon Rectifier Power Supplies.

See VOM-4100-0115-003, SM-320J, Page 9 for maintenance of Suspended Electro-Magnets.

See VOM-4100-0115-006, SM-240B, Page 5 for maintenance of Suspended Magnetic Pulleys.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
SSL-129C	Tramp Iron Magnet Low Speed Alarm	Eriez Magnetics		
ISL-129C	Tramp Iron Magnet Low Current Alarm	Eriez Magnetics		
TSH-129B	Tramp Iron Magnet High Temperature Alarm	Eriez Magnetics		
HS-129D	Tramp Iron Magnet Conveyor JOG-Off-Auto Switch	General Contractor	Allen Bradley	800H
HS-129E	Tramp Iron Magnet JOG-Off-Auto Switch	General Contractor	Allen Bradley	800H

Pneumatic Conveying

The Pneumatic Conveying equipment includes the ME-113 Pneumatic Conveyor Air filter, B-113 Pneumatic Conveyor Blower, ME-128 Filter Receiver, ME-131A Pneumatic Product Air Lock, and ME-131B Pneumatic Product Air Lock.

Process	PNEUMATIC	Equipment Name:	PNEUNATIC CONVEYOR BLOWER
System:	CONVEYING		
ID/Tag No.:	B-113	Model No.:	7MP
Supplier:	HARDY SYSTEMS	P&ID Dwg. No.:	D-4110-502-006
Manufacturer:	SUTORBILT®	Capacity:	
Procurement	S-4100-103	Vendor Comp. No:	
Package:			

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
SB-7-622 1 st Edition	VOM-4100-0100-053	-	A	20	Parts list, Operating and Service Manual
	VL-4100-0100-038	-	A	5	Sturobilt® Blower Curve and Specifications

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

See VOM-4100-0100-053.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
PI-112	Pressure Indicator			
HS-113D	Blower B-113 JOG Off Auto Switch	General Contractor	Allen-Bradley	800H

PI-112B	Pressure Indicator			
Process	PNEUMATIC	Equipment Name:	PNEUNATIC CONVEYOR AIR FILTER	
System:	CONVEYING			
ID/Tag No.:	ME-113	Model No.:		
Supplier:	HARDY SYSTEMS	P&ID Dwg. No.:	D-4110-502-006	
Manufacturer:	STODDARD	Capacity:		
Procurement Package:	S-4100-100	Vendor Comp. No:		

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	TBD	-	A	-	TBD

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

See TBD Manual.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
PDT-113A	Pneumatic Transport High Pressure Alarm	Vortec Corporation	Rosemount	1151DP4S22B1
PDI-113A	Pneumatic Differential Indicator			

Process System: PNEUMATIC CONVEYING	Equipment Name: PNEUNATIC CONVEYOR AIR FILTER RECEIVER
ID/Tag No.: ME-128	Model No.:
Supplier: HARDY SYSTEMS	P&ID Dwg. No.: D-4110-502-006
Manufacturer: HARDY SYSTEMS	Capacity:
Procurement Package: S-4100-100	Vendor Comp. No:

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	TBD	-	A	-	TBD

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

See TBD Manual.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
KY-128B	Run Air Filter Timer	Hardy Systems	National Controls	
XY-128B-5	Relay			
XY-128B-1	Relay			
XV-128B-1	Relay			
XV-128B-5	Relay			
PSH-112A	Pneumatic transport High Pressure Alarm	Hardy Systems	Ashcroft	Vacuum Switch LPDN4-G25-3
XY-131A	Energize Double Gate Solenoid Valve A	Hardy Systems	ASCO	8210

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XY-131B	Energize Double Gate Solenoid Valve B	Hardy Systems	ASCO	8210
XY-131C	Energize Double Gate Solenoid Valve C	Hardy Systems	ASCO	8210
PDIT-128C	Filter Receiver Differential Pressure	Hardy Systems	Rosemount	1151DP3552
LSH-128A	Filter Receiver High Level Alarm	Hardy Systems	Bindicator	LMR180000 mini Roto Level
ZSC-131A	Filter Receiver Discharge Gate A Closed	Hardy Systems	ASCO	8210
ZSC-131B	Filter Receiver Discharge Gate B Closed	Hardy Systems	ASCO	8210
ZSO-131A	Filter Receiver Discharge Gate A Open	Hardy Systems	ASCO	8210
ZSO-131B	Filter Receiver Discharge Gate B Open	Hardy Systems	ASCO	8210

Product Handling

The Product Handling equipment includes the ME-197X Metals Hood Hoist, two ME326x Weigh Scales, two ME-403X ST-90 Hood Assemblies, ME-323 Diverter Gate, ME 404 Ferrous Metals Hood, ECP-197 Product Loading Control Panel, and Interconnecting Piping.

Process System:	PRODUCT HANDLING	Equipment Name:	PRODUCT LOADING CONTROL PANEL
ID/Tag No.:	ECP-197	Model No.:	
Supplier:	VORTEC CORPORATION	P&ID Dwg. No.:	D-4110-502-007
Manufacturer:	REES INDUSTRIAL	Capacity:	
Procurement Package:		Vendor Comp. No:	

This unit has not yet been purchased.

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	TBD	-	A	-	-
-	-	-	-	-	-

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic.

SHUTDOWN:

Per PLC Logic.

MAINTENANCE:

Not yet purchased, TBD.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
HS-197AB	Emergency Pushbutton	Vortec Corporation	Allen-Bradley	800H-FTRXT6A5
HS-197AV	Hood Vacuum Local/Auto	Vortec Corporation	Allen-Bradley	800H-HR2A
HMS-197C	Ferrous Metals Box Offline PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS197W	Hoods Reset PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-197A	Hood A Offline PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-197B	Hood B Offline PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-197AP	Hood Vacuum "On" PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-197AR	Hood Vacuum "Off" PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-197AT	Horn Silence PB Depressed	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-323D	Diverter Position "A" Selected	Vortec Corporation	Allen-Bradley	800H-AR1D
HMS-323E	Diverter Position "B" Selected	Vortec Corporation	Allen-Bradley	800H-AR1D
WI-326A	Weigh Scale ME-326A Weight Local Indicator	Vortec Corporation	Newport	558B-ET-SPC4
WI-326B	Weigh Scale ME-326B Weight Local Indicator	Vortec Corporation	Newport	558B-ET-SPC4
YL-197M	Light	Vortec Corporation		
YL-197Z	Ferrous Metals Box Offline Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-197Y	Hood B Offline Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-197X	Hood A Offline Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-323F	Diverter Gate Position A Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-323G	Diverter Gate Position B Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-197AQ	Hood Vacuum On Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
YL-197AS	Hood Vacuum Off Pilot Light On	Vortec Corporation	Allen-Bradley	800H-PRL16A
XA-197AU	Activate Local Alarm Horn at ECP-197	Vortec Corporation	Federal Signal	350-EB

Process System:	PRODUCT HANDLING	Equipment Name:	PRODUCT WEIGH SCALE
ID/Tag No.:	ME-326A & ME-326B	Model No.:	
Supplier:	HARDY INSTRUMENTS	P&ID Dwg. No.:	D-4110-502-007
Manufacturer:	MULTI-MEASUREMENTS	Capacity:	
Specification No:	S-4100-310	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0310-003	-	-	22	Installation and Maintenance Manual

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic

SHUTDOWN:

Per PLC Logic

MAINTENANCE:

See VOM-4100-0310-003.

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
WE-326A	Weight Element (ME-326A)			
WE-326B	Weight Element (ME-326B)			
WT-326A	Weight Scale Weight Transmitter (ME-326A)		Hardy	HI2204LT
WT-326B	Weight Scale Weight Transmitter (ME-326B)		Hardy	HI2204LT

Process System:	PRODUCT HANDLING	Equipment Name:	ST-90 PNEUMATIC HOOD ASSEMBLY
ID/Tag No.:	ME-403A & ME-403B	Model No.:	
Supplier:	VORTEC CORPORATION	P&ID Dwg. No.:	D-4110-502-007
Manufacturer:	TRI FAB	Capacity:	
Specification No:	S-4100-403	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	-	-	-	-	-

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Manual Operation

SHUTDOWN:

Manual Operation

MAINTENANCE:

TBD

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
HS-403G	Hand Switch (ME-403A)			
HS-403H	Hand Switch (ME-403B)			
HS-403A	Hand Switch (ME-403A)			
HS-403B	Hand Switch (ME-403B)			
ZSC-403D	Hood A Closed Limit Switch (ME-403A)	Vortec Corporation		
ZSC-403F	Hood B Closed Limit Switch (ME-403B)	Vortec Corporation		
ZSO-403C	Hood A Open Limit Switch (ME-403A)	Vortec Corporation		

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
ZSO-403E	Hood B Open Limit Switch (ME-403B)	Vortec Corporation		
XY-197AC	Hood Open Assembly A Pneumatic Valve (ME-403A)	Vortec Corporation	ASCO	8316G44
XY-197AD	Hood Open Assembly B Pneumatic Valve (ME-403B)	Vortec Corporation	ASCO	8316G44
XV-197G	Hood Assembly A Pneumatic Valve (ME-403A)	Vortec Corporation		
XV-197H	Hood Assembly B Pneumatic Valve (ME-403B)	Vortec Corporation		
XY-197D	Energize Hood Assembly A Solenoid Valve (ME-403A)	Vortec Corporation		
XY-197G	Energize Hood Assembly B Solenoid Valve (ME-403B)	Vortec Corporation		
ZSC-197F	Hood Assy A Isolation Valve Closed Limit Switch (ME-403A)	Vortec Corporation		
ZSC-197K	Hood Assy B Isolation Valve Closed Limit Switch (ME-403B)	Vortec Corporation		
ZSO-197E	Hood Assy A Isolation Valve Open Limit Switch (ME-403A)	Vortec Corporation		
ZSO-197H	Hood Assy B Isolation Valve Open Limit Switch (ME-403B)	Vortec Corporation		

Process System:	PRODUCT HANDLING	Equipment Name:	ST-90 FERROUS METALS HOOD
ID/Tag No.:	ME-404	Model No.:	
Supplier:	VORTEC CORPORATION	P&ID Dwg. No.:	D-4110-502-007
Manufacturer:	TBD	Capacity:	
Specification No:	TBD	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	-	-	-	-	-

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Manual Operation, use with ME-197A or ME-197B as Required.

SHUTDOWN:

Manual Operation, use with ME-197A or ME-197B as Required.

MAINTENANCE:

TBD

INSTRUMENTATION:

None for the Ferrous Metals Hood

Nuisance Dust Collection Instrumentation (ME-120)				
ID	Description	Supplied By	Mfg	Mfg ID
XY-197AE	Open Ferrous Metals Chute	Vortec Corporation		
XV-197AE	Ferrous Metals Box Isolation Valve	Vortec Corporation		
XV-197AF	Ferrous Metals Box Isolation Valve	Vortec Corporation		

Instrumentation, Cont'd				
ID	Description	Supplied By	Mfg	Mfg ID
XV-197AH	Compensating AirValve	Vortec Corporation		
XY-197AF	Open Ferrous Metals NDC Isolation Valve	Vortec Corporation		
XY-197AH	Open Compensating Air Valve	Vortec Corporation		
ZSC-197T	Ferrous Metals Box NDC Isolation Valve Closed Limit Switch	Vortec Corporation		
ZSC-197V	Ferrous Metals Box Isolation Valve Closed Limit Switch	Vortec Corporation		
ZSC-197AL	Compensating Air Valve Closed	Vortec Corporation		
ZSO-197S	Ferrous Metals Box NDC Isolation Valve Open limit Switch	Vortec Corporation		
ZSO-197U	Ferrous Metals Box Isolation Valve Open limit Switch	Vortec Corporation		
ZSO-197AJ	Compensation Air Valve Open	Vortec Corporation		

Process	PRODUCT	Equipment Name:	DRIED PRODUCT
System:	HANDLING		DIVERTER GATE
ID/Tag No.:	ME-323	Model No.:	
Supplier:	BEAUMONT BIRCH	P&ID Dwg. No.:	D-4110-502-007
Manufacturer:	BEAUMONT BIRCH	Capacity:	
Specification No:	S-4100-309	Vendor Comp. No:	

DETAILED INFORMATION ON START-UP, SHUTDOWN, AND MAINTENANCE PROCEDURES IS AVAILABLE IN THE VENDOR LITERATURE

Vendor No.	Vortec No.	Rev *	Size	No. Sh.	Description
-	VOM-4100-0309-009 (Use Section 4 pages 4-3 and 4-7 only)	-	-	2	Installation, Operation, and Maintenance Manual for Submerged drag Conveyor

* Document revision may be superseded by subsequent change, check with document control for current revision.

START-UP:

Per PLC Logic

SHUTDOWN:

Per PLC Logic

MAINTENANCE:

TBD

INSTRUMENTATION:

ID	Description	Supplied By	Mfg	Mfg ID
XV-323A	Diverter Gate Valve	Vortec Corporation		
ZSA-323B	Diverter Gate Chute A Selected Position Switch	Vortec Corporation		
ZSA-323C	Diverter Gate Chute B Selected Position Switch	Vortec Corporation		
XY-323A	Energize Diverter Gate Solenoid Valve	Vortec Corporation		

Instrumentation, Cont'd				
XY-197A	Hood Assembly A Isolation Valve	Vortec Corporation		
XY-197B		Vortec Corporation		
Nuisance Dust Collection Instrumentation (ME-120)				
ID	Description	Supplied By	Mfg	Mfg ID
XY-197C		Vortec Corporation		
XY-197D	Energize Hood Assembly B Solenoid Valve	Vortec Corporation		
XY-197L	Energize NDC A Solenoid Valve	Vortec Corporation		
XY-197P	Energize NDC B Solenoid Valve	Vortec Corporation		
ZSC-197N	NDC A Isolation Valve Closed Limit Switch	Vortec Corporation		
ZSC-197R	NDC B Isolation Valve Closed Limit Switch	Vortec Corporation		
ZSO-197M	NDC A Isolation Valve Open Limit Switch	Vortec Corporation		
ZSO-197Q	NDC B Isolation Valve Open Limit Switch	Vortec Corporation		

APPENDIX H

Vortec Corporation Procedure for Emergency, Urgent, and Routine Class 2 Configuration Control

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Vortec Corporation
Procedure for Emergency, Urgent, and Routine Class 2 Change Control

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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H1. PURPOSE

This procedure defines the change control process ensures that proposed changes are properly identified, developed, reviewed, approved, implemented, verified, validated, and documented. Figure H-1 illustrates the change control flow.

H2. APPLICABILITY

This procedure applies to all site standard operations, drawings, equipment or process specifications, procedures, work instructions and plant and process design as well as any other documentation that could impact the process operation or product characteristics. Note an approved change control form is a work authorization document, whereas a work order is an implementation document issued after the approval of the Change Control Form (CCF).

H3. PRECAUTIONS AND LIMITATIONS

None

H4. PREREQUISITES

Determine if change is Class 1 or Class 2

H5. OTHER DOCUMENTS NEEDED

QP-12 Government Contract Demonstration Plant Change/Installation Control

H6. CONFIGURATION CONTROL

H6.1.0 Normal Sequence of Processing Changes.

This section describes the normal sequence of events for processing a Class 2 emergency, urgent, or routine change. See Sections H6.2.1 and H6.2.2 for information on emergency changes and temporary modifications, respectively. Figure H-1 illustrates the Change Control Process flow.

H6.1.1 Proposal/Request for Change

The requester:

- consults with the Engineering Manager and/or the Vortec Site Manager to obtain concurrence with the need for the proposed change and

- initiates a formal change request using the Change Control Form (CCF), Form QDP12-001, in Figure L-2 with assistance from the Engineering Manager and/or Vortec Operations Manager.

H6.1.2 Screening Routine Activities Versus Changes

The Vortec Operations Manager screens each proposed change to determine whether the proposal constitutes a “routine” maintenance/operation activity or a “change” that must be reviewed by the Change Control Board (CCB). The following criteria are used for screening:

Routine Activity

- the replacement of a part with an exact replica (same type, manufacturer, model number, etc.) used in the same application; or
- routine, preventive, or periodic activities performed as outlined in a technically reviewed and approved procedure.

Change

Changes can be classified as Class 1 or Class 2. Class 1 changes are those that affect the fit, form, or function of a configuration item. A Class 1 example for hardware would be changing a bolt hole pattern; for software, an example would be adding a new screen capability. Class 2 changes do not affect fit, form, or function of a configuration item; an example of a class 2 change is correcting a spelling error on a design drawing, replacing a hardware item with the same part number or with a previously approved equivalent part number.

Examples of changes are:

- Class 1, any modification (including software) that affects the form, fit, or function of a configuration item;
- Class 2, the use of replacement hardware that may be similar in form, fit, or function to the original but has a different manufacturer or model number;
- Class 1, any modification or replacement that requires revision of the system requirements document or operating permits;
- Class 1, deviations from approved O & M, testing, or other procedures that could affect the facility modes of operation, regardless of apparent significance;

- Class 1, any modification (hardware or software) that requires a corresponding change to a procedure (e.g., O & M, and testing);
- Class 1, any change to an approved set point as specified in a procedure; or
- Class 1, any change to computer hardware or software used to control process functions, provide alarms or warnings, or display parameters used to control the process.

When the person requesting the change is not the Vortec Operations Manager, the Site Manager will explain to the requester why the proposed change is considered to be routine.

H6.1.3 Change Control Form Preparation

Normally site changes are requested by site management but may be initiated by Vortec Corporation's Engineering department located in Collegeville, PA. The organization that initiates the change is responsible for completing the change control form as follows:

- The requestor completes blocks 1 through 9 and 11.
- Block 1. Date of origination. This date is the date when the requestor submits the change control form to the CM Administrator (CMA).
- Block 2. Change. Indicates whether the proposed change is Emergency, Urgent, or Routine (see Section H6.2.1). Emergency and routine changes require operations manager approval whereas the plant supervisor may approve a routine change.
- Block 3. Temp. Change. Indicates whether the proposed change is temporary (see Section H6.2.2).
- Block 4. CCF No. Obtain a CCF number from the CMA.
- Block 5. Title. Short descriptive title of the change.
- Block 6. Requestor. Requestor's name.
- Block 7. Change Description and Block 8. Reason for Change. Provide a clear, complete, and accurate "Description of Change" and "Reason for Change". Sufficient detail should be provided to allow subsequent CCB reviewers to have a full understanding of the change. Use attachments as required.

- Block 9. Change Impact. Identify the impact to the change. Changes with cost impacts $\geq$ \$5,000 require Site Manager approval and changes with cost impacts $\geq$ \$10,000 require Program Manager/Corporate Management approval.
- Block 10. Emergency Change Authorized by. The Operations Manager completes this section.
- Block 11. Functional Test. This section is completed by initiator and coordinated with the Operations Manager or other appropriate personnel.
- After completion of Blocks 1 - 11, the change is submitted to the CMA for administration of the approval process.
- Block 12. CCB Member Review and Recommendation. Completed by CCB members during the approval process. The CCB members perform a multi-disciplined technical and management review of the proposed change and attach review sheets to the change control package, as appropriate. The CCB signs and dates the form to indicate its approval of the proposed change

CCB Decision. The CCB Chairperson (appointed by the Site Manager) considers the recommendation of the CCB and approves or disapproves the proposed change.

- Block 13. (not used) Not listed on the form.
- Blocks 14 -16, 18, and 19. Completed after the change has been approved
- Block 14. Change Implementation Confirmed By. The Operations Manager verifies that the change was implemented.
- Block 15. Field Walkdown Performed By. The Operations Manager or designee verifies that the field change agrees with the pertinent documentation.

Block 16. Turnover to Operations. After the change is completed, the QA Engineer verifies that if a functional test was required that it has been performed satisfactorily. The Operations Manager verifies that all requirements have been met and all key affected documents have been redlined to turn over the modified item to the site.

- Block 17. CM Administrator Control & Distribution. Used by the CMA for control and distribution of the requested change.

- Block 18. Close Out For Programmatic Elements. The CMA verifies that all affected programmatic elements have been revised, updated, and/or completed as indicated on the Programmatic Elements Attachment Sheet.
 - CCF Origination Date. Transfer the date from the CCF to the Programmatic Elements Attachment Sheet. These dates should be identical.
 - CCF No. Transfer the CCF Number from the CCF to the Programmatic Elements Attachment Sheet. These numbers should be identical.
 - Programmatic Elements. List all drawings, procedures, and other programmatic elements affected by this configuration change. Attach a red-lined copy of changes to the change control package. As changes are made to the programmatic elements, indicate their completion by signing and dating in the appropriate space.
- Block 19. QA Closeout Check. The QA Engineer performs a final QA check to ensure that all steps in the change control process have been met and verifies that the change package is complete.

The CMA then distributes the final closeout information to the Site Manager and Vortec Corporation's home office.

H6.1.4 In-Process Monitoring and Control

The Configuration Management Administrator (CMA) performs the following tasks:

- checks the CCF for clarity and completeness,
- informs the CCB of proposed changes and distributes copies of the change package for technical review by the CCB members, and schedules CCB meetings to review proposed changes.

Figure H-1 Change Control Process Flow

Figure H-2. Class 2 Change Control Form

Vortec Corporation Class 2, Change Control	1. Origination Date:	2. Change: Emergency Urgent Routine	3. Temp. Change: ☐ Yes ☐ No	4. CCF No.:																																																								
5. Title:			6. Requester:																																																									
7. Change Description (use continuation sheet, if necessary):																																																												
8. Reason for Change (use continuation sheet, if necessary):																																																												
9. Change Impact: ____ Draw Stock from Existing Inventory ____ New Procurement Required, Cost < \$5,000 ____ New Procurement Required, Cost = \$5,000			10. Emergency Change Authorized by: ____ Date: Comments:																																																									
11. Functional Test: ____ Required ____ Not Applicable Initials/Date: ____																																																												
12. CCB Member Review & Recommendation: <table border="1"> <thead> <tr> <th>Function</th> <th>Appr</th> <th>Reject</th> <th>Hold</th> <th>Signature</th> <th>Date</th> <th>Comments (Use attachments if required)</th> </tr> </thead> <tbody> <tr> <td>Health & Safety</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Environmental</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Process Engineer</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Other _____</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Other _____</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Operations Manager</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Chairperson:</td> <td>☐</td> <td>☐</td> <td>☐</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>					Function	Appr	Reject	Hold	Signature	Date	Comments (Use attachments if required)	Health & Safety	☐	☐	☐	_____	_____	_____	Environmental	☐	☐	☐	_____	_____	_____	Process Engineer	☐	☐	☐	_____	_____	_____	Other _____	☐	☐	☐	_____	_____	_____	Other _____	☐	☐	☐	_____	_____	_____	Operations Manager	☐	☐	☐	_____	_____	_____	Chairperson:	☐	☐	☐	_____	_____	_____
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Operations Manager	☐	☐	☐	_____	_____	_____																																																						
Chairperson:	☐	☐	☐	_____	_____	_____																																																						

Figure H-2. Change Control Form (Continued)

14. Change Implementation Confirmed By: <div style="border-bottom: 1px solid black; width: 80%; margin-left: 0;"></div> <div style="text-align: right; margin-right: 20px;">Date: <div style="border-bottom: 1px solid black; width: 150px;"></div></div>	
15. Field Walk-down Performed By: <div style="border-bottom: 1px solid black; width: 80%; margin-left: 0;"></div> <div style="text-align: right; margin-right: 20px;">Date: <div style="border-bottom: 1px solid black; width: 150px;"></div></div>	
16. Turn over to Operations: Signature: <div style="border-bottom: 1px solid black; width: 250px;"></div> Date: <div style="border-bottom: 1px solid black; width: 150px;"></div>	
17. CM Administrator Control & Distribution: <div style="border-bottom: 1px solid black; width: 80%; margin-left: 0;"></div> <div style="text-align: right; margin-right: 20px;">Date: <div style="border-bottom: 1px solid black; width: 150px;"></div></div>	
18. Close-out for Programmatic Elements (use attachment sheet, if necessary): Signature/Date: <div style="border-bottom: 1px solid black; width: 400px;"></div> Comments: <div style="border-bottom: 1px solid black; width: 400px;"></div>	19. QA Close-out Check Signature: <div style="border-bottom: 1px solid black; width: 200px;"></div> Date: <div style="border-bottom: 1px solid black; width: 150px;"></div>

CCB Change Control Board
 CCF Change Control Form
 CM Configuration Management
 QA Quality Assurance

H6.1.5 Technical Review

The technical review procedures, including responsibility and documentation, are explained in the subsections that follow.

H6.1.5.1 Technical Scope

The CCB collectively performs multi-disciplined technical reviews of all proposed changes to ensure that a proposed change:

- is properly screened and categorized;
- resolves the initial concern without creating new ones;
- is technically correct and consistent with applicable requirements; and
- does not compromise human health and safety or the environment.

Individual members of the CCB further review proposed changes, focusing on their respective areas of expertise. The CCB represents the following technical disciplines:

- **Health & Safety** reviews the change for general Health and Safety along with any Health Physics impacts and that any proposed change is consistent with applicable industrial safety requirements and commitments, Occupational Safety and Health Administration (OSHA) regulations, and applicable standards and codes.
- **Environmental Compliance** reviews proposed changes to verify consistency with the operating permits and state and federal regulations. This review identifies any required permit modifications and/or notifications, initiates permit modifications where necessary and identifies and resolves any other potentially detrimental environmental impacts.
- **Process Engineering** reviews issues regarding acceptance, storage, mixing, or blending of waste materials and looks at waste accountability and analytical methods used for waste characterization.
- **Control Systems (if required)** reviews technical issues associated with the systems used to control the processes. Control systems include sensors, instruments, recorders, computer hardware, computer software, and administrative controls necessary to operate the facility.
- **Engineering and Technical Support (if required)** reviews design specifications and drawings and the design requirements to verify that the change is consistent with the limits, safety margins, and other parameters for which the facility was designed and permitted.
- **Operation and Maintenance** verifies that proposed change is constructable, operable, and maintainable.
- The CCB may authorize any other appropriate reviews as required.

H6.1.5.2 Insufficient Design Information

If detailed design is required or further information is needed to complete the technical reviews, the need for additional design information will be documented on the CCF. Depending on the extent of information needed to complete the reviews, the CCB will either (1) send the change package back to the Vortec Site Manager or Engineering Manager for further clarification and/or design development or (2) revise the CCF for approval of the next design stage rather than implementation, and request more extensive design development before recommending the change for implementation. In either case, the needed information will be developed and the change package will be resubmitted to the CCB for approval. Subsequent multi-disciplined technical reviews

will be conducted to ensure that the change is consistent with the information presented and accepted in the initial reviews (see to Section 2.3).

H6.1.5.3 Technical Review Documentation

The Change Control Board:

- verifies that all affected programmatic elements are identified and listed on the programmatic elements attachment sheet of the CCF,
- indicates which of the affected key programmatic elements must be updated before the modified item is turned over to the site, and
- signs and dates the CCF to verify satisfactory completion of the technical reviews and concur with the technical adequacy of the change as proposed in the change package.
- The chairperson signs the CCF to verify that an adequate review has been performed and approve or deny the change request.

The Configuration Management Administrator:

- ensures that the CCB Chairperson has approved the change package before implementation, and
- collects technical review documentation and attaches it to the CCF. (This documentation will include all information necessary to understand and audit the technical review process for each proposed change.)

H6.1.6 Management Reviews for changes $\geq$ \$10,000

The Vortec Program Manager responsible for the project performs a management review of the proposed change to verify that:

- the benefits of the change warrant the cost to implement the change;
- adequate resources are available for implementation;
- the technical reviews have been performed adequately;
- the change package is complete and ready for implementation;
- any necessary external approvals have been obtained; and
- the change is authorized for implementation or ready for further design to proceed, as needed.

The Vortec Program Manager signs and dates the CCF to indicate acceptance of the proposed change, as described in the change package, and verifies that resources are available for further design or implementation.

The Vortec Program Manager brings to the attention of the CCB changes for which adequate resources are not available to establish the priority of the proposed changes with respect to other activities.

H6.1.7 Implementation

The implementation of approved changes as part of Vortec Corporation's configuration control process is described in the subsections that follow.

H6.1.7.1 Work Control System Interface

- The CM Administrator:
 - performs or requests a QA check of the change package before implementation; and
 - distributes copies of approved change packages to the Operations Manager or Plant Supervisor who then initiates a work order to implement the approved change.
- The Operations Manager or Plant Supervisor ensures that hardware changes which are implemented will be controlled through the *formal configuration control system*.
- The Vortec Operations Manager ensures that hardware changes that personnel other than Vortec employees install are properly controlled through applicable work control processes.

H6.1.7.2 Field Changes

- During implementation, the Site Manager identifies and approves field changes, such as deviations from design and installation drawings, parts and material substitutions, etc., and documents these changes on the field change form (FCF) (Figure H-3).
- The Site Manager sends all deviations to the Engineering Manager for review and final disposition.
- The Engineering Manager reviews all field changes before closure of the change package to:
 - ensure that these field changes are consistent with the original design assumptions, calculations, technical reviews, and other design considerations;

- concur, in writing, with the field changes;
 - update and document the design information, as required; and
 - determine whether the field change or non-conforming item requires review and concurrence by the CCB.
- The Engineering Manager transmits the FCF to the CM Administrator for inclusion in the change package and to coordinate document reviews.

H6.1.7.3 Delayed Implementation

Any change for which implementation has not been initiated within four weeks of approval by the CCB chairperson will be brought to the attention of the CCB by the CM Administrator. The CCB will reconfirm the appropriateness, adequacy, and need for the proposed change before it is implemented.

H6.1.7.4 Partial implementation

The CCB reviews and approves the partial implementation of changes. The CCF must be revised to reflect the partial implementation of a change and technical reviews must be repeated and documented. The CM Administrator is responsible for tracking to completion all documents related to the change and ensuring that these documents are updated, as required.

H6.1.8 Verification and Validation

The verification and validation procedures described in the following subsections have been developed to ensure that changes have been implemented safely and correctly.

H6.1.8.1 Final Walkdown

The Site Manager or their designee conducts a final walkdown of the implemented change is to:

- verify that the final installation is consistent with the design as described in the change package;
- verify that the documents which were updated as a result of the change are accurate and reflect the as built conditions;
- identify, document, and analyze additional field deviations or configuration problems, if they exist; and
- familiarize operations personnel with the as built configuration before release for post-implementation testing or use, as applicable.

Figure H-3. Field Change Form

Vortec Field Change Form (FCF)	1. Originator:	2. Date:	3. CCF No.
4. Change Description:			
5. Reason for Change: <div style="display: flex; justify-content: space-between;"> <div> ☐ Procedural Change ☐ Engineering Error ☐ Scope Change ☐ Unexpected Field Condition ☐ Other _____ </div> <div> ☐ Construction Error ☐ Material Change ☐ Design Improvement ☐ Improve Constructability </div> </div> Comments: _____			
6. Documents Affected (drawings, sketches, procedures, etc.):			
7. Approvals: <div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>Date: _____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Site Manager</div> <div>Date: _____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>Date: _____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Engineering Manager</div> <div>Date: _____</div> </div> CCB Review/ Approval Required? ☐ Yes ☐ No			
8. CM Administrator Notification: <div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>Date: _____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Signature</div> <div>Date: _____</div> </div> Comments: _____ _____ _____			

CCF Change Control Form
CCB Change Control Board

CM Configuration Management
H6.1.8.2 Functional testing

The Engineering Manager:

- develops the appropriate post-implementation functional testing and acceptance criteria to verify that the implemented change performs as intended and operates within the design requirements; and
- ensures that the modified hardware, software, or procedure is not used for routine operations until all issues are resolved or until the original conditions are restored.

The QA Manager:

- informs the Site Manager and Engineering Manager if the test acceptance criteria are not met, and sends all relevant documentation for review and resolution; and
- documents this information and includes it in the change package when the acceptance criteria are met.

H6.1.9 Close-out Documentation

In order to record changes for future reference and process modifications, documentation is managed in accordance with the following procedures.

All information related to a change is combined into the change package that should include:

- a completed CCF;
- the conceptual and detailed design packages, as appropriate;
- any review documentation and/or checklists;
- implementation guidance, functional test procedures, and test results;
- any other supporting information (e.g., memoranda, correspondence, specifications, data sheets, analysis, etc.); and
- field change documentation and verification that drawings, specifications, and equipment agree.

The CM Administrator:

- combines all change information into the change package;

- maintains record copies of in-process packages and tracks the change package status from initiation to implementation;
- performs or requests a QA check of the change package to complete the closure process; and
- coordinates storage of record copies of closed-out change packages.

H6.2.0 ADDITIONAL INFORMATION ON SPECIFIC CHANGE CONTROL ELEMENTS

H6.2.1 Emergency Changes

Conditions may arise where an emergency change must be implemented immediately to provide personnel safety or protection of capital equipment. Emergency changes are not exempt from the requirements of this procedure, but may be expedited through the use of verbal approval from the Site Manager or their designee prior to implementation. On the next convenient workday, emergency changes will be formally documented and begin post implementation technical review and approval consistent with this procedure. The requester/originator will indicate on the CCF that the change was an emergency change, the name of the person authorizing the change, and the date that the change was authorized. If the post implementation technical reviews indicate potential problems, corrective actions will be taken to amend the identified concern(s). The final resolution will be documented.

H6.2.2 Temporary Modifications

Temporary modifications are changes that will be implemented in response to conditions that will change in the future date and require further modifications. An example would be a change to one system/component to allow continued operation until another system/component which has failed is replaced or repaired.

Temporary modifications are:

- identified as temporary and described on a CCF as similar to permanent changes.
- reviewed for technical adequacy and approved through the CCB prior to implementation.
- described through interim, marked-up drawings and procedures which will be made available to the CCB, operations, and other site personnel as required in the change package. (Unlike permanent modifications, permanent drawings and procedure updates are not required for temporary modifications.)

- tracked separately through the CM Administrator to ensure that any temporary modification older than four weeks is brought to the attention of the CCB for re-affirmation, conversion to permanent modification, or removal and continued every three months until final conversion or removal.

H6.2.3 Design Development

The amount of design detail required to describe a change will vary depending on the scope of the change. Many changes can be implemented using conceptual drawings, sketches, and descriptions. Major changes, however, require more design detail and often involve several design iterations.

H6.2.3.1 Conceptual design development

Conceptual design involves the following tasks:

- The Engineering Manager or designee, with input from others as required, conducts a walk-down and develops a conceptual design for the requested change.
- The conceptual design information is attached to the CCF when it goes to the CM Administrator to obtain approval from the CCB.
- The CCB performs multi-disciplined technical reviews of the conceptual design proposed in the change package. If detailed design is not required because of the simplicity of the proposed change and/or the completeness of the conceptual design, the change request will not require further review from the CCB prior to implementation.
- If detailed design is required or further information is needed to complete the reviews, the need for additional design information will be documented on the CCF, the detailed design will be developed, and the change package will be revised and resubmitted to the CCB for review and approval.

H6.2.3.2 Detailed Design Development (As Required)

The Engineering Manager, with assistance from the Site Manager and/or other technical functions deemed appropriate, will develop the detailed design for all hardware changes. The Engineering Manager:

- conducts a comprehensive walkdown of the proposed change with the Site Manager, requester/originator, and other appropriate site personnel, to verify the information and accuracy of the conceptual design, obtain an understanding of the problem(s), review and obtain final agreement of the design alternatives, and identify additional configuration problems such as interferences.

- determines whether assistance from outside contractors, architect or engineering groups, or any other support group is required, and obtains support when appropriate.
- develops the detailed, design including analyses, new parts and materials lists, installation and test procedures, and any other necessary change information.
- attaches the detailed design to the CCF and resubmits the change package to the CCB for review and approval. Subsequent multi-disciplined technical reviews will be conducted to ensure that the change is consistent with the information presented and accepted in the initial reviews.

H6.2.3.3 Design Stage Progression

Major changes to the site often involve several design iterations before the change is implemented. Small scale projects require conceptual design and detailed design, while the normal evolution of a major site change is characterized by the following stages: preliminary proposal, feasibility study, conceptual design report, and design criteria. The change control process suggests the use of intermediate CCB reviews and approvals during a multi-step design project to ensure that resources are not expended on designs which are not authorized by the CCB. Therefore, the CCB reviews and recommends approval of the design at appropriate stages in the project before proceeding to the next design stage.

The Site Manager or Engineering Manager indicates on the CCF that approval is being requested to proceed to the next design stage when it is known that further design work will be required after the initial CCB approval. After the CCB approves the request to proceed to the next design stage, the Engineering Manager is notified of approval to proceed and the CCF is closed. The CM Administrator will use an alphanumeric numbering system to group CCFs corresponding to the same design project (e.g., 500, 500A, 500B, etc.).

H6.3.0 RECORDS

In addition to records maintained at the site, records of all documents contained in the change package will be maintained in the program files at Vortec Corporate Headquarter office. The documents will include the completed CCF, FCF, and all design drawings and specifications associated with the change.

H6.4.0 FIELD CHANGE FORM AND INSTRUCTIONS

H6.4.1 General

These instructions are designed to assist the Originator, Site Manager, CM Administrator, and Engineering Manager with completion of the FCF (Figure H-3) during the implementation of the corresponding CCF.

H6.4.2 Instructions

The Originator or Operations Manager completes Blocks 1 through 6.

- Block 1. Requester/Originator. The Originator's name is entered in this field.
- Block 2. Date. This is the date that the FCF is being initiated.
- Block 3. CCF No. The original corresponding CCF number is entered in this field.
- Block 4. Change Description. A complete description of the field change is entered in this field.
- Block 5. Reason for Change. An explanation of why proposed change is required is entered in this field.
- Block 6. Documents Affected. All documents affected with this field change, such as drawings, sketches, procedures, etc., are listed in this field, red-lined copies of the affected documents should be attached.

The Site Manager, Engineering Manager and CCB chairman complete Block 7.

- Block 7. Approvals. Both the Site Manager and the Engineering Manager sign and date this field.
- Block 7. Approvals. CCB Review/Approval Required. The Engineering Manager checks the appropriate box to indicate whether this field change must be reviewed by the CCB.

The CM Administrator completes Block 8.

- Block 8. CM Administrator Notification. The CM Administrator acknowledges receipt of the field change by signing and dating this field. Comments regarding special interfaces are also documented here and distribution to appropriate organizations and Vortec Corporation's Collegeville, PA office.

APPENDIX I

Vortec Corporation Limited Demonstration Functional Responsibilities and Position Descriptions

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Vortec Corporation
Functional Responsibilities and Position Descriptions

Prepared by: R.F. Jaeger / R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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I1. PURPOSE

This procedure defines the duties, requirements and responsibilities for all Limited Demonstration personnel at the Vortec Paducah Soil Conditioning Plant. Additional staffing for full scale operations will be defined at a subsequent date.

I2. APPLICABILITY

This procedure applies to all personnel at the Vortec Paducah Vitrification Plant. Some of the positions will be filled by DOE provided personnel or subcontracted labor as shown in the Table 3.1-1 of the Limited Demonstration Operational Plan

I3. PRECAUTIONS AND LIMITATIONS

This procedure is limited to the limited Demonstration activity

I4. PREREQUISITES

None

I5 TRAINING PREREQUISITES

None

I6 OTHER DOCUMENTS NEEDED

BFA-4110-904-005 Figure 2-1

Vortec Waste Pretreatment and Conditioning Demonstration Plant Organization Chart

17. FUNCTIONS AND POSITION DESCRIPTIONS

17.1 Function Title: Site Manager

Site Manager is responsible for the safe and efficient operation of the plant, and effective completion of contractual requirements; Site Manager is responsible for developing and maintaining good customer and community relations, and for full compliance with all applicable State, Federal, and local laws, rules, and regulations.

Site Manager is responsible for coordinating the efforts of all assigned Vortec and contractor employees and vendor representatives while they are on site.

Site Manager assigns and delegates responsibilities to other direct and indirect reporting personnel, according to their Position Descriptions and the Pre-Treatment and Conditioning Plant Organization Table, to efficiently accomplish his objectives; Site Manager is ultimately responsible for the results.

Site Manager is responsible for implementing the Phase IV Demonstration Test Plan, for developing the daily menu schedule of surrogate waste soil drum deliveries, monitoring site visitors, and for the hiring, performance evaluation, and firing of personnel assigned to the site.

Site Manager is responsible for site security; Site Manager authorizes access to the Pre-Treatment and Conditioning Plant facilities for all dignitaries, officials and visitors and has accountability for all persons on site at all times.

Site Manager is responsible for establishment, maintenance and enforcement of all health and safety programs; Site Manager ensures that appropriate training programs, records, record maintenance, employee notifications, etc. occur in timely fashion and in strict accordance with Federal and State regulations and requirements.

Site Manager has responsibilities under Configuration Management: he identifies changes in equipment or procedures, verifies proper implementation of changes and their maintenance and confirms validity of change.

Site Manager conducts shift changeover meetings as well as other relevant briefings; he establishes logbooks for key positions, maintains logbooks and ensures logbooks are kept current.

17.2 Function Title: Site Administrator/Configuration Management Administrator

Site Administrator/Configuration Management Administrator (CMA) is responsible for personnel records, personnel medical and training records, site contractor and visitor access and control, visitor escorts, visitor related paperwork, contractor and visitor health and safety awareness, visitor personal protective equipment and radiation badges, visitor records, contractor training records as well as all other functions related to contractor and visitor on site presence. He /she issues badges and safety equipment and conduct site exit procedures for contractors and visitors.

Site Administrator/Configuration Management Administrator will assist the Site Manager with the hiring and training of new employees and with firing employees, exit interviews and records related to termination. Site Administrator/Configuration Management Administrator is responsible for development, maintenance of all personnel records, including, physicals, site-wide training programs, disciplinary actions as well as other necessary personnel issues. Health insurance records responsibility will occur back at Vortec's Office in Collegeville, PA.

Site Administrator/Configuration Management Administrator is responsible for providing secretarial support to the site for tasks including but not limited to the preparation of correspondence, routine and ad hoc reports, meeting minutes and notes, communication services and coordination, and office services, such as copying, mail distribution, telephone and message control.

Site Administrator/Configuration Management Administrator is responsible for supporting the Data Management System, monitors data collection activities to insure the database is updated in a timely manner, etc.

Site Administrator/Configuration Management Administrator coordinates Paducah PGDP imposed employee training programs.

17.3 Function Title: Plant Operations Manager (Demo Test Manager)

Plant Operations Manager is responsible for all plant facilities and operations which involve the production of pre-treatment and conditioned product including the receipt of raw materials from vendors, proper equipment operation, maintenance and repair, proper plant staffing and product manufacturing. Plant Operations Manager directs operations for plant processing equipment through process instrumentation and controls and visual surveillance, and coordinates production activities with environmental, health and safety, quality assurance, health physics and other site functions. Plant Operations Manager prepares the weekly and daily production schedules that the Site Manager approves.

Plant Operations Manager prepares and implements personnel work procedures, prepares and recommends manpower staffing requirements and shift assignments. Plant Operations Manager prepares performance evaluations for review and concurrence with the Site Manager and for review with the individual.

Plant Operations Manager implements Design and Control Procedure for all Vortec site personnel working in areas subject to control throughout the facility and equipment design recommendations; Plant Operations Manager, through administrative control, regulates radiation exposure to levels as low as reasonably achievable (ALARA), when performing work involving radioactive material. Plant Operator monitors personnel for PPE and thermoluminescent dosimeters (TLDs) to ensure compliance with Radiological Work Permit (RWP).

Plant Operations Manager is the Demonstration Test Manager. As the Demonstration Test Manager, he is responsible for process operations during demonstration testing with the overall responsibility to produce Pre-treated and conditioned product from surrogate wastes that meet the objectives of the demonstration. Demonstration Test Manager develops and coordinates pre-demonstration testing plans and operations and provides all necessary logistics to implement sample locations and selection.

Demonstration Test Manager serves as chairman of the Configuration Change Board and as such reviews change requests and verifies validity of those proposed changes. Demonstration Test Manager resolves technical discrepancies and grants approval for changes through Configuration Change Board consensus.

I7.4 Function Title: Materials Control Coordinator

Materials Control Coordinator is responsible for purchasing, receiving and shipping functions as well as for on-site inventory including production materials, soil feed materials per schedule, raw materials, office and shop supplies, and maintenance materials production and other waste.

Materials Control Coordinator coordinates activities between DOE PGDP and Vortec regarding waste information and waste material shipments; Materials Control Coordinator ensures that site personnel responsible for receiving follow inspecting, handling, transporting and shipping procedures.

Materials Control Coordinator monitors material shipments from LMUS to confirm adherence to DOT regulations for transporting radioactive waste drums over public roads per 10CFR173 and communicates responsibilities to LMUS to ensure that the activity does not exceed the DOT limits.

Materials Control Coordinator formally requests Material Safety Data Sheets (MSDSs) on all purchase orders and maintains vendor records on follow-up letters for all shipments received without MSDSs.

Materials Control Coordinator places material requirements on LMES for the daily delivery of specific waste soil drums to support the Test Plan as well as for the daily removal of empty drums, rejected drums, and miscellaneous waste containers. Materials Control Coordinator tracks all Purchase Orders and Receiving paperwork and maintains complete records of all transactions.

17.5 Function Title: Site Health and Safety Officer

Site Health and Safety Officer is responsible for implementation of all health and safety programs and training, including but not limited to Lock-out/Tag-out, Hazard Communication, Right-to-Know, Material Safety Data Sheets, medical surveillance, first aid, and CPR training, Hazardous Waste Worker training, personal protective equipment, Bloodborne Pathogens, hazard analyses, safety and health analyses, accident and incident analyses and reporting, Confined Space Entry, spill containment, and all other health and safety issues.

Site Health and Safety Officer serves as Health and Safety Officer (HSO).

Site Health and Safety Officer is responsible for monitoring compliance with the Health and Safety Plan and issues Deficiency Reports as necessary. Incumbent monitors work rules and procedures surrounding health and safety, such as lunch, breaks, suit-up, de-contamination, etc.

Site Health and Safety Officer shall implement training, provide records of training conducted to Human Resources and provide for periodic refresher training. Incumbent is responsible for proper labeling on all containers on site as well as those coming on site. for identity, hazard warning, and name and address of responsible party. Incumbent ensures that all defaced or damaged labels are replaced, and that secondary containers are properly labeled.

Site Health and Safety Officer ensures that the chemical inventory is complete and updated annually, and that a list of hazardous chemicals will be maintained with MSDSs for all chemicals on site. Incumbent reviews all MSDSs for completeness, conformance and revision status as well as new MSDSs for compatibility with PPE; incumbent recommends upgrades in PPE as necessary.

Site Health and Safety Officer trains all appropriate employees on the Hazard Communication Program. Incumbent exchanges chemical information and MSDSs with contractors prior to start work and reviews chemicals on site as well as those that the contractor brings on site. Incumbent provides hazardous chemical awareness to all contractors and contractor employees prior to starting work.

Site Health and Safety Officer designates radioactive areas and establishes necessary control procedures; incumbent monitors radioactive control areas (not applicable to the Ltd Demo Test), reviews, updates and revises designations as appropriate.

Site Health and Safety Officer is responsible for authorizing radiological work permits (RWPs) (not applicable to the Ltd Demo Test) and authorizing appropriate personnel.

17.6 Function Title: Radiation Control Technician (Not required for Ltd Demo)

The Radiation Control Technician evaluates radiological work permit requests and investigates radiological conditions in the area, performing appropriate surveys to determine radiological contamination, dose rate, and airborne radioactivity.

The Radiation Control Technician reviews survey results and completes the RWP form and confirms that PPE specified on the RWP is compatible with industrial hygiene requirements; incumbent will specify the more stringent requirement when requirements differ.

Radiation Control Technician is responsible to continuously monitor all general and specific RWPs to whether radiological conditions have changed and permits must be re-defined and re-issued. When Active RWPs are no longer adequate, incumbent closes existing permit and issues new permit with changes.

Radiation Control Technician develops and issues all job specific RWPs under authority of Site Health and Safety Officer in conjunction with Health Physicist for the duration of a specific task, PPE, work order.

Radiation Control Technician records original RWPs in the project log book, and posts copies at every entrance to the radiological area; incumbent monitors and files records of personnel sign in/sign out sheets for permit area.

Radiation Control Technician will write the new RWP, performing surveys as necessary to verify radiological conditions in the work area; Radiation Control Technician submits new RWP to Site Health and Safety Officer for his approval and signature. After notification that work under the RWP is complete, the Technician verifies radiological conditions, collects all forms and sign-in sheets attached to the RWP, and presents them to Site Health and Safety Officer to close the RWP with signature and date.

Radiation Control Technician is responsible to post radiological areas and monitor that all appropriate personnel wear thermoluminescent dosimeters (TLDs) as well as any other supplemental PPE required on the RWP. Radiation Control Technician places radio-logical barriers and monitors posted areas; Technician informs all workers including subcontractors of area radiological hazards and entry requirements.

17.7 Function Title: Health Physics Technician

Health Physics Technician is responsible for insuring that all site workers have all the necessary training including OSHA 29 CFR 1910.120, respirator fit test, Radiation Worker II, GET/GERT (site specific) training.

Health Physics Technician implements badging/tracking program and assists with compliance checks, is responsible for maintaining quality records that are easily accessible for audit purposes and for monitoring 29CFR1910.120 compliance, physicals, urinalysis program, and badges.

Health Physics Technician ensures that all appropriate physical and administrative controls are established and in operation for container management, including handling, opening, transporting; Health Physics Technician specifies proper personal protective equipment. Health Physics Technician verifies that radiation and contamination levels do not exceed those levels that DOT permits; Health Physics Technician visually inspects drums to verify that contents are satisfactory and places drums in appropriate process or return areas.

Health Physics Technician monitors site for radioactive materials (not applicable for Ltd Demo Test) the in the work area, informs workers of potential hazards and specifies proper PPE. Health Physics Technician ensures that all applicable RWPs are in place and complete and isolates process areas subject to contamination, performs air monitoring to determine the level of airborne contamination, takes smear samples as needed to check surface contamination, adjusts PPE and exclusion area as conditions warrant, verifies that all areas and equipment are free from contamination following work completion, and removes all postings.

Health Physics Technician provides scans in designated areas prior to maintenance, during spill occurrence and prior to sample release to laboratory; Health Physics Technician monitors site for cross-contamination, detect the gradual buildup of radioactive material in the workplace (not applicable to the LTD Demo Test); and verifies the effectiveness of engineering and process controls in controlling radioactive material and reducing exposure.

Health Physics Technician monitor PPE inventory including, fire-retardant, seamless Tyvek suits, booties and gloves, respirators, safety goggles, boundary control equipment including yellow and magenta radiation rope, step-off pads, disposal bags for used PPE, and signs for posting radiation areas and survey equipment including alpha meters, beta-gamma meters, dose rate meters, air samplers, smears, envelopes, alpha-beta counter to count smears and air samples as well as de-contamination equipment and materials.

Health Physics Technician provides data to support Request for Disposal forms as well as specific paperwork and reports such as Radiological Work Permit, Air Sample Data Sheet, Personnel Contamination Report.

I7.8 Function Title: Environmental Compliance Engineer

Environmental Compliance Engineer is responsible for compliance with environmental programs and permits, environmental control and reporting, spill containment, and all other environmental issues.

Environmental Compliance Engineer interfaces with regulators, gathers information and prepares responses to regulator's requests; Environmental Compliance Engineer prepares required environmental reports, monitors all emissions data, advises the Site Manager and Vortec Corporation Management on compliance issues.

Environmental Compliance Engineer maintains contact with the three separate Kentucky Department of Environmental Protection (KDEP) organizations monitoring the site in addition to the USEPA and OSHA. There are a number of reports that are required to provide, and there may be innumerable requests from regulators, DOE-PGDP, other government organizations, and the facility will be under the watchful eyes of environmental activists. He/she will prepare and submit the required reports, response to requests from regulators, DOE-PGDP, and submit necessary environmental reports, including but not limited to all RCRA reports, NESHAPS reporting requirements air and water reports, state and federal reports. The Environmental Compliance Engineer also maintains and updates the environmental records.

Environmental Compliance Engineer coordinates environmental functions with the Configuration Management Administrator; ensures that all equipment, procedure and process changes are consistent with all operating permits; initiates and submits permit modifications where necessary.

17.9 Function Title: Quality Assurance Engineer

Quality Assurance Engineer is responsible for preparing and implementing the procedures, control programs, and systems to verify the quality of pre-treated and conditioned waste, records, product traceability records, and compliance with standard operations and maintenance procedures.

Quality Assurance Engineer monitors instrumentation and assures periodic maintenance and calibration at least once per year; Quality Assurance Engineer ensures use of appropriate instrument for the type, level, and energy of the radiation that will be monitored as well as for existing environmental conditions. Quality Assurance Engineer routinely tests instrumentation for functionality and operability.

Quality Assurance Engineer prepares necessary information/data and issues instructions to the Site Manager or his designee to clear drums of waste and other materials in hold from disposition areas.

Quality Assurance Engineer establishes controls to ensure quality of data and that the data collection meet DOE, EPA AND OSHA requirements.

Coordinates quality assurance activities with Configuration Management Administrator; verifies completeness, comprehensiveness, sufficiency and correctness of equipment and procedure changes under Configuration Management.

Conducts overall surveillance of change process as well as adherence to Company policies and operation and maintenance procedures.

I7.10 Function Title: Plant Supervisor

Plant Supervisor is responsible for all support functions which Plant Operations Manager requires, including trouble-shooting operational problems, maintaining prescribed operational rates and schedules and functioning as the Control Room Operator during the Ltd Demo Testing. The Plant Supervisor serves as lead of operational personnel in the absence of the Plant Operations Manager.

Plant Supervisor is responsible for implementation of the Propane Tank Unloading Procedure including all activities surrounding propane deliveries, propane unloading, paperwork, vehicle inspection, etc.

When Plant is processing radioactive waste

Plant Supervisor initiates requests for Radiation Work Permits for operational personnel, informs the Radiation Control Technician, monitors evaluation of radiological conditions in the area, and ensures appropriate performance of surveys on radiological contamination, dose rate, and airborne radioactivity.

Plant Supervisor also monitors work performed under Radiation Work Permits and ensures strict adherence to work procedures, personal protective equipment and radiation control in the controlled area.

I7.11 Function Title: Processing System Operators

Waste Processing System Operators are responsible for verifying that drums delivered to the pole barn for processing are on the schedule, have proper identification, are within weight limits, and appear structurally sound. Waste Processing System Operators load individual drums into the skip hoist bucket and monitor transfer to the shredder.

Waste Processing System Operators weigh drums and place rejects on pallets for removal from the pole barn.

Note: When the LTD DEMO Test is completed, the plant is operational and radioactive material is processed, then the entire area where soil is processed will be the first of two, specified radiological work areas; workers must wear full PPE (Tyvek, booties, gloves, safety goggles) and air-purifying respirators with combination cartridges.

I7.12 Function Title: Conditioning System Operators

Waste Conditioning System Operators are responsible for conditioned waste as it is processed to the ST-90 containers. There are two stations where the conditioned soils are collected into a ST-90 container and one station where the separated ferrous metals are collected.

The Waste Conditioning Operators are responsible for moving the ST-90 collection containers and putting on the lids prior to being collected by the Shipping Operator.

Note: When the LTD DEMO Test is completed, the plant is operational and radioactive material is processed, then the entire area where the conditioned soil is collected will be the second of two, specified radio-logical work areas; workers must wear full PPE (Tyvek, booties, gloves, safety goggles) and air-purifying respirators with combination cartridges.

I7.13 Function Title: Control Room Operators

Control Room Operators are responsible operating the PLC system for processing and conditioning the waste. The Control Room Operator is responsible to ensure that the system is operating safely and provides the focus for operational status.

The control room work area does not require the operator to wear any special PPE.

I7.14 Function Title: Waste Processing System Rover

Waste Processing System Rover is responsible for monitoring all equipment in operation throughout the Waste Processing, monitoring waste collection stations, checking control parameters and settings, where specified, maintaining material and product flow.

Waste Processing System Rover alerts Material Control Coordinator on status of waste materials inventory, removal and replacement of containers at intermediate waste collection stations, and provides communications between the control trailer and feed preparation operators, ensuring continuity within process operations.

Waste Processing System Rover checks for proper alignment and operation of rotary dryer drum, conveyors, equipment malfunctions, leakage and implements spill control and contain-ment measures as necessary.

Waste Processing System Rover assists the control room operator during the start-up cycle.

I7.15 Function Title: Receiving Operator

Receiving Operator is responsible for off-loading, inspecting, and accepting or rejecting incoming materials purchased per Vortec purchase orders; Receiving Operator is responsible for on-site movement, storage, and control of all materials in inventory. Receiving Operator segregates all raw materials in proper storage areas, isolating radiological contaminated materials according to procedure. The receiving operator is also responsible for scanning drums for surface contamination when receiving radioactive waste.

Receiving Operator informs and updates Material Control Coordinator on status of all deliveries. Receiving Operator, strictly following the Propane Unloading Procedure, monitors propane deliveries and off-loading.

Receiving Operator delivers drums required for pre-treatment and conditioning from storage to the shredder processing area per the daily schedule.

I7.16 Function Title: Shipping Operator

Shipping Operator is responsible for the delivery of production materials and wastes from inventory to Bechtel-Jacobs. Shipping Operator removes waste materials from the Conditioned Waste Station to storage, empty ST-90 boxes and drums from clean storage location to waste pick-up stations, full ST-90 boxes and process waste drums from waste pick-up stations to proper storage areas, ST-90 boxes and conditioned waste pick-up stations from storage to Bechtel-Jacobs locations per authorized shipping documents.

Shipping Operator is responsible for all materials leaving plant site, including but not limited to conditioned wastes to Bechtel-Jacobs, non-soil related site wastes, outside services such as janitorial, repairs and returns, sanitary, water, etc.; Shipping Operator is responsible for completion of appropriate paperwork and data entry

I7.17 Function Title: Plant Maintenance Electrician

Plant Electrician is responsible for maintaining electrical and instrument systems, conducting routine electrical preventive maintenance, installing replacement components, conducting routine electrical inspections, trouble-shooting electrical problems, providing assistance to other processing areas as required, and ensuring continuity of the process operation. Plant Electrician implements assigned maintenance work orders and complies with all specified safety and environmental requirements.

Plant Electrician dons and doffs appropriate PPE per Work Order or RWP, follows all work place health and safety work procedures, including but not limited to Confined Space Entry and LockOut/TagOut.

I7.18 Function Title: Plant Maintenance Mechanic

Plant Mechanic is responsible for maintaining mechanical and instrument systems, conducting routine preventive maintenance, installing replacement components, routine mechanical system additions, updates or upgrades, ensuring mechanical safety, and conducting routine mechanical inspections, trouble-shooting mechanical problems. Plant Mechanic provides assistance to other processing areas as required, ensuring continuity within process operations. Plant Mechanic implements assigned maintenance work orders and complies with all specified safety and environmental requirements

Plant Mechanic dons and doffs appropriate PPE per Work Order or RWP, follows all work place health and safety work procedures, including but not limited to Confined Space Entry and LockOut/TagOut.

I7.19 Function Title: Sampling and Testing Personnel (For Ltd Demo Testing Only)

Sampling and Testing Personnel are responsible performing the sampling and testing as defined in the Phase IV Test Plan, BFA-4110-904-004.

Sampling and Testing Personnel dons and doffs appropriate PPE per Work Order or RWP, follows all work place health and safety work procedures, including but not limited to Confined Space Entry and LockOut/TagOut.

I7.20 Function Title: All-Purpose Personnel (Not Applicable to Ltd Demo Test)

All-Purpose Personnel are responsible for off-shift activities including electrical and mechanical repairs which the Plant Electrician or Plant Mechanic have identified, conducting routine preventive maintenance and inspections, transporting containers to and from appropriate locations, moving scheduled waste containers into the Waste Processing queue, starting specified equipment in advance of the production shift to pre-heat, and/or initiate similar time consuming cycles to facilitate start-up on the production shift.

All-Purpose Personnel don and doff appropriate PPE per Work Order or RWP, and follow all work place health and safety work procedures, including but not limited to Confined Space Entry and LockOut/TagOut.

I7.21 Function Title: Plant Security Personnel

Plant Security Personnel are responsible for the security of the plant. This includes the operational equipment and operational personnel. Plant security is provided by the DOE/PGDP. Plant security reports directly to the site manager.

All security reporting will include normal DOE/PGDP reporting procedures along with scheduled activity reports furnished to Vortec Corporation's site manager.

I7.22 All Employees:

Attend and successfully complete all required health, safety and other specified training including hazard communications.

Apply hazardous chemical labels to unlabeled secondary containers; check with the HSO and MSDS before labeling containers. Each employee shall practice safe handling, usage, and storage of hazardous chemicals. Each employee will be responsible for seeing that all portable containers used in their work area are labeled with proper identity and hazard warnings.

Each employee is required to comply with all health and safety requirements and procedures, report all accidents and incidents immediately, and report all unsafe acts and/or conditions.

All Employees don and doff appropriate PPE per area requirements or RWP, and follow all work place health and safety work procedures, including but not limited to Confined Space Entry and LockOut/TagOut.

I8. Records

Personnel records will be maintained at the Vortec Corporation office in Collegeville, PA.

Operational records will be maintained by the CMA and stored at the Site Managers office.

APPENDIX J

Vortec Corporation

Procedure for Lockout/Tagout

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Vortec Corporation
Procedure for Lockout/Tagout

Prepared by: R.K. Hnat
Approved by: *James G. Hnat*
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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Lockout/Tagout Procedure

J1. PURPOSE

The purpose of this document is to describe the methods and procedures Lockout/Tagout.

J2. APPLICABILITY

This procedure is applicable to Vortec's Waste Conditioning Plant.

J3. ACRONYMS

DOE - The United States Department of Energy
CFR - Code of Federal Regulations
LOTO – Lockout/Tagout
DDNO – Danger-Do Not Operate

J4. REFERENCES

29 CFR 1910, Occupational Safety and Health Standards.

J5. LOCKOUT/TAGOUT NOT REQUIRING A PERMIT

17. Work activities may be performed without a Lockout/Tagout (LOTO) work permit provided an agreement is reached between the Site Manager and employee(s) for all of the following steps:
 1. The machine or equipment has no potential for stored or residual energy or the reaccumulation of stored energy after shutdown, which would endanger employees.
 2. The machine or equipment has a single energy source that can be readily identified and isolated.
 3. The isolation of that energy source and a single LOTO device shall completely de-energize and deactivate the machine or equipment
 4. If the single energy source is lockable, the authorized employees shall apply their lock and personal Danger-Do Not Operate (DDNO) tag.
 5. If the single energy source is not lockable, the authorized employees shall apply their personal DDNO tag.
 6. The LOTO device is under the exclusive control of the authorized employee(s) performing the servicing or maintenance (that is, each authorized employee must apply their own lock/tag).
 7. The servicing or maintenance does not create hazards for other personnel.
 8. The Site Manager and issuing authority is unaware of any incidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.
 9. The isolation does not disable other equipment or systems necessary for employee safety/health or for production.
18. If all of the above conditions are met:
 1. The equipment shall be isolated to a safe energy state.
 2. The authorized employees shall use their personal tag and/or lock to secure the energy isolation device. If more than one authorized employee will be working on the job, each employee shall hang his or her own lock and tag.
19. Work performed under this provision of the program is limited to those tasks that can be completed during a continuous work assignment except as provided below:

1. A continuous work assignment would be a regular shift or regular shift plus continuous overtime.
2. If the work cannot be completed and the system left in a safe condition in this time frame, the Site Manager will determine the need and method to secure the system.
3. When the work is completed, the authorized employee removes the lock/tag.

6. USE OF DANGER- DO NOT OPERATE TAGS

The DDNO tags are to be used only for the protection of personnel.

Affix DDNO tags to all isolation points. Points not lockable shall be tagged with warnings about hazardous conditions, if the machine or equipment is energized. The tag shall be labeled with one of the following legends accordingly: **Do Not Start, Do Not Open, Do Not Close, Do Not Energize, or Do Not Operate.**

The tag shall also indicate the identity of the employee applying the tag and date at a minimum. Tags are essentially warning devices affixed to energy-isolating devices, and do not provide the physical restraint on those devices that is provided by a lock. When a tag is attached, it shall not be removed without authorization of the person responsible for it, and shall never be bypassed or ignored.

Tags may evoke a false sense of security and their meaning needs to be understood as part of the overall energy control program.

An example of the tags is provided as Figure J-1.

Figure J-1. Danger – Do Not Use Operate Tags

<p>UE-633 (12-93)</p> <p>DANGER</p> <p>DO NOT OPERATE</p> <p>PERSONNEL PROTECTION</p> <p>Lockout/ Tagout Tearoff Tab</p> <p>Front</p>	<p>DANGER</p> <p>Issuing Authority: _____</p> <p>Dept. No.: _____</p> <p>Device Identification: _____</p> <p>Device Position: _____</p> <p>Applied By: _____</p> <p>Date: _____</p> <p>Tag No.: _____</p> <p>Tag No.: _____</p> <p>Device Identification: _____</p> <p>Back</p>
---	--

7. USE OF LOCKS AND LOCKBOXES

The LOTO program locks will have only two keys existing to open a lock. One key will belong to the group or individual owning the lock and the other key will be under the control of the Site Manager.

Three classes or uses of locks are associated with the LOTO program:

2. Tag Lock — A lock actually used to lock energy isolation components. The locks can be single units or groups of locks keyed the same. The keys to all tag locks applied on a permit are placed in a permit lockbox.
3. Permit Lock — A permit lock is a lock used by the Site Manager to lock onto a permit lockbox. Each lock will be unique (no series locks).
4. Personal Lock — These are the locks used by the authorized employees to overlock lockboxes and in some cases energy isolation points.

Care and protection of the keys and locks are the responsibility of the employee. The loss of system keys must be reported to the Site Manager as soon as possible.

A lockbox is under the control of the Site Manager. The keys to tag-locks and the tabs, if used, from DDNO tags on devices that are not lockable will be visibly displayed in the permit lockbox.

Overlocking the Permit Lockbox:

1. The issuing authority determines control points and applies locks and tags. The keys to tag-locks shall be visibly displayed in the permit lockbox. The issuing authority applies a personnel lock to the permit lockbox.
2. The Site Manager or designee applies a personal lock to the lockbox and proceeds with the verification.
3. After protection has been verified, the authorized employees shall then overlock the permit lockbox. The authorized employees have the option to verify protection, if desired.

8. USE OF THE LOCKOUT/TAGOUT WORK PERMIT FORM

The issuing authority or designee completes the blocks listed below on the “original” Permit form shown in Figure J-2:

5. Logged By: Enter permit number in log and initial on this line.
6. LOTO No. This number is assigned on the LOTO permit. For example, 96-1, where 96 is the year and 1 is the sequential number.
7. Location: State the location of the equipment and/or area where, work is to be performed.
8. Issued on the Following Equipment: List the specific equipment.
9. Pressure: Enter the pressure within the system at the time the permit is ready to issue.
10. System Normally Contains: A description of the materials normally found in the system.
11. Test Results: Enter the test results from sampling the system. If the system was not tested, enter “not sampled” in the block.

NOTE: If the permit only concerns electrical hazards, place NA’s in lines 5, 6, and 7.

12. Tagout Sequence to be followed: If equipment is to be operated and protection is to be applied in the order listed on the permit, check the yes block. If no sequence must be followed, check the no block.
13. Tag No.: Enter the tag number suffix to be applied on this particular device.
14. Energy Isolating Device: Identify the component providing the isolation.
15. Device Status: Give the position of the component required to provide energy isolation.
16. Lockable: Identify by YES if a lock is to be applied; NO if not lockable.
17. Additional Energy Isolating Devices: When more energy isolating devices are required than can be listed on the LOTO work permit, additional energy isolating devices, shall be utilized. Check the yes block and enter the page number. The permit number and page number are also entered on the attached page.

18. Cautionary Notes: This identifies other applicable protective devices such as barriers, control points, and other precautions.

NOTE: Steps 15 through 18 are completed as part of concurrent verification.

15. Device Aligned By: The first authorized employee operates the equipment aligning the devices(s).
16. Status Verified By: The second authorized employee verifies equipment alignment.
17. Lock(s)/Tags(s) Placed By: The first authorized employee places the locks/tags and enters initials in the corresponding blocks.
18. Lock(s)/Tag(s) Verified By: The second authorized employee verifies placement of lock(s)/tag(s) and initials in the corresponding blocks.

NOTE: The issuing authority is responsible for ensuring that the key(s) to tag locks and any tabs from DDNO tags are visibly displayed in a permit lockbox, the lockbox is identified on the permit, and their departmental lock is applied.

19. System Isolation Verification: A system verification will be performed to assure the equipment de-energized is specified on the permit. If a functional verification is not practical, a visual verification shall be performed. The person making the verification shall sign/date in the system isolation verification signature/date section.
20. Verified By: The authorized employee(s) who initialed in block 16 and 18 signs the form.

The supervisor in charge or the issuing authority completes blocks 21 and 22 on the original permit form.

21. Issuing authority: Reviews the permit to be certain all required activity has been completed, properly documented, and signs in the issuing authority block.
22. Time and Date: Enter the time and date.

The permit is now issued.

23. Lock/Tag Verification: The issuing authority or designee shall verify lock/tag location is as specified on the permit. The person making this verification will initial the block on the copy for each energy-isolating device.

24. Craft/Remarks: Give a brief description of the work to be performed.
25. Verified By: The authorized employee who initialed in Block 23 signs the form.
26. Site Manager: The Site Manager reviews the permit to be certain all required activity has been completed and properly documented. The Site Manager determines if the applied protection is adequate for the work to be done. Assistance from a knowledgeable person may be requested to ensure adequate protection exists. On approval, the Site Manager signs in this block.
27. Time and Date: The Site Manager enters time and date.

At this time, the issuing authority makes a single copy of the signature list portion of the permits, stamps or writes copy on the permit, and gives to the Site Manager.

The following entries are made on the issuing authority's original permit form to release the permit.

NOTE: The grounds applied/removed section must be completed. If no electrical grounds were applied, enter NA.

28. Site Manager: The Site Manager signs in this block to release the permit.
29. Time and Date: The Site Manager enters time and date.

Entries for the remarks section will normally be made on the original permit form:

30. Remarks: This section is provided for logging information relevant to this permit.
31. Tag Removal Authorization: The issuing authority will identify locks/tags to be removed by initialing the appropriate blocks in the locks/tags removal authorization column.

NOTE: If part of the protection is being removed to allow a system check, only the needed keys and tabs are removed from the permit lockbox. The keys/tabs shall be secured in the permit lockbox until the permit is reissued.

32. Lock/Tag Removed By: The issuing authority or designee (an authorized employee) to remove the locks/tags from the energy isolating devices. The person removing the locks/tags initials each corresponding block.
33. Tag Removal Verified By: An authorized employee shall verify removal of the tags removed in Step 31 and shall initial each corresponding block.

The issuing authority shall complete the permit closure section.

34. Permit Closed By: The issuing authority will dose out the permit by signing in this block.

35. Date and Time: The issuing authority will enter date and time of closure.

NOTE: At this time, all tags will be destroyed.

[illegible]

Signature List

LOTO No. _____ PAGE _____

ISSUING AUTHORITY		SITE MANAGER VERIFIED/ACCEPTED		SITE MANAGER PERMIT RELEASE	
20. VERIFIED BY:		24. CRAFT REMARKS:		NO. GROUNDS APPLIED:	
VERIFIED BY:				NO. GROUNDS REMOVED:	
21. ISSUING AUTHORITY:		25. VERIFIED BY:		28. SITE MANAGER:	
22. DATE:	22. TIME:	26. SITE MANAGER:		29. DATE:	29. TIME:
		27. DATE:	27. TIME:		
VERIFIED BY:		CRAFT REMARKS:		NO. GROUNDS APPLIED:	
VERIFIED BY:				NO. GROUNDS REMOVED:	
ISSUING AUTHORITY:		VERIFIED BY:		SITE MANAGER:	
DATE:	TIME:	SITE MANAGER:		DATE:	TIME:
		DATE:	TIME:		
VERIFIED BY:		CRAFT REMARKS:		NO. GROUNDS APPLIED:	
VERIFIED BY:				NO. GROUNDS REMOVED:	
ISSUING AUTHORITY:		VERIFIED BY:		SITE MANAGER:	
DATE:	TIME:	SITE MANAGER:		DATE:	TIME:
		DATE:	TIME:		
VERIFIED BY:		CRAFT REMARKS:		NO. GROUNDS APPLIED:	
VERIFIED BY:				NO. GROUNDS REMOVED:	
ISSUING AUTHORITY:		VERIFIED BY:		SITE MANAGER:	
DATE:	TIME:	SITE MANAGER:		DATE:	TIME:
		DATE:	TIME:		
VERIFIED BY:		CRAFT REMARKS:		NO. GROUNDS APPLIED:	
VERIFIED BY:				NO. GROUNDS REMOVED:	

Figure J-3. Lockout /Tagout Work Permit Form

APPENDIX K

Vortec Corporation

Other Miscellaneous Vortec Procedures/Plans

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Vortec Corporation
Other Miscellaneous Vortec Procedures/Plans

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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Quality Procedure # 8	Procurement and Purchasing Control
Quality Procedure # 9	Government Contract Plant Receiving, Inspection, and Maintenance Surveillance
Quality Procedure # 10	Performing Construction, Installation, and Operations Surveillance at Government Demonstration Plants
Quality Procedure # 11	Control of Non-Conforming Conditions for Government Contracts
Quality Procedure # 12	Government Contract Demonstration Plant Change Control
Quality Procedure # 13	Control of Government-Owned Property, Facilities and Materials
QDP-211-0-001	Respiratory Protection Plan
QDP-211-0-002	Chemical Hygiene Plan (CHP)
QDP-211-0-003	Personnel Protection Plan
QDP-211-0-004	Hazard Communication Program (HAZCOM)
QDP-211-0-006	Hot Work Permit Plan (Draft A)
QDP-211-9-001	Procedures for Plant Receiving, Inspection, and Maintenance Surveillance at the Paducah Kentucky Demonstration Plant
QDP-211-13-001	Procedures for Property Management of Government Owned Property

Vortec Corporation

SAFETY POLICY

When we emphasize safety and health, we develop an attitude and awareness that enhances our commitment to excellence in everything we do.

The Safety and Health of each employee is of primary concern. Our goal is to prevent all injuries and occupational illnesses by the elimination of unsafe conditions and unsafe acts.

We are all, each and every employee, responsible for assuring that:

- We do each job in a way that protects us, and others around us;
- We help others to work safely;
- Facilities, tools, and equipment are properly designed, maintained, and used as intended;
- Personal protective equipment is suitable for the job, properly maintained, and correctly used;
- Safety standards and work procedures are always carefully followed;
- We are trained to understand the hazards or potential hazards of our jobs;
- We shut down any operation that cannot be done safely;

These responsibilities are shared among all members of our organization. By working together and each playing our part, we will eliminate unsafe conditions and unsafe acts and thereby protect ourselves and our fellow employees from injury.

J. G. Hnat

A handwritten signature in dark ink, appearing to read "James G. Hnat", written in a cursive style.

President, Vortec Corporation

11/98

Engineering Quality Assurance Plan

Quality Procedure #1: Engineering and Design Control

QP-1: Engineering and Design Control

Purpose and Scope

Purpose—This procedure establishes methods for the preparation, review, and approval of designs of engineered systems and design revisions.

Scope—This procedure applies to the design of engineered systems and design revisions activities performed by Vortec. Also, this procedure *may* apply to design activities performed by a contracted Architect/Engineer (A/E)—the A/E may work to his or her design procedures *if* stated in the contract and provided that they meet or exceed Vortec Corporation Procedures or approved requested exceptions.

Definitions

Acceptance Criteria	Specified limits placed on characteristics of an item, process, or service defined in codes, standards, or other requirement documents, such as design output.
Computer Hardware Validation	The process which demonstrates that computer equipment correctly performs its stated capabilities and functions.
Computer Program Validation	The process that demonstrates that the computer program correctly performs its stated capabilities and functions.
Computer Program Verification	The process which demonstrates that the mathematical or statistical model embodied in the computer program is an acceptable representation of the process or system for which it is intended and meets all specified requirements.
Design Change	Any revision or alteration of the technical requirements defined by approved and issued design output documents, and any approved and issued changes thereto.
Design Input	Those criteria, parameters, bases, or other design requirements upon which detailed final design is based.
Design Output	Drawings, specifications, or other documents used to define technical requirements of structures, systems, components, and computer programs.
Design Process	Technical and management processes that begin with identification of design input and that lead to, and include the issuance of, design output documents.
Design Verification	The act of evaluating and documenting that the design meets specified requirements. Examples of how this can be accomplished are design reviews, alternate calculations, and/or qualification testing.

QP-1: Engineering and Design Control

Responsibilities

WHO	DOES WHAT
Originators	<ul style="list-style-type: none">• Develop design documents
Technical Reviewers	<ul style="list-style-type: none">• Review design documents• Resolve comments with the originator• Sign and date final design package
Interface Engineers, Lead Designer, and System Engineering Manager	<ul style="list-style-type: none">• Review conceptual drawings• Review preliminary drawings• Review and sign final drawings
Engineering Manager	<ul style="list-style-type: none">• Approves and signs final drawings• Assigns independent Technical Reviewers to review calculations• With the Program Manager, conducts design reviews• Reviews, approves, and signs final calculations
Program Manager	<ul style="list-style-type: none">• Assembles a design team and assigns responsibilities• With Engineering Manager, conducts design reviews• Conducts status meetings with Engineering and Task Managers

QP-1: Engineering and Design Control

Design Procedures

Whenever Vortec Corporation wins a contract, a Program Manager (PM) is assigned to that contract. His or her responsibilities are summarized in the following outline.

PERSON OR FUNCTION:	REQUIREMENTS:
Program Manager	<ol style="list-style-type: none">1. Assembles design team.2. Assigns responsibilities.3. Reviews contract and associated documentation to determine applicable codes and standards and specific program requirements.4. Defines design input from information compiled from step #3.5. Determines design activities (which may be accomplished manually or with verified/validated computer programs).6. Determines whether or not each computer program—if any of the design activities are to be accomplished using computer programs—has been verified/validated.<ul style="list-style-type: none">• If the program has been verified/ validated, places documentation of such in the program files.• If the program has not been verified/validated, PM does this. <p>Some options are to:</p> <ul style="list-style-type: none">- Compare the program output with that of a previously verified program.- Compare the program output with results of approved hand calculations.- Identify the program as an industry standard. <p>When verification/validation has been accomplished, places documentation in the program files.</p>

QP-1: Engineering and Design Control

PERSON OR FUNCTION:

REQUIREMENTS:

**Systems
Requirement
Document**

1. Must contain the following identifiers:
 - A. Program title and contract number
 - B. Date of first submittal
 - C. Revision level with date
 - D. Controlled document copy number
 - E. Engineering Manager's approval signature and date.
 - F. Environmental Compliance Manager's approval signature and date
 - G. Program Manager's approval signature and date
2. Must contain the following information:
 - A. Introduction
 - B. Facility requirements
 - C. Major system requirements
 - D. Equipment design requirements
 - E. General requirements
3. Must be reviewed and approved by the Program Manager or designee.

Engineering Manager

1. Reviews contents based on the following:
 - A. All information is consistent with design objectives, environmental requirements, project requirement meetings, and pertinent correspondence.
 - B. All data are requirements and not solutions.
2. Transmits reviewed calculations as follows:
 - A. Transmits document with review comments to the originator for resolution.
 - B. Signs and dates the satisfactory resolved differences.
 - C. Submits document to Program Manager for final review and approval.

QP-1: Engineering and Design Control

Environmental Compliance Manager

Reviews contents to ensure that all information is consistent with environmental requirements.

Originator

1. Analyzes the review comments, resolves any differences, and makes the necessary corrections.
2. Returns document to the Engineering Manager for final review and approval.

Program Manager

1. Reviews and approves final document.
2. Places document in the program file.
3. Issues the document through document control.

Controlled Engineering Calculations

Controlled Engineering Calculations

- CMS™ Heat and Mass Balance
 - Process Mass Balance
 - Structural Calculations
 - Strength of Materials
 - Water Jacket Sizing
 - Heat rejection system calculations
 - Pressure drop calculations for gases and liquids
 - Engineering calculations submitted to either a subcontractor or customer.
1. Must contain the following identifiers:
 - a. Program title and contract number
 - b. Subject
 - c. A unique calculation number
 - d. Originator's name
 - e. Date of calculation
 - f. Name of computer programs used for calculation
 - g. Revision level with date and initials
 - h. Technical Reviewer's signature and date
 - i. Engineering Manager approval signature and date

QP-1: Engineering and Design Control

PERSON OR FUNCTION:	REQUIREMENTS:
Controlled Engineering Calculations (cont'd)	<ol style="list-style-type: none">2. Each calculation shall include the following:<ol style="list-style-type: none">a. Objective of the calculationb. Scope of the calculationc. Referencesd. Assumptions used in the calculation and those assumptions requiring future confirmatione. Technical approachf. Input datag. Calculationsh. Results of the calculation3. Must be reviewed and approved by the Engineering Manager or designee.
Technical Reviewer	<ol style="list-style-type: none">1. Reviews each calculation, considering the following:<ol style="list-style-type: none">a. Does the calculation contain all the required identifiers?b. Are all the inputs to the calculation clearly identified, and are they consistent with the objectives and technical approach?c. Are assumptions reasonable?d. Is the technical approach appropriate?e. Are the calculations accurate?f. Are the results reasonable, considering the inputs and assumptions?2. Transmits reviewed calculations as follows:<ol style="list-style-type: none">a. Transmits calculations with review comments to the originator for resolution.b. Signs and dates the satisfactorily resolved differences.c. Submits calculation to EM for final review and approval.
Originator	<ol style="list-style-type: none">1. Analyzes the review comments, resolves any differences, and makes the necessary corrections.2. Returns calculation(s) to the Technical Reviewer for approval.
Engineering Manager	<ol style="list-style-type: none">1. Reviews and approves final calculations.2. Places the calculations in the program file.

QP-1: Engineering and Design Control

PERSON OR FUNCTION:**REQUIREMENTS:**

Engineering Drawings

1. Drawings are defined as conceptual, preliminary, and final.
2. All drawings shall contain the following identifiers:
 - a. Program title and contract number
 - b. Client's name
 - c. Originator's name
 - d. Unique drawing identification number
 - e. Date of issue
 - f. Revision level
3. The title block will contain the company name, revision level, and brief description.
 - a. Conceptual and preliminary drawings identify the revision level with a letter.
 - 1.) The original revision level will be "A," with revision levels progressing alphabetically.
 - 2.) To avoid confusion between lettered and numbered revision levels, the letters "I" and "O" will not be used on conceptual and preliminary drawings.
 - b. Final drawings identify the revision level with a number. The original revision level will be "0" (zero), with revision levels increasing numerically.

Interfacing Engineers, System Engineering Manager(s), and Lead Designer

1. Reviews each conceptual, preliminary, and final drawing considering the following:
 - a. Does the drawing contain all the identifiers as specified above?
 - b. Are the objectives of the drawing clearly identified, and are they consistent with the technical approach?
 - c. Are assumptions reasonable?
 - d. Is the technical approach appropriate?
 - e. Is all the information accurate?
 - f. Are the results reasonable, considering the inputs and assumptions?
2. Transmits reviewed drawings as follows:
 - a. Transmits drawings with review comments to the originator for resolution.
 - b. Signs and dates the satisfactorily resolved differences.
 - c. Submits drawing to EM for final review and approval.

QP-1: Engineering and Design Control

PERSON OR FUNCTION:	REQUIREMENTS:
Originator	<ol style="list-style-type: none">1. Analyzes the review comments, resolves any differences, and makes the necessary corrections.2. Returns drawings(s) to the Technical Reviewer for approval.
Technical Reviewer	<ol style="list-style-type: none">1. Verifies that drawings are in compliance with the SRD.2. Signs and dates the satisfactorily resolved differences.3. Submits them to the EM for final review and approval.
Engineering Manager	<ol style="list-style-type: none">1. Approves final drawings and revisions.2. Issues drawings through document control.
All Personnel	Maintain all drawings in the program file.

QP-1: Engineering and Design Control

PERSON OR FUNCTION:**REQUIREMENTS:**

Engineering Specifications

1. Must contain the following identifiers:
 - a. Program title
 - b. Subject
 - c. A unique specification number
 - d. Originator's name
 - e. Date issued
 - f. Revision level with date and initials
 - g. Technical Reviewer's signature and date
 - h. EM's approval signature and date.
2. Each specification must follow the procedures for format and content.
3. Must be reviewed.

Technical Reviewer

1. Reviews each specification, considering the following:
 - a. Does the specification contain all the required identifiers?
 - b. Are all the necessary attachment specifications included?
 - c. Is the technical approach appropriate?
 - d. Is the description of work accurate?
 - e. Are the design requirements accurate?
 - f. Are the correct drawings referenced?
 - h. Is the specification in compliance with the SRD?
 - i. Is the specification in compliance with environmental requirements
2. Transmits reviewed calculations as follows:
 - a. Transmits specifications with review comments to the originator for resolution.
 - b. Signs and dates the satisfactory resolved differences.
 - c. Submits specifications to EM for final review and approval.

Originator

1. Analyzes the reviewed comment, resolves any differences, and makes the necessary corrections.
2. Returns specifications to the Technical Reviewer for approval.

Engineering Manager

1. Reviews and approves specifications.
2. Places the specification into the project file.

QP-1: Engineering and Design Control

PERSON OR FUNCTION:**REQUIREMENTS:**

Design Review and Approval

1. Meet design review objectives—including, but not limited to, the following:
 - a. Obtain concurrence of appropriate levels of program management and in-house expertise as to technical quality of the work.
 - b. Reinforce the program design and systems engineering through assessment of program elements, both incrementally and cumulatively.
 - c. Support the schedule for submittal of quality program deliverables.
2. Conduct design reviews both informally and formally during the course of the work.
 - a. Informal reviews encompass such concerns as the progress of work, the need for additional resources or data input, and the technical quality of the work. These reviews need not be documented.
 - b. Formal reviews are conducted by the Engineering Manager and Program Manager.
 - c. Schedule formal reviews to parallel program development milestones and reinforce the ultimate goal of configuration management which are:
 - 1.) Assurance that discrete system components have been addressed.
 - 2.) Satisfaction of the requirements of interfacing systems.
3. Encourage the participation of subject matter experts in the design review process.
4. Incorporate the formal design review proceedings and resulting action items into the appropriate documentation:
 - Final calculations
 - Final drawings
 - Specifications
 - System Requirements Document

Interface Management

1. The PM will define the interface between Vortex's functional organizations and the corresponding group with the subcontractor established.
2. Define the procedure for the flow of information between Vortec and its subcontractors. Assure that all information is documented and approved by the PM.
3. QA Manager will assure uniformity of terminology and concepts between Vortec and its subcontractor. QAM will assure documentation requirements of the program are met.

Engineering Quality Assurance Plan

Quality Procedure #8 Procurement and Purchasing Control

QP-8: Procurement and Purchasing Control

Purpose and Scope

Purpose—The purpose of this procedure is to establish a uniform method to control procurement, purchasing, and inspection.

Scope—This procedure applies to:

- Procurement of construction, professional, and manufacturing services;
- Purchasing of materials, supplies, and equipment;
- Requesting quotations for materials and equipment;
- Evaluating requests for proposals and quotations; and
- Receiving of purchased items.

References

This procedure was developed in accordance with objectives stated in the *Vortec Procedures Manual (VPM)*, Section 3: Procurement and Purchasing.

Definitions

Purchase Requisition (PR)	The document used internally to request the purchase of materials, supplies, equipment, engineering support, subcontractors.
PR Number	Unique number assigned to purchase requisitions.
Purchase Order (PO)	The document used for purchasing materials, supplies, or equipment.
PO Number	A unique number assigned to each Purchase Order. PO number is based on the contract number it supports.
PO Register	A structured log sheet used to record all purchasing actions.
Tax Exempt Form	Form used to exempt Vortec Corporation from payment of state sales tax on purchases made under Government contracts or manufactured items.

QP-8: Procurement and Purchasing Control

Definitions (cont'd)

Request for Quote (RFQ)	A document issued to potential material and equipment suppliers as a request for price data. The document contains a detailed description of the item(s) required and conditions for quoting. RFQs do not obligate the Vortec Corporation to a purchase.
Quotation	A contractor's offer in response to an RFQ.
RFQ Log	A structured log sheet used to record all RFQ actions.
RFQ Number	A unique number assigned to each RFQ.
Source Evaluation and Selection Board (SESB)	Personnel appointed by the Program Manager to evaluate and select a contractor or supplier based on their proposals and quotations.
Short List	A list developed as the result of the evaluation process that identifies the most technically qualified firms in descending order of qualification.
Receiving	The process of counting item quantities and examining their physical characteristics for shipping damage and for conformance with the requirements of the procurement documents.
Material Receiving Report	A structured form used to record the receipt and acceptability of purchased items.
Disposition Inquiry	A structured form used to advise the purchasing agent of receipts which have incorrect price counts, damaged material, or other supplier or carrier discrepancies.
Procurement Document	Purchase Order, contract, specification, or other descriptive document used to procure items of supply.
Receiving Coordinator	The designated person responsible for determining acceptability of all purchased items.

QP-8: Procurement and Purchasing Control

Responsibilities

WHO	DOES WHAT
QA Manager or designated representative	<ul style="list-style-type: none">• Prepares procurement procedures• Ensures that procurement procedures are implemented.
Procurement Specialist	<ul style="list-style-type: none">• Ensures that procurement is accomplished in accordance with established procedures.• Maintains logs of procurement activities.
Cost Account Manager	<ul style="list-style-type: none">• Ensures that procurements are within the scope of the contract.• Approves Purchase Requisitions.
Accounting Specialist	<ul style="list-style-type: none">• Prepares and issues Purchase Orders• Maintains cost records of procurements.
Program Manager	<ul style="list-style-type: none">• Approves Purchase Orders
Operations Manager	<ul style="list-style-type: none">• Approves Purchase Orders.
Vortec Corporate Officer	<ul style="list-style-type: none">• Approves Purchase Orders exceeding \$10,000.

QP-8: Procurement and Purchasing Control

Procurement and Purchasing Procedures

<i>WHO</i>	<i>DOES WHAT</i>
Requisitioner - Vortec employee or subcontractor requiring material, supplies, or equipment	<ol style="list-style-type: none">1. Completes Request for Quotations (RFQs) seeking pricing information on supplies, material, or equipment.2. Forwards RFQs along with a list of potential suppliers to the Cost Account Manager (CAM).3. Prepares purchase requisitions (PRs) using Vortec's PR Form (Example Figure 8-1).4. Prepares Request for Proposals.5. Forwards PRs to the Procurement Specialist.6. Participates, as required, on Source Evaluation and Selection Board (SESB) for review of Quotations and Proposals and Selection of Vendors.
Procurement Specialist	<ol style="list-style-type: none">1. Ensures that RFQs and PRs contain adequate information.2. Assigns numbers to and logs RFQ, RFP, and PR activities.3. Forwards RFQs to suppliers.4. Notifies requisitioner of vendor selection of SESB.5. Notifies successful bidder.6. Notifies bidders who were not selected by the SESB.7. Signs PR and forwards PR to Cost Account Manager.8. Logs date/time that Quotations and Proposals are received and forwards Quotations and Proposals to SESB.9. Follow up on any supplier who does not respond to RFQs to determine if they will respond.10. Sends copy of PR to Property Manager.11. Contacts vendor to assure that PO was received and resolve any questions.12. Tracks progress of and expedites purchase order.

QP-8: Procurement and Purchasing Control

WHO	DOES WHAT
Procurement Specialist (cont'd)	<ol style="list-style-type: none">13. Prepares Purchase Order (PO) using Vortec's PO Form (Figure 8-2) from PR.14. Forwards PO to Program Manager for Approval.15. Assigns PO Number to approved POs and distributes PO to vendor.16. Distributes copy of PO to Accounting Specialist.17. Checks the packing slip for items received against the PO to ensure that all items purchased have been delivered.18. Initiates corrective action with vendor or carrier for discrepancies noted by Receiving Coordinator on the Material Receiving Report (MRR) and the Disposition Inquiry.19. Checks invoices against MRR, Disposition Inquiry, and PO and approves invoices.
Cost Account Manager	<ol style="list-style-type: none">1. Reviews RFQs, RFPs, and PRs to ensure that request is within scope of contract, all applicable codes are included, and that standards and quality requirements are met.2. Signs PRs and forwards PRs to Accounting Specialist.3. Participates on SESB, as required, for review of Quotations and Proposals and Selection of Vendors.4. Forwards RFQs with any comments to Procurement Specialist
Accounting Specialist	<ol style="list-style-type: none">1. Receives approved PO from Procurement Specialist.2. Enters PO into accounting system3. Receives invoices from vendor.4. Forwards copy of invoice to Procurement Specialist for approval.5. Forwards approved invoices to Finance Officer for payment.
Operations Manager	<ol style="list-style-type: none">1. Reviews and approves PRs and forwards PRs to Program Manager for approval.2. Assigns Vortec Personnel to SESB and designates an SESB Chairman.

QP-8: Procurement and Purchasing Control

WHO	DOES WHAT
Program Manager	<ol style="list-style-type: none">1. Reviews PRs/POs to ensure that all requirements of contract are satisfied, PRs/POs have been prepared in accordance with Vortec's procedures, and all required signatures are in place.2. Signs PR/PO indicating his/her approval and forwards PR to Procurement Specialist and PO to Accounting Specialist.3. Participates on SESB for review of Quotations and Proposals and selection of vendors, or reviews findings of SESB.
QA Manager	<ol style="list-style-type: none">1. Develops procurement procedures.2. Conducts periodic audits to ensure that established procurement procedures are being followed.
Engineering Manager	<ol style="list-style-type: none">1. Participates in SESB meetings as required.
Corporate Officer	<ol style="list-style-type: none">1. Approves POs with value in excess of \$10,000.
Source Evaluation and Selection Board (SESB)	<ol style="list-style-type: none">1. Review RFQs to ensure that they understand the requirements to which the proposers are responding.2. Review the Quotations and Proposals received relative to the requirements identified in the RFQs.3. Grade the Quotations and Proposals recording findings on Vortec's Source Evaluation and Selection Form.4. The SESB Chairman will generate a short list based on the results of the evaluation.5. After completion of the short list, the SESB Chairman will determine the type of interview, if necessary, to be conducted with the firms on the short list.6. Conduct interviews of firms on the short list.7. Make a final selection of the vendor/firm as supplier.8. Notify the Procurement Specialist of the selected supplier.

QP-8: Procurement and Purchasing Control

WHO	DOES WHAT
Receiving Coordinator	<ol style="list-style-type: none">1. Logs the receipt of delivered items on a Materials Receiving Report. (MRR).2. Checks the packing slip to verify that agreement with the packing slip and contents of the package and inspects the delivered items for damage or other supplier or carrier discrepancies..4. If no discrepancies exist, acceptance of the items are noted on the MRR.5. If discrepancies exist, the discrepancies are described in detail on a Disposition Inquiry form.6. Forwards the MRR, Disposition Inquiry form, and a copy of the packing slip to the Procurement Specialist.
Property Manager	<ol style="list-style-type: none">1. Enters items into appropriate Property Management System.

Procurement and Purchasing Procedures — Flow Diagram

QP-8: Procurement and Purchasing Control

Procurement and Purchasing Procedures — Flow Diagram (cont'd)

QP-8: Procurement and Purchasing Control

Procurement and Purchasing Procedures — Flow Diagram (cont'd)

QP-8: Procurement and Purchasing Control

Procurement and Purchasing Procedures — Flow Diagram (cont'd)

QP-8: Procurement and Purchasing Control

ortec Corporation PURCHASE REQUEST <small>This Purchase Request must be fully approved and accompanied by supporting information before a Purchase Order can be created.</small>				SUPPLIER/VENDOR COMPANY: ADDRESS: CONTACT: PHONE: FAX:			
SHIP TO: CONTACT: PHONE: FAX:				BILL TO: CONTACT: PHONE: FAX:			
REQUISITION NO.	REV. NO.	JOB NO. & NAME	TASK NO.		REQUEST DATE	REQ. REV. DATE	
ECR NO.		SPECIFICATION NO.	TAG NO. (DOE)		ECR APPR. DATE	DATE REQUIRED	
REQUISITIONER		SHIP VIA	PAYMENT TERMS	ORDER TYPE	EXEMPT STATUS	P.O. NUMBER	
ITEM NO.	QUANTITY	U/M	DESCRIPTION		UNIT PRICE	EXTENDED PRICE	
DESCRIPTION SUMMARY:					☐ TOTAL ☐ SUBTOTAL		
REASON FOR THIS REQUEST: 			PROGRAM MANAGER: <div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> PURCHASING APPROVAL DATE </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> PURCHASE REQUEST APPROVAL DATE </div> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black;"> PROGRAM MANAGER APPROVAL DATE </div> </div>				

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PAGE No. Of

Figure 8-1 Purchase Requisition Form

QP-8: Procurement and Purchasing Control

PURCHASE ORDER NO.	DATE	PAGE OF

SUPPLIER / VENDOR:

PURCHASE ORDER

Purchase Order Number Must Appear on all invoices & packing slips.
Subject to all terms & conditions on the reverse side of this form.

SHIP TO:

BILL TO:

SPECIFICATION NO.		DATE REQUIRED		FOB/FREIGHT TERMS		PAYMENT TERMS	
ACCOUNTING DATA				REQUISITION - ECR NO.		JOB NUMBER	
Item	Quantity	U/M	Description			Unit Price	Extended Price
							TOTAL

Purchasing Approval

Date

Corporate Officer

Date

Required for PO's greater than \$10,000.00

Acknowledgement

Vendor Signature

Date

ORIGINAL

Figure 8-2 Purchase Order Form

Engineering Quality Assurance Plan

Quality Procedure #9: Government Contract Plant Receiving, Inspection, and Maintenance Surveillance

QP-9: Government Contract Plant Receiving, Inspection, & Maintenance Surveillance

Purpose and Scope

Purpose — This procedure describes the surveillance activities which shall be performed by Vortec personnel to verify that appropriate receipt, inspection, and maintenance of materials, items and components in storage are being performed.

Scope — This procedure shall apply to materials, items and/or components received and/or stored by the Contractor while performing work at the project site.

Definitions

Unique Requirements	Material Test Reports, ASME Code Data Forms, storage requirements, storage maintenance requirements, Instruction Manuals or other like items required by Purchase Order or Specification.
DMRL	Daily Material Received Log
MISL	Maintenance in Storage Log

References

Applicable Purchase Order and/or Specification

Applicable Codes and Standards

Supplier's Manuals and/or Recommendations

Responsibilities

Vortec Corporation
Personnel

1. Perform surveillance checks of material control as specified by this procedure.
2. Document surveillance activities by utilizing the example surveillance checklists (Figures 9-1 and 9-2).

QP-9: Government Contract Plant Receiving, Inspection, & Maintenance Surveillance

Procedures

<i>Who</i>	<i>Does What</i>
Receiving Surveillance	<ol style="list-style-type: none">1. Review the "Daily Material Received Log" to determine which items shall be reviewed.2. Upon determining which item(s) shall be verified, the purchase order and applicable specification and standards shall be reviewed for specific requirements.3. Make note of any unique storage requirements.4. The requirements found in either 2 or 3 shall be documented in the "Receiving Inspection Checklist" (Figure 9-1) prior to the verification. The documentation required as indicated on the checklist (Items "A") shall also be examined to verify that the information on the document(s) is correct.5. Verification of acceptance shall be achieved either in conjunction with the Contractor's Receiving Inspector or by means of audit of Contractors' receiving reports and actual visual examination.6. Nonconformance shall be handled in accordance with Procedure QP-11.

**QP-9: Government Contract Plant Receiving, Inspection, & Maintenance
Surveillance**

Storage Surveillance

1. Tour those areas which have been designated as storage areas.
 2. During this tour, select a sampling of items and review the storage requirements (Levels A, B, C or D) of the purchase order (if applicable) and the technical specifications for each item.
 3. After the item storage requirements have been determined, the requirements for the storage area shall also be determined and noted.
 4. Verify that the item(s) and the storage areas are in compliance with the requirements of the contract, purchase order, and supplier's specification.
 5. The surveillance shall be documented in a "Storage Area Checklist" and "Receiving Procedure QDP-211-9-001".
 6. Nonconformance shall be handled in accordance with Procedure QP-11.
-

QP-9: Government Contract Plant Receiving, Inspection, & Maintenance Surveillance

Storage Requirements

Items shall be classified based upon contract specifications, procurement documents, and/or supplier recommendations. Conflicts should be resolved with the Engineer.

1. Level A - Items classified to Level A are those that are sensitive to environmental conditions and require special measures for protection from one or more of the following effects: sudden temperature changes, humidity, physical damage, and airborne contamination (e.g. rain, snow, and dirt).
2. Level B - Items classified to Level B are those that are less sensitive to environmental conditions than Level A items, but require indoor storage for protection from normal airborne contaminants (e.g. rain, snow and dirt) and protection from physical damage
3. Level C - Items classified to level C are less sensitive to environmental conditions than Level B items, but require protection from physical damage as well as adequate tarping or covering for protection from airborne contamination (e.g. rain, snow, dust and dirt).
4. Level D - Items classified to Level D are less sensitive to the environment conditions than Level C items, can be stored outdoors, and uncovered, but require protection from physical damage.

QP-9: Government Contract Plant Receiving, Inspection, & Maintenance Surveillance

Figure 9-1. Receiving/Inspection Checklist (Example)

ortec Corporation		Receiving / Inspection Checklist			
Section 1. Receiving Checklist		Contract No.:			
P. O. No.:		ID/Stock No.:			
Manufacturer:		Vendor:			
Specification No.:		Inspection Report No.:			
Property Tag No.:		Quantity:			
Item Description:					
Storage Requirements:	Level "A"	Level "B"	Level "C"	Level "D"	
Special Handling/Storage and/or Maintenance Requirements:		Yes	No		
Signature:		Date:			
Section 2. Inspection Checklist					
(A) VISUAL EXAMINATION	Reqd	Sat/Unsat	Comments		
Checklist Item	Y/N	S/U			
A1 Evidence of Moisture					
A2 Fastener Type					
A3 Grease/Oil Filings					
A4 Loose, Missing, Binding Parts					
A5 Position of Indicator/Actuator					
A6 Properly Sealed/Protected					
A7 Internal Surface/Proper Preservative					
A8 External Surface/Proper Preservative					
A9 Workmanship					
A10 Oil Level					
OTHER:					
A11					
A12					
A13					
(B) MANUFACTURERS' MARKINGS	Reqd	Sat/Unsat	Comments		
Item Checked	Y/N	S/U			
B1 Electrical Rating/Name-Plate Data					
B2 Press Rating/Temp. Range					
B3 Nameplate Data					
B4 Material Type					
B5 Motor Size					
B6 Contract Marking Requirements					
OTHER:					
B7					
B8					
B9					
B10					
Signature:		Date:			
Attach additional sheets if required		Form QDP9-001			

Surveillance

Figure 9-2. Storage Area Checklist (Example)

[illegible]

Engineering Quality Assurance Plan

Quality Procedure #10: Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants

REVISION INDEX

REVISION NO.	REVISION DATE	REVISION DESCRIPTION
0	March 1996	Original Distribution
1	May 1997	Administrative Corrections
2	6/23/98	Page numbering now relates to QP #.
3	10/6/99	Revised to include Operations Surveillance

	Name/Signature	Title/Position
Revised by:	R. K. Hnat	10/6/99 Director of Operations
Reviewed by:	Merih Pude 10/6/99	10-6-99
Issued by:	R.K.Hnat	10/7/99 Director of Operations
Approved by:	J.S. Patten	1/25/00 FETC Program Manager

QP-10: Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants

Purpose and Scope

Purpose — This procedure provides instructions for performing and documenting Vortec Corporation surveillance of Contractor and/or Operations activities at Government Demonstration Plants.

Scope — This procedure applies to all site surveillance performed by Vortec Corporation personnel at the project site.

Definitions

Contractor	An organization assigned to perform a specific function or service with respect to site activities.
Contractor Work/Test Schedule	A planned or projected series of events or activities submitted by a Contractor(s) or Subcontractor(s) which identify construction or test activities to be performed within a specific time span.
Detailed Surveillance Checklist (DSC)	A Vortec document identifying specific surveillance activities and attributes to be sampled and/or verified during the performance of surveillance activities.
Plant Operations Manager	Vortec Corporation manager assigned responsibility for plant operations.
Construction Manager	Vortec Corporation manager assigned responsibility to work with the contractor to integrate, coordinate, and approve construction activities with the contractor.
Site Manager	Vortec Corporation manager assigned overall responsibility for the facility
Procedure	Document describing how an activity is to be performed, including acceptance/rejection criteria.
Specification	A concise statement of requirements to be satisfied by a product, material, process or service during design, fabrication, construction, erection or testing.
Surveillance	A review, observation, or inspection for the purpose of verifying that Contractor and/or Operational Tasks and quality levels have been accomplished as specified.

Responsibilities

Construction Manager (Construction & Installation)	Periodically monitors, verifies and documents Contractor's activities in accordance with the procedure.
Plant Operations Manager (Operations)	Periodically monitors, verifies and documents change activities in accordance with the procedure. Monitor and verify compliance with HASP, O&M and other operational procedures when changes occur.
Site Manager (Operations)	Reviews and approves emergency change activities (QP-12).

QP-10: Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants

Instructions

Surveillance Activity Requirements	<ol style="list-style-type: none">1. Surveillance activities shall consider the relative importance of activities, degree of previous coverage and consistency of overall coverage on total site quality-related functions. Quantities, frequencies, and priorities of surveillance will be established by the QAM and Construction Manager or Plant Operations Manager based on the above logic and the following considerations:<ol style="list-style-type: none">a. Construction or Production Surveillance/Test Schedules.b. Past surveillance activity results.c. Construction or Plant Operations Manager input.d. Unique activities which allow only one opportunity for surveillance, test, and/or verification.e. Frequencies of surveillance will be determined by past performance. In general, areas/activities found to be deficient or nonconforming are documented at more frequent intervals. Conversely, areas/activities found satisfactory will require less documentation.f. Attempts shall be made to document each Contractor's activities regardless of the performance of other Contractors in similar areas. Additionally, efforts shall be made to document Contractors at the onset of their activities so as to identify and resolve potential or actual problem areas.
Preliminary Review and Preparation	<ol style="list-style-type: none">1. Review, become familiar with, and utilize the specific Detailed Surveillance Checklists.
Section I	<ol style="list-style-type: none">2. Determine the following:<ol style="list-style-type: none">a. Reference Codes and Standards.b. Applicable Specifications, Contractor Procedures and Drawings.
Performance of Surveillance Activities	<ol style="list-style-type: none">1. In general, surveillance will be performed simultaneously with the actual activities in a particular area of interest. Where conflicting schedules or surveillance priorities preclude observation of actual efforts, a surveillance of the Contractor's or Operations records and inspection verification documentation may be substituted.
Section II	<ol style="list-style-type: none">2. Where surveillance is conducted by either observation of the actual physical activities in the field or by review of documentation packages, a sampling technique shall be utilized. This sampling should be a random selection and have a sufficient quantity to establish a representative sample.3. Surveillance observations of physical activities or documentation review shall be accomplished by utilizing the attributes of the applicable DSCs. These attributes shall be reviewed and/or examined as necessary to determine inconsistencies, nonconforming conditions, or conformance to the controls and/or procedural requirements identified.

QP-10: Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants

Documentation of Surveillance Activities

Section III

1. DSCs shall be used to document surveillance activities.
2. Recording of information on DSCs shall be accomplished using permanent type markers.
3. Changes to entries on DSCs shall be made by drawing a single line through the entry and annotating the lined out area with the originator's initials and date.
4. Utilizing data obtained from the preliminary review and preparation, complete Section I of the DSC. Assure that all data is precise and accurate. Assure that all items checked are completely identified.
5. Complete Section II of the DSC for the surveillance activity as follows:
 - a. Check either "yes" or "no" for each attribute observed.
 - b. Where attributes are not checked during the surveillance, write "N/C" in the yes/no column.
 - c. Where attributes are not applicable for the specific surveillance, write "N/A" in the yes/no column.
 - d. Items marked "No" represent conditions nonconforming to requirements and will be further explained in Section III, Comments.
 - e. Where additional specific surveillance attributes exist and are not covered within the DSC, utilize the comment section to document such items. Where additional space is needed, supplementary sheets shall be used.
6. Complete Section III of the DSC for the specific surveillance as follows:
 - a. Where items marked "No" are noted as stated in Section III No. 5, identify the specific attribute by referencing the applicable number or letter. When giving details, be precise and accurate to assure complete understanding of the existing condition.
 - b. In addition to any additional attributes per Section III No. 5a, a statement shall be made to indicate that the surveillance is "Closed" based on one of the following conditions:
 - 1.) Condition I - All areas were found to be satisfactory.
 - 2.) Condition II - Nonconforming conditions were identified and documented by the Owner, Operator or Contractor Quality Group. The DSC shall remain open until an acceptable disposition is verified.
 - 3.) Condition III - Nonconforming conditions were identified. The processing of nonconforming conditions shall be in accordance with Procedure No. QP-11.
7. Upon completion of the DSC Section I, II, and III, the originator shall affix his signature and title in the comments section.
8. Completed DSCs shall be filed upon completion of the surveillance.

QP-10: Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants

Figure 10-1 Detailed Surveillance Checklist Form Example (Page 1)

Detailed Surveillance Checklist					
Date:	Prepared By:	DSC No.:	Page 1 of		
Reference Codes: (use attachment if required)					
Reference Standards: (use attachment if required)					
Applicable Dwg: (use attachment if required)					
Applicable Spec: (use attachment if required)					
Applicable Procedures: (use attachment if required)					
Date:		Surveillance By:			
Item No.	Surveillance Activity	Observed			Comment or Condition
		N/A	Yes	No	
DSC Completion		Date:		Originator:	

Form QP10-001 Page 1

Figure 10-2 Detailed Surveillance Checklist Form Example (Page 2)

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Page 10.6

**ortec
Corporation**

Engineering Quality Assurance Plan

***Quality Procedure #11: Control of Non-Conforming Conditions for
Government Contracts***

QP-11: Control of Non-Conforming Conditions for Government Contracts

Purpose and Scope

Purpose — This procedure establishes controls for processing nonconformance in contractor quality control activities and status tracking of nonconformance documentation generated by Vortec Corporation personnel for Government Contracts.

Scope — This procedure includes, but is not limited to, surveillance over contractor quality control activities.

Definitions

Non-conformance	Items and/or activities which fail to conform to applicable established codes, specifications, or standards.
------------------------	--

Responsibilities

Vortec Construction Manager	<ol style="list-style-type: none">1. Identify and document non-conforming Contractor's Quality Control (CQC) activities on a Deficiency Surveillance Checklist (DSC).2. Transmit a copy of completed DSC to CQC.3. Close out DSC upon correction action by CQC.4. Initiate Deficiency Report (DR) when the DSC is not promptly addressed by Contractor Quality Control.5. Transmit DR to Program Manager for disposition.6. Close out DRs upon receiving/verifying disposition.7. Develop and maintain status tracking system for DRs.
Program Manager or Designee	<ol style="list-style-type: none">1. Signature authority for approval of disposition of non-conforming conditions.

QP-11: Control of Non-Conforming Conditions for Government Contracts

Procedures

WHO

DOES WHAT

Vortec Construction
Manager (CM) or CM
Designated Inspector

1. Document activities not conforming to requirements established in applicable procedures, specifications, codes and/or standards on a Detailed Surveillance Checklists (DSCs).
2. DSCs shall be issued and controlled according to Procedure No. QP-10.
3. Upon completing the DSC the Inspector shall sign, date and transmit a copy of the DSC to Contractor Quality Control and Vortec CM.
4. If after seven (7) days from DSC transmittal no corrective action has been taken by Contractor Quality Control, a Deficiency Report (DR) shall be generated.
5. Upon completion of the DR, a unique identification number will be assigned to the DR and the DR number into the Deficiency Report Log (DRL) along with appropriate entries. The status of "open" deficiency reports will be documented monthly on the "Monthly Open" Deficiency Report Log".
6. CM shall transmit a copy of the DR to the CQC and Vortec Program Manager.
7. Upon completion of disposition, the CM will record corrective action on the DR and transmit the DR to the CQC and Vortec Program Manager.
8. Upon final close-out of DR the Vortec Program Manager shall sign and date the DR and file the DR.

QP-11: Control of Non-Conforming Conditions for Government Contracts

ortec Corporation		DEFICIENCY REPORT (DR)													
ORIGINATOR															
WORK ORDER: _____ CONTRACTOR: _____ PART / ASSY NO.: _____ PART / ASSY NAME: _____ SPEC/DWG. NO.: _____ QUANTITY: _____ SYSTEM: _____ IDENTIFICATION: _____ MATERIAL: _____ PROCEDURE: _____ LOCATION: _____	DR NO.: _____ DSC NO.: _____ ORIGINATOR: _____ DATE: _____ REFERENCE DOCUMENT: _____ PROJECT: _____														
DEFICIENCY DESCRIPTION: _____															
REQUIREMENT: _____															
QUALITY / MRB / HARDWARE DISPOSITION:															
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3" style="text-align: center; padding: 2px;">OWNERSHIP</td> </tr> <tr> <td style="text-align: center; padding: 2px;">CO.</td> <td style="text-align: center; padding: 2px;">GOV</td> <td style="text-align: center; padding: 2px;">CUST</td> </tr> <tr> <td colspan="3" style="text-align: center; padding: 2px;">T&R</td> </tr> <tr> <td style="text-align: center; padding: 2px;">Y</td> <td style="text-align: center; padding: 2px;"></td> <td style="text-align: center; padding: 2px;">N</td> </tr> </table>	OWNERSHIP			CO.	GOV	CUST	T&R			Y		N	USE AS IS ☐ SCRAP ☐	REWORK ☐ RETURN TO SUPPLIER ☐	HOLD TAG NO. _____
OWNERSHIP															
CO.	GOV	CUST													
T&R															
Y		N													
INSPECTOR: _____		DATE: _____													
SUPERVISOR: _____		DATE: _____													
REINSPECTION: (SAT) ☐ (UNSAT) ☐															
INSPECTOR: _____		DATE: _____													
SUPERVISOR: _____		DATE: _____													
CORRECTIVE ACTION: _____															
BY: _____ POSITION: _____ DATE: _____															
CORRECTIVE ACTION IMPLEMENTED: YES ☐ NO ☐															
SIGNATURE: _____		DATE: _____													
DR CLOSEOUT:															
DR CLOSEOUT COMPLETE: YES ☐ NO ☐															
CONTRACTOR QUALITY CONTROL: _____		DATE: _____													
CONSTRUCTION MGR.: _____		DATE: _____													
DISTRIBUTION: _____															

Form QDP11-001

Figure 11-1. Deficiency Report Form (Example)

QP-11: Control of Non-Conforming Conditions for Government Contracts

[illegible]

Figure 11-2. Deficiency Report Log (Example)

QP-11: Control of Non-Conforming Conditions for Government Contracts

[illegible]

Figure 11-3. Monthly Open Deficiency Report Log (Example)

Vortec Corporation
Engineering Quality Assurance Plan

Quality Procedure #12: Government Contract Demonstration Plant Change Control

REVISION INDEX

REVISION NO.	REVISION DATE	REVISION DESCRIPTION
0	March 1996	Cover Page Issue Only
1	May 1997	Cover Page Issue Only
2	6/23/98	Page numbering now relates to QP #.
3	10/6/99	Initial Distribution of Procedure

	Name/Signature	Title/Position
Written by:	Ed Keenhan / R. K. Hnat	10/4/99 Quality Engineer
Reviewed by:	Merilee Pault 10-5-99
Issued by:	R.K.Hnat	10/5/99 Director of Operations
Approved by:	J.S. Patten	1/25/00 FETC Program Manager

QP-12: Government Contract Demonstration Plant Change / Installation Control

Purpose and Scope

Purpose - This procedure defines the change control process and ensures that proposed changes are properly identified, developed, reviewed, approved, implemented, verified, validated, and documented. Figure 12-1 illustrates the change control flow.

Scope - This procedure applies to all Government Plants where Vortec Corporation operates the Plant.

Applicability

This procedure applies after the plant start-up and shakedown testing is completed. This procedure applies to maintenance of all site standard operations, drawings, equipment or process specifications, procedures, work instructions, plant and process design as well as any other documentation which could impact the process operation, product characteristics, environment, health or safety.

Precautions and Limitations

Health, safety and environmental concerns will govern any and all precautions and limitations.

Prerequisites

Prerequisites include access to and knowledgeability of operations and maintenance manuals for plant and equipment, health, safety and environmental training.

Other Documents Needed

Implementation of the Procedure for Change Control requires access to plant design drawings and specifications, the Plant Specific Operations and Maintenance Manual, the Research, Development and Demonstration Permit, Site Personnel Position Descriptions, Equipment Operation and Maintenance Manuals, the Health and Safety Plan, and Air and Water Permit requirements.

QP-12: Government Contract Demonstration Plant Change / Installation Control

Definitions

ECP	Engineering Change Proposal. This is a Class 1 activity that affects the contract and requires customer approval prior to implementation.
Class 1 Change	Changes that affect form, fit, or function. However, other factors such as cost or schedule can cause a Class 1 change. A non-exclusive list of potential Class 1 items are shown in Figure 12-2. Requires a proposal (solicited or unsolicited) to receive advance customer approval. The proposal requires review and approval of the CCB.
Class 2 Change	Other than Class 1 changes. Includes preventative and corrective maintenance that have no impact to form, fit or function. Will require a detailed implementation plan.
Change Priority	For Class 2 only, changes are prioritized as Emergency, Urgent, and Routine.
Emergency Change	A Class 2 change that requires immediate action to prevent damage to equipment or to prevent a plant shutdown.
Urgent Change	A Class 2 change that must be incorporated in less than 1-week.
Routine Change	A Class 2 change that includes normal maintenance activities with no impact on configuration and usually can be planned for 30-days prior to implementation.
Change Control Board (CCB)	Personnel appointed by the Site Manager to evaluate and approve configuration changes.
CCF Number	Unique number assigned to each Change Control Item.

QP-12: Government Contract Demonstration Plant Change / Installation Control

Responsibilities

WHO	LOCATION	DOES WHAT
Change Originator	Site	<ul style="list-style-type: none">• Initiates Change Control Form and completes items 1 through 9 on the Change Control Form. (See Figure 12-3 for Class 2 and Figure 12-4 for Class 1)• Obtains Change Control Form ID from CMA.
Site Manager	Site	<ul style="list-style-type: none">• Appoints personnel to site CCB.• Chairs the site CCB.• Approves Class 1 changes.• Reviews and approves Class 2 Emergency and Urgent changes.• Approves all Purchase requests $\geq$ \$5,000.• Submits Purchase requests $\geq$ \$10,000 to Program Manager for approval.
Plant Operations Manager	Site	<ul style="list-style-type: none">• Authorizes Class 2 Emergency and Urgent Changes.• Approves all Purchase requests $<$ \$5,000.• Submits Purchase requests $\geq$ \$5,000 to Site Manager for approval.• Maintains logs of procurement activities.• Maintains logs of Class 2 Emergency and Urgent Changes.• Ensures that procurements are within the scope of the contract.• Prepares Class 2 Emergency and Urgent Detailed Implementation Plan• Responsible for preparation of Class 1 Detailed Implementation Plans
Plant Supervisor	Site	<ul style="list-style-type: none">• Authorizes Class 2 Routine Changes.• Prepares Class 2 Routine Detailed Implementation Plan
Configuration Management Administrator	Site	<ul style="list-style-type: none">• Assigns Change Control Form ID No.• Processes Change Control Documentation.• Maintains Change Control Log of all change items.

QP-12: Government Contract Demonstration Plant Change / Installation Control

CCB	Site	<ul style="list-style-type: none">• Configuration Control Board• Approves all Class 1 changes• Approves all Class 2 Detailed Implementation Plans• Membership includes the following disciplines:<ol style="list-style-type: none">1) Chairperson2) Plant Operations Manager3) Process Engineer4) Environmental Compliance Engineer5) Health & Safety Engineer6) Additional supporting personnel as deemed appropriate by the Site Manager
Quality Assurance Engineer	Site	<ul style="list-style-type: none">• Ensures that Change Control procedures are in place and followed.
Environmental Compliance Engineer	Site	<ul style="list-style-type: none">• Reviews and approves Change Control Forms for Environmental Compliance.
Health & Safety Engineer	Site	<ul style="list-style-type: none">• Reviews and approves Change Control Forms for Health & Safety.
Purchasing	Collegeville	<ul style="list-style-type: none">• Processes all PR's and PO's per QP-8
Program Manager	Collegeville	<ul style="list-style-type: none">• Approves Purchase Orders $\geq$ \$10,000• Coordinates, negotiates, and approves Class 1 change activities
Process Engineer	Collegeville	<ul style="list-style-type: none">• Provides consultation regarding process changes
Engineering	Collegeville	<ul style="list-style-type: none">• Provides consultation as requested by the Site Manager or Site Operations Manager.• Reviews and Approves engineering for Class 1 changes
Corporate Officer	Collegeville	<ul style="list-style-type: none">• Approves Purchase Orders $\geq$ \$10,000• Reviews and Approves cost for Class 1 changes
Finance	Collegeville	<ul style="list-style-type: none">• Reviews and Approves cost for Class 1 changes

QP-12: Government Contract Demonstration Plant Change / Installation Control

Figure 12-1 Change Control Process

QP-12: Government Contract Demonstration Plant Change / Installation Control

**Figure 12-2 Items Prompting a Class 1 Change
(A non-exclusive listing)**

Item	Description
1	System specification
2	Performance requirements outside stated tolerances
3	Reliability, maintainability
4	Major component interface characteristics
5	Contract schedule or processing rate
6	Contract guarantees
7	Government-furnished equipment
8	Safety
9	System or subsystem performance improvements
10	Operation and maintenance manuals for which change/revision funding is not in current contract
11	Existing spares (obsolete or require modification, or will new spares be required)
12	Operational cost
13	Interchangeability (excludes pieces and parts of non repairable subasscmblics)

QP-12: Government Contract Demonstration Plant Change / Installation Control

Surveillance

Surveillance Activity Requirements	<ol style="list-style-type: none">1. Surveillance activities for Class 1 and Class 2 Construction and Installation changes shall be accomplished per QP-10 Performing Construction, Installation, and Operations Surveillance Activities at Government Demonstration Plants.2. Surveillance activities for Class 1 and Class 2 Maintenance changes shall be accomplished per QP-9 Government Contract Plant Receiving, Inspection & Maintenance.
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Non-conformance

Non-conformance Requirements	<ol style="list-style-type: none">1. Non-conformance activities for Class 1 and Class 2 changes shall be accomplished per QP-11 Control of Non-conforming Conditions for Government Contracts.
-------------------------------------	--

Procurement

Procurement Requirements	<ol style="list-style-type: none">1. Procurement activities for Class 1 and Class 2 changes shall be accomplished per QP-8 Procurement and Purchasing Control and processing activities identified within this procedure.
---------------------------------	---

QP-12: Government Contract Demonstration Plant Change / Installation Control

Figure 12-3 Class 2 Change Control Form Sample (P 1 of 2)

Vortec Corporation Class 2, Change Control	1. Origination Date:	2. Change: ☐ Emergency ☐ Urgent ☐ Routine	3. Temp. Change: ☐ Yes ☐ No	4. CCF No.:		
5. Title:			6. Requester:			
7. Change Description (use continuation sheet, if necessary):						
8. Reason for Change (use continuation sheet, if necessary):						
9. Change Impact: _____ Draw Stock from Existing Inventory _____ New Procurement Required, Cost < \$5,000 _____ New Procurement Required, Cost ≥ \$5,000			10. Emergency Change Authorized by: _____ Date: _____ Comments:			
11. Functional Test: _____ Required _____ Not Applicable Initials/Date: _____						
12. CCB Member Review & Recommendation:						
Function	Appr	Reject	Hold	Signature	Date	Comments (Use attachments if required)
Health & Safety	☐	☐	☐	_____	_____	_____
Environmental	☐	☐	☐	_____	_____	_____
Process Engineer	☐	☐	☐	_____	_____	_____
Other _____	☐	☐	☐	_____	_____	_____
Other _____	☐	☐	☐	_____	_____	_____
Operations Manager	☐	☐	☐	_____	_____	_____
Chairperson:	☐	☐	☐	_____	_____	_____

QP-12: Government Contract Demonstration Plant Change / Installation Control

Figure 12-3 Class 2 Change Control Form Sample (P 2 of 2)

14. Change Implementation Confirmed By: _____ Date: _____	
15. Field Walk-down Performed By: _____ Date: _____	
16. Turn over to Operations:	Signature: _____ Date: _____
17. CM Administrator Control & Distribution: _____ Date: _____	
18. Close-out for Programmatic Elements (use attachment sheet, if necessary): Signature/Date: _____ Comments: _____	19. QA Close-out Check Signature: _____ Date: _____

CCB Change Control Board
CCF Charge Control Form
CM Configuration Management
QA Quality Assurance

QP-12: Government Contract Demonstration Plant Change / Installation Control

Figure 12-4 Class 1 Engineering Change Proposal Form Sample (P 1 of 2)

Vortec Corporation Class 1 Engineering Change Proposal		1. Origination Date:	2. ECP No.:	3. Rev.:
4. Contract No.:				Date:
5. Title:			5. Originator:	
6. Change Description (use continuation sheet, if necessary):				
7. Reason for Change (use continuation sheet, if necessary): a. ☐ Product Improvement b. ☐ Customer Request c. ☐ Health & Safety d. ☐ Performance e. ☐ Processing Rate f. ☐ Operational Cost g. ☐ Reliability / Maintainability h. ☐ System Specification i. ☐ Environmental j. ☐ Contract Guarantees k. ☐ Other _____		8. Change Impact: (explain all Yes items) a. ☐ Yes ☐ No Hardware b. ☐ Yes ☐ No Software c. ☐ Yes ☐ No Electrical d. ☐ Yes ☐ No Spares e. ☐ Yes ☐ No SRD f. ☐ Yes ☐ No Specifications g. ☐ Yes ☐ No O&M Manual h. ☐ Yes ☐ No Subcontracts i. ☐ Yes ☐ No Operational Labor j. ☐ Yes ☐ No Functional Testing k. ☐ Yes ☐ No Cost < \$500,000 Est. Cost \$ _____ l. ☐ Yes ☐ No Cost ≥ \$500,000 Est. Cost \$ _____ m. ☐ Other _____		
7A. Reason for Change Comments:		8A. Change Impact Comments:		
9. Other Documentation Required (use continuation sheet, if necessary):				

QP-12: Government Contract Demonstration Plant Change / Installation Control

Figure 12-4 Class 1 Engineering Change Proposal Form Sample (P 2 of 2)

10. CCB Member Review & Recommendation:						
Function	Appr	Reject	Hold	Signature	Date	Comments (Use attachments if required)
Health & Safety	☐	☐	☐	_____	_____	_____
Environmental	☐	☐	☐	_____	_____	_____
Process Engineer	☐	☐	☐	_____	_____	_____
Other _____	☐	☐	☐	_____	_____	_____
Other _____	☐	☐	☐	_____	_____	_____
Operations Manager	☐	☐	☐	_____	_____	_____
Chairperson:	☐	☐	☐	_____	_____	_____

11. Corporate Approvals:						
Function	Appr	Reject	Hold	Signature	Date	Comments (Use attachments if required)
Program Manager	☐	☐	☐	_____	_____	_____
Finance	☐	☐	☐	_____	_____	_____
Engineering	☐	☐	☐	_____	_____	_____
Corporate Officer	☐	☐	☐	_____	_____	_____

12. CM Administrator Control & Distribution:	

Date: _____	

13. Close-out for Programmatic Elements (use attachment sheet, if necessary): Signature/Date:	14. QA Close-out Check
_____	Signature: _____
Comments: _____	Date: _____

CCB Change Control Board
ECP Engineering Change Proposal
CM Configuration Management
QA Quality Assurance

Engineering Quality Assurance Plan

Quality Procedure #13: Control of Government-Owned Property, Facilities and Materials

QP-13: Control of Government-Owned Property, Facilities and Materials

Purpose and Scope

Purpose — This procedure describes the surveillance activities which shall be performed by Vortec personnel to verify the overall accountability and control of all Government property which has been assigned to the Vortec Corporation under the terms of this contract.

Scope — This procedure is intended to assure that the Property Management Procedures that the Vortec Corporation has put in place adequately control, protect, preserve, and maintain all Government-owned property, property furnished by the Government or acquired by the contractor at Government expense in accordance with the provisions of the contract.

Definitions

Government Property Tag Number (GPTN)	A unique number assigned to an unit of property. The tag number is used to identify the property for all purposes defined in the contract.
Property Tag	A legible, permanent, conspicuous, tamper-proof label affixed to the property indicating Government ownership, contract number and GPTN.
Capital Equipment (Non-Exempt)	A unit of property generally having an acquisition cost of \$5,000.00 or more with a two year shelf life.
Non- Capital Equipment (Exempt)	A unit of property generally having an acquisition cost of less than \$5,000.00 with a two-year shelf life.
Sensitive Item	Items of property which are susceptible to being appropriated for personal use or which can be readily converted to cash. Examples are firearms, photographic equipment, binoculars, tape recorders, calculators, and power tools.
Semi-Annual Summary Report	DOE Form F 4300.3
Termination or Completion Inventories	DOE Forms SF 120 and SF 1428
Property Management Procedure	A procedure instituted by Vortec Corporation, based on referenced government regulations, by which all property and materials are accounted for during the duration of the contract.
Accessory Item	An item that facilitates or enhances the operation of plant equipment but is not essential for its operation.
Auxiliary Item	An item without which the basic unit or plant equipment cannot operate.
Material	Property that may be incorporated into or attached to a deliverable end item or that may be consumed or expended in performing a contract. It includes assemblies, components, parts, raw and processed materials, and small tools and supplies that may be consumed in normal use in performing a contract.

QP-13: Control of Government-Owned Property, Facilities and Materials

Plant Equipment	Personal property of a capital nature (including equipment, machine tools, test equipment, furniture, vehicles, and accessory and auxiliary items) for use in manufacturing supplies, in performing services, or for any administrative or general plant purposes. It does not include special tooling or special test equipment.
Government Property	All property owned by or leased to the Government or acquired by the Government under the terms of a contract or subcontract. It includes Government-furnished property.
Government-Furnished Property	Property in the possession of or directly acquired by the Government and subsequently made available to a Contractor or Subcontractor.
Subcontractor-Acquired Property	Property acquired or otherwise provided by the Subcontractor for performing a subcontract and to which the Government has title.
Property	All property, both real and personal. It includes facilities, material, special tooling, special test equipment, and Government Agency peculiar property.
Real Property	Land and rights in land, ground improvements, utility distribution systems, and buildings and other structures. It does not include foundations and other work necessary for installing special tooling, special test equipment, or plant equipment.
Special Test Equipment	Means either single or multipurpose integrated test units engineered, designed, fabricated, or modified to accomplish special purpose testing in performing a contract or subcontract. It consists of items or assemblies of equipment that are interconnected and interdependent so as to become a new functional entity for special testing purposes. It does not include material, special tooling, facilities (except foundations and similar improvements necessary for installing special test equipment), and plant equipment items used for general plant testing purposes.
Special Tooling	Means jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, all components of these items, and replacement of these items, which are of such a specialized nature that without substantial modification or alteration, their use is limited to development or production of particular supplies or parts thereof or to the performance of particular services. It does not include material, special test equipment, facilities (except foundations and similar improvements necessary for installing special tooling), general or special machine tools, or similar capital items.

QP-13: Control of Government-Owned Property, Facilities and Materials

References

Applicable Procurement, Receiving and Disposition Documents.

Vortec Corporation's Contract Document Number DE-AC21-92MC29120.

"Management of Government Property in the Possession of Contractors" (FAR Subpart 45.5 and DEAR Subparts 945.5 and 917.74).

Responsibilities

<i>WHO</i>	<i>DOES WHAT</i>
Program Manager	<ol style="list-style-type: none">1. Responsible for the use, care and keeping of government owned property and materials.2. Reviews and approves all reports.3. Ensures that the property management plan is implemented and monitors compliance.4. Appoints qualified person as Property Manager.5. Approves all reports submitted to FETC.
Property Manager	<p>Oversees implementation of and compliance with the property management plan.</p> <p>Assures the maintenance of all pertinent records including but not limited to:</p> <ol style="list-style-type: none">1. Contract purchase orders and sub-contracts.2. Up-to date property lists and required inventories.3. Excess property status lists.4. Disposition and disposal records.5. Sensitive Property determinations.6. Assignments of GPTN's.7. Out-of-Plant shipments. <p>Assures the preparation, and submittal of all the required Government property documents and reports.</p>

QP-13: Control of Government-Owned Property, Facilities and Materials

Vortec Construction Manager

During construction phase of the contract, the Field Construction Manager:

1. Oversees the receipt, inspection, and maintenance of government property in accordance with Vortec Corporation's QP-9.
2. Oversees installation of property.
3. Assures property tags are applied as directed by the Property Manager.
4. Performs construction and installation surveillance activities in accordance with Vortec Corporation's QP-10.

Facility Manager

1. Assures compliance with the property management plan as part of daily operations through training programs and surveillance.
2. Updates any changes to property/inventory lists per property management procedures.
3. Assures receipt, inspections and maintenance of all government property and materials in accordance with Vortec Corporation's QP-9.

Plant-Site Operations Personnel

1. Maintains all Government property in accordance with the Vortec Corporation's property management procedures.
2. Maintains property and materials in proper condition in accordance with Vortec Corporation's QP-9.
3. Notifies appropriate management personnel of any unusual changes in condition, location or use of property.

QP-13: Control of Government-Owned Property, Facilities and Materials

Procedures

<i>Who</i>	<i>Does What</i>
Vortec Corporation Personnel	<ol style="list-style-type: none">1. Performs surveillance checks to ensure that the Vortec Corporation's Property Management Procedures provide for the overall accountability and control of all Government property assigned under the contract.2. Documents surveillance activities by performing audits in the various specific areas of responsibility addressed under this Quality Assurance Plan QP-13 to assure continued compliance.
Project Manager and/or Designee's surveillance of: the acquisition, receiving and storage functions in relation to property control.	<ol style="list-style-type: none">1. Samples and Reviews a specific sequences of transactions starting with the acquisition process of the purchasing of materials and follows it through receiving process and into the storage area requirements.2. Determine if the proper policies and procedures were followed. Specifically reviews compliance with the Vortec Corporation's property management and receiving procedures.3. Make notes of all activities that are correct, and in compliance with stated procedures, as well as, all activities that are not.4. Includes in the documentation of this surveillance and any and all reasons for non-compliance observed, as well as, any suggestions/observations for improvements to current methods.5. Nonconformance shall be handled in accordance with Procedure QP-11.

QP-13: Control of Government-Owned Property, Facilities and Materials

Program Manager and/or Designee's Surveillance of the identification of Government property as related to property control

1. Inspects and analyzes a specific sampling of Government property under the Vortec Corporation's control in the various stages of receiving, placement, storage, and disposition to ensure it has been properly identified.
 2. Determines if the proper policies, procedures and documentation were followed. Specifically reviews compliance with the Vortec Corporation's property management and receiving procedures.
 3. Make notes of all activities that are correct, and in compliance with stated procedures, as well as, all activities that are not.
 4. Includes in the documentation of this surveillance and any and all reasons for the non-compliance observed, as well as, any suggestions/observations for improvements to current methods.
 5. Nonconformance shall be handled in accordance with Procedure QP-11.
-

QP-13: Control of Government-Owned Property, Facilities and Materials

Program Manager and/or
Designee's Surveillance of
Government Property Records as
related to property control

1. Selects and reviews a sampling of the existing property records and documentation to observe compliance with the requirements of the Vortec Corporation's property management procedures.
2. Determines if the proper policies, procedures and documentation's were followed. Specifically reviews compliance with the Vortec Corporation's property management and receiving procedures.
3. Make notes of all activities that are correct, and in compliance with stated procedures, as well as, all activities that are not.
4. Includes in the documentation of this surveillance and any and all reasons for non-compliance found, as well as, any suggestions/observations for improvements to current methods.
5. Nonconformance shall be handled in accordance with Procedure QP-11.

VORTEC CORPORATION			
SAFETY AND HEALTH PROCEDURE			
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RESPIRATORY PROTECTION PLAN

WRITTEN BY:

Christopher M. Holdridge
 Christopher M. Holdridge
 Environmental Compliance Specialist

9/4/98

Date

REVIEWED BY:

Edward J. Keenan
 Edward J. Keenan
 Quality Assurance Manager

9/4/98

Date

ISSUED BY:

Robert K. Hnat
 Robert K. Hnat
 Director of Operations

9/8/98

Date

APPROVED BY:

James G. Hnat
 James G. Hnat
 President

10/22/98

Date

REVISION INDEX

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Respiratory Protection Program

This Respiratory Protection Program specifies standard operating procedures to protect all site employees from respiratory hazards, according to the requirements of 29 CFR 1910.134. Respirators are to be used where engineering control of respiratory hazards have not been effective, while engineering controls are being installed, and in emergencies.

This Respiratory Protection Program is a company document which acts to provide the specific requirements for Vortec's Collegeville and U-PARC facilities as well as construction and related projects which fall under Vortec's scope of work or responsibilities. All individuals and companies which are contracted by Vortec to complete any work which may require respiratory protection are obliged to adhere to a plan which is at least as comprehensive as the policies written in this document. Furthermore, any additional protection or procedures, which are not covered in Vortec's Respiratory Protection Program, must meet current federal and state regulations and are subject to Vortec Corporation's approval.

1.0 Policy

All Vortec personnel who work in areas where the exposure or reasonable possibility of exposure to harmful airborne dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, are not controlled by engineering methods, shall wear appropriate respirators in accordance with 29 CFR 1910.134 or equivalent standard.

Respirators shall be provided to the employees, and employees shall be required to wear them when and where it has been determined that such equipment is necessary.

All required respiratory protection devices shall be selected from those approved by the National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CFR Part II or by the Mine Safety and Health Administration (MSHA) or other international standards organizations.

No employee required to wear a respirator shall wear a beard or other facial hair that would interfere with obtaining an effective facial seal with the facepiece. A determination by a job supervisor or the compliance manager, that an employee's facial hair prevents the effective use of a respirator shall preclude the employee from working in any job requiring the wearing of a respirator until such facial hair is removed.

Contact lenses shall not be worn while wearing respiratory protection. Only eye glasses requiring special mounts may be used inside full-face respirators. Under no conditions will eyeglass temples penetrate the face shield of the respirator.

2.0 Application

This policy applies to jobs, tasks, or conditions where respiratory protection is required to prevent exposure to hazardous airborne contaminants from known sources or from conditions generated by building or chemical spill emergencies.

3.0 Administrative Duties

At Vortec Corporation, the Environmental Compliance Specialist (ECS) is the person responsible

for maintaining the program and arranging for the purchase of equipment necessary to implement and operate the program. The ECS will develop written detailed instructions covering each of the basic elements in this program and may amend these instructions should it be necessary.

The ECS is qualified by appropriate training and experience that is commensurate with the complexity of the program to administer or oversee our Respiratory Protection Program and conduct the required evaluations of program effectiveness.

Employees may review a copy of our Respiratory Protection Program which is located at Vortec Corporation's Collegeville location. The ECS reviews this program periodically to ensure its effectiveness. All revisions to the written program shall be in accordance with the Engineering Quality Assurance Plan (EQAP).

4.0 Definitions

Air-purifying respirator means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Atmosphere-supplying respirator means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Canister or cartridge means a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

Demand respirator means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Emergency situation means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

End-of-Service-Life Indicator (ESLI) means a system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator means a respirator intended to be used only for emergency exit.

Filter or air purifying element means a component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit factor means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test means the use of a protocol to qualitatively evaluate the fit of a respirator on an individual.

Helmet means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

High Efficiency Particulate Air (HEPA) filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Hood means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Immediately Dangerous to Life or Health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Loose-fitting facepiece means a respiratory inlet covering that is designed to form a partial seal with the face.

Mass Median Aerodynamic Diameter (MMAD) is the diameter of the particle of unit density (1g/cm^3) which has the same median mass as the particle in question.

Negative pressure respirator (tight fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Oxygen deficient atmosphere means an atmosphere with an oxygen content below 19.5% by volume.

Physician or other Licensed Health Care Professional (PLHCP) means an individual whose legally permitted scope of practice allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by this document.

Positive pressure respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

Powered Air-Purifying Respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative Fit Test (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Quantitative Fit Test (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory inlet covering means that portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

Self-Contained Breathing Apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life means the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

Supplied-Air Respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting facepiece means a respiratory inlet covering that forms a complete seal with the face.

User seal check means an action conducted by the respirator user to determine if the respirator is properly seated to the face.

5.0 Respirator Selection

Respirators are selected on the basis of respiratory hazards to which the worker is exposed and workplace and user factors that affect respirator performance and reliability. All respirator selections will be made by the ECS or designated appointee.

The ECS will select only NIOSH-certified respirators which are applicable to the jobs being performed. Outside consultation, manufacturer's assistance, and other recognized authorities will be consulted if there is any doubt regarding proper selection.

Our company's selection procedures include coverage of all OSHA requirements. The selection procedures are found in the following checklist:

Selection Procedure Checklist

5.1 General guidelines for respirator selection

- A. Select and provide respirators based on respiratory hazard(s) to which a worker is exposed and workplace and user factors that affect respirator performance and reliability.
- B. Select only NIOSH-certified respirators.
- C. Identify and evaluate the respiratory hazard(s) in the workplace, including a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Consider the atmosphere to be IDLH if you cannot identify or reasonably estimate employee exposure.
- D. Select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

5.2 Selecting respirators for IDLH atmospheres

Vortec currently does not have any areas which are considered IDLH. Should such a condition exist in the future, the work will be completed by a contractor in accordance with the applicable regulations. Vortec employees shall not work in IDLH atmospheres.

5.3 Selecting respirators for atmospheres that are not IDLH

- A. Provide a respirator that is adequate to protect the health of the employee and ensure compliance with all other OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.
- B. Select respirators appropriate for the chemical state and physical form of the contaminant.

C. For protection against gases and vapors, provide one of the following:

- An atmosphere-supplying respirator
- An air-purifying respirator, provided that: (1) The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or (2) if there is no ESLI appropriate for conditions in the workplace, implement a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The ECS must specify in writing the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.

D. For protection against particulates, provide one of the following:

- An atmosphere-supplying respirator
- An air-purifying respirator equipped with a high efficiency particulate air (HEPA) filter or a filter certified for particulates by NIOSH under 42 CFR 84
- For contaminants consisting primarily of particles with Mass Median Aerodynamic Diameters (MMAD) of at least 2 micrometers, an air-purifying respirator equipped with any filter certified for particulates by NIOSH

5.4 Only NIOSH-certified respirators are selected and used. Where practicable, the respirators will be assigned to individual workers for their exclusive use.

6.0 Medical Evaluations

A medical evaluation to determine whether an employee is able to use a given respirator is an important element of an effective Respiratory Protection Program and is necessary to prevent injuries, illnesses, and even, in rare cases, death from the physiological burden imposed by respirator use.

At Vortec Corporation, persons will not be assigned to tasks requiring the use of respirators nor fit tested unless it has been determined that they are physically able to perform the work and use the respirator.

All medical questionnaires and examinations are confidential and handled during the employee's normal working hours or at a time and place convenient to the employee. A PLHCP will perform medical evaluations using the medical questionnaire found in Sections 1 and 2, Part A of Appendix C of 29 CFR 1910.134. The medical questionnaire is administered so that the employee understands its content. All employees are provided an opportunity to discuss the questionnaire and examination results with the PLHCP.

6.1 Before any initial examination or questionnaire is given, Vortec supplies the PLHCP with the following information so that he/she can make the best possible recommendation concerning an employee's ability to use a respirator:

- Type and weight of the respirator to be used by the employee
- Duration and frequency of respirator use (including use for rescue and escape)
- Expected physical work effort
- Additional protective clothing and equipment to be worn
- Temperature and humidity extremes that may be encountered

6.2 Once the PLHCP determines whether the employee has the ability to use or not use a respirator, he/she sends Vortec Corporation a written recommendation containing only the following information:

- Limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator
- The need, if any, for follow-up medical evaluations
- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation

6.3 Follow-up medical examination

A follow-up medical examination will be provided if a positive response is given to any question among questions 1 through 8 in Section 2, Part A of Appendix C of 29 CFR 1910.134 or if an employee's initial medical examination demonstrates the need for a follow-up medical examination. The follow-up medical examination includes tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

If the respirator is a negative pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the respirator is used, Vortec will provide a powered air-purifying respirator (PAPR) if the PLHCP's medical evaluation finds that the employee can use such a respirator. If a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then Vortec Corporation is no longer required to provide a PAPR.

6.4 Vortec provides additional medical evaluations if:

- An employee reports medical signs or symptoms related to the ability to use a respirator
- A PLHCP, supervisor, or the ECS informs the employer that an employee needs to be reevaluated
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation
- A change occurs in workplace conditions (e.g. physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee

6.5 Employees who desire a copy of their confidential medical evaluation or questionnaire may obtain it from the PLHCP.

7.0 Fit Testing Procedures

It is self-evident that respirators must fit properly to provide adequate protection. If a tight seal is not maintained between the facepiece and the employee's face, contaminated air will be drawn into the facepiece and be breathed by the employee. Fit testing seeks to protect the employee against breathing contaminated ambient air and is one of the core provisions of our respirator program.

In general, fit testing may be either qualitative or quantitative. Qualitative fit testing (QLFT) involves the introduction of a gas, vapor, or aerosol test agent into an area around the head of the respirator user. If that user can detect the presence of the test agent through subjective means, such as odor, taste, or irritation, the respirator fit is inadequate.

In a quantitative respirator fit test (QNFT), the adequacy of respirator fit is assessed by measuring the amount of leakage into the respirator, either by generating a test aerosol as a test atmosphere, using ambient aerosol as a test agent, or using controlled negative pressure to measure the volumetric leak rate. Appropriate instrumentation is required to quantify respirator fit in QNFT.

7.1 Vortec Corporation makes sure that employees are fit tested at the following times with the same make, model, style, and size of respirator that will be used on the job:

- Before any of our employees are required to use any respirator with a negative or positive pressure tight-fitting facepiece
- Whenever a different respirator facepiece (size, style, model, or make) is used
- At least annually
- Whenever the employee reports, or our company, PLHCP, supervisor, or ECS makes visual observations of changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight
- When the employee, subsequently after passing a QLFT or QNFT, notifies the company, ECS, supervisor, or PLHCP that the fit of the respirator is unacceptable. That employee will be retested with a different respirator facepiece

7.2 Employees must pass one of the following fit test types that follow the protocols and procedures contained in 29 CFR 1910.134 Appendix A:

- QLFT (Only used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less. May be used to test tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators if tested in the negative pressure mode)
- QNFT (May be used to fit test a tight-fitting half facepiece respirator that must achieve a fit factor of 100 or greater OR a tight-fitting full facepiece respirator that must achieve a fit factor of 500 or greater OR tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators if tested in the negative pressure mode)

7.3 Fit Testing Procedures-General Requirements

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

- A. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
- B. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
- C. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
- D. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

E. The more acceptable facepieces can be annotated to the record in case the one selected proves unacceptable. The most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item 6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

F. Assessment of comfort shall include a review of the following points with the test subject:

- Position of the mask on the nose
- Room for eye protection
- Room to talk
- Position of mask on face and cheeks

G. The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed
- Adequate strap tension (not overly tightened)
- Fit across nose bridge
- Respirator of proper size to span distance from nose to chin
- Tendency of respirator to slip
- Self-observation in mirror to evaluate fit and respirator position

H. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of 29 CFR 1910.134 or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

I. The test shall not be conducted if there is any excessive hair growth between the skin and the facepiece sealing surface which would jeopardize the effectiveness of the facepiece. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

J. If a test subject exhibits difficulty in breathing during the tests, he or she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

K. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

L. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

M. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with

respirator fit.

N. The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:

- Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
- Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
- Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale while looking upwards.
- Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor.
- Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
- Normal breathing. Same as exercise (1).

O. Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

7.4 Qualitative Fit Test (QLFT) Protocols

A. The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

B. The employer shall ensure that the QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

C. The following QLFT procedures are acceptable to Vortec Corporation:

- Isoamyl Acetate Protocol
- Saccharin Solution Aerosol Protocol
- Bitrex™ (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol
- Irritant Smoke (Stannic Chloride) Protocol

7.5 Quantitative Fit Test (QNFT) Protocols

A. Vortec shall ensure that persons administering the QNFT are able to calibrate the equipment, perform the tests properly, recognize invalid tests, calculate fit factors properly,

and ensure that the testing equipment is in proper working order.

B. Vortec shall ensure that the QNFT equipment is kept clean and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

C. The following QNFT procedures are acceptable to Vortec Corporation:

- Generated Aerosol Quantitative Fit Testing Protocol
- Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol
- Controlled negative pressure (CNP) quantitative fit testing protocol

D. User Seal Check Procedures, includes the following:

The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed in this section, or the respirator manufacturer's recommended user seal check method shall be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

1) Facepiece Positive and/or Negative Pressure Checks

- Positive pressure check. Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.
- Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

2) Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

8.0 Proper Use Procedures

Once the respirator has been properly selected and fitted, its protection efficiency must be maintained by proper use in accordance with 29 CFR 1910.134(g). Vortec ensures with written procedures that respirators are used properly in the workplace. Our company follows the requirements below to ensure that proper use procedures include coverage of OSHA requirements:

8.1 Facepiece Seal Protection

- A. Do not permit respirators with tight-fitting facepieces to be worn by employees who have facial hair or any other condition that interferes in such a way as to decrease the

effectiveness of the face-to-facepiece seal or valve function

B. If an employee wears corrective glasses or goggles or other personal protective equipment, ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

C. For all tight-fitting respirators, ensure that employees perform a user seal check each time they put on the respirator using the procedures in 29 CFR 1910.134 Appendix B-1 (User Seal Check Procedures) or procedures recommended by the respirator manufacturer that can be demonstrated to be as effective as those in Appendix B-1.

8.2 Continuing Respirator Effectiveness

A. Appropriate surveillance must be maintained of work area conditions and degree of employee exposure or stress. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, reevaluate the continued effectiveness of the respirator.

B. Ensure that employees leave the respirator-required areas for the following reasons:

- To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use
- If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece
- To replace the respirator or the filter, cartridge, or canister elements

C. If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, replace or repair the respirator before allowing the employee to return to the work area.

9.0 Maintenance and Care Procedures

In order to ensure continuing protection from respiratory protective devices, it is necessary to establish and implement proper maintenance and care procedures and schedules. A lax attitude toward maintenance and care will negate successful selection and fit because the devices will not deliver the assumed protection unless they are kept in good working order.

9.1 Cleaning and disinfecting

A. Vortec provides each respirator user with a respirator that is clean, sanitary, and in good working order. We ensure that respirators are cleaned and disinfected using the procedures below:

- Appendix B-2 of 29 CFR 1910.134. (See the attached appendix)
- All procedures recommended by the respirator manufacturer.

B. The respirators are cleaned and disinfected at the following intervals:

Respirator type:	Are cleaned and disinfected at the following interval:
Issued for the exclusive use of an employee	As often as necessary to be maintained in a sanitary condition
Issued to multiple employees	Before being worn by different individuals
Maintained for emergency use	After each use
Used in fit testing and training	After each use

C. In order to meet these intervals, we have created the following schedules to be used for each respirator:

- Respirator issued for the exclusive use of an employee must be cleaned and disinfected as often as necessary to be maintained in a sanitary condition.
- Respirators issued to more than one employee must be cleaned and disinfected before being worn by different individuals.
- Respirators maintained for emergencies must be cleaned and disinfected after each use.
- Respirators used in fit testing/training must be cleaned and disinfected after each use.

9.2 Storage

Storage of respirators must be done properly to ensure that the equipment is protected and not subject to environmental conditions that may cause deterioration. We ensure that respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they are packed or stored within a clean plastic bag in a designated locker, closet, or cubicle to prevent deformation of the facepiece and exhalation valve. In addition, emergency respirators are kept accessible to the work area, stored in compartments and covers that are clearly marked as containing emergency respirators, and are in accordance with any applicable manufacturer instructions.

9.3 Inspection

A. In order to assure the continued reliability of respirator equipment, it must be inspected on a regular basis. The frequency of inspection is related to the frequency of use. The following table encompasses our frequencies for inspection.

Respirator type:	Inspected at the following frequencies:
All types used in routine situations	Before each use and during cleaning
Maintained for use in emergency situations	At least monthly and in accordance with the manufacturer's recommendations, and checked for proper function before and after each use
Emergency escape-only respirators	Before being carried into the workplace for use

B. In order to meet these intervals, we have created the following schedule(s) to be used for each respirator:

- All types of respirators used in routine situations must be inspected before each use and during cleaning.
- Respirators maintained for use in emergency situations must be inspected at least monthly and in accordance with the manufacturer's recommendations, and checked for proper function before and after each use.

- Emergency escape-only respirators must be inspected before being carried into the workplace for use.
- C. Any one of our respirator inspections includes a check of the following:
 - Respirator function, cleanliness, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, cartridges, canisters, and filters.
 - Pliability and signs of deterioration of elastomeric parts.
 - For self-contained breathing apparatus, in addition to the above, air and oxygen cylinders are inspected monthly, recharged when the pressure falls to 90% of the manufacturer's recommended pressure level, and checked to ensure that the regulator and warning devices function properly.
- D. Also, for respirators maintained for emergency use, we certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator. This information shall be maintained until replaced following a subsequent certification.

9.4 Repairs

Respirators that fail an inspection or are otherwise found to be defective are removed from service, and are discarded, repaired, or adjusted in accordance with the following procedures:

- A. Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and only with the respirator manufacturer's NIOSH-approved parts designed for the respirator.
- B. Repairs must be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed.
- C. Reducing and admission valves, regulators, and alarms must be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

9.5 Discarding of respirators

Respirators that fail an inspection or are otherwise not fit for use and cannot be repaired must be discarded. Vortec's policy is to remove, clean, disinfect, and save all working, salvageable parts and dispose of the remainder in a trash can.

10.0 Air Quality Procedures for Atmosphere-Supplying Respirators

When atmosphere-supplying respirators are being used to protect employees it is essential to ensure that the air being breathed is of sufficiently high quality. Our company's procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators include coverage of the following OSHA requirements:

10.1 Compressed Air, Compressed Oxygen, Liquid Air, and Liquid Oxygen Used for Respirators

- A. Compressed and liquid oxygen must meet the United States Pharmacopoeia requirements for medical or breathing oxygen.

B. Compressed breathing air must meet at least the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:

- Oxygen content (v/v) of 19.5-23.5%
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less
- Carbon monoxide (CO) content of 10 ppm or less
- Carbon dioxide content of 1,000 ppm or less
- Lack of noticeable odor

C. Ensure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.

D. Ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.

10.2 Cylinders Used to Supply Breathing Air to Respirators

A. Cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR 173 and 178).

B. Cylinders of purchased breathing air must have a certificate of analysis from the supplier that the breathing air meets the requirements for Type 1-Grade D breathing air.

C. Moisture content in cylinder must not exceed a dew point of -50°F (-45.6 °C) at 1 atm.

10.3 Breathing Air Couplings

Ensure that breathing air couplings are incompatible with outlets for nonrespirable worksite air or other gas systems.

10.4 Breathing Gas Containers

Use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

10.5 Filters, Cartridges, and Canisters

Ensure that all filters, cartridges, and canisters used in the workplace are labeled and color coded with the NIOSH approval label and that the label is not removed and remains legible.

11.0 Training

The most thorough respiratory protection program will not be effective if employees do not wear respirators, or if wearing them, do not do so properly. The only way to ensure that our employees are aware of the purpose of wearing respirators, and how they are to be worn is to train them. Simply put, employee training is an important part of the respiratory protection program and is essential for correct respirator use.

11.1 Our training program is a two-fold process which covers the following:

- A. Respiratory hazards to which our employees are or may be exposed during routine and emergency situations.
- B. Proper use of respirators, including putting on and removing them, limitations on their use, and routine maintenance.

11.2 All of the above training is provided prior to requiring an employee to use a respirator at any of Vortec's sites. Vortec requires that all of its employees be retrained annually and when the following situations occur:

- A. Changes in the workplace or the type of respirator render previous training obsolete
- B. Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skills necessary for safety
- C. Any other situation in which retraining appears necessary to ensure safe respirator use

11.3 Seven basic elements

Our employees are trained sufficiently to be able to demonstrate a knowledge of at least these seven elements of respirator safety:

- A. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.
- B. The limitations and capabilities of the respirator.
- C. How to use the respirator effectively in emergency and malfunction situations.
- D. How to inspect, put on, remove, use, and check the seals of the respirator.
- E. The procedures for maintenance and storage of the respirator.
- F. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- G. The general requirements of 29 CFR 1910.134
 - Respirator must be NIOSH approved
 - Different respirators exist for different conditions
 - Medical evaluations, fit-testing, and training are required when work conditions or respirator type change
 - Respirators must be maintained through cleaning and disinfection
 - Respirators are to be inspected before each use

12.0 Program Evaluation

It is inherent in respirator use that problems with protection, irritation, breathing resistance, comfort, and other respirator-related factors occasionally arise in most respirator protection programs. Although it is not possible to eliminate all problems associated with respirator use, we try to eliminate as many problems as possible to improve respiratory protection and encourage

employee acceptance and safe use of respirators. By having our ECS thoroughly evaluate and, as necessary, revise our Respiratory Protection Program, we can eliminate these problems effectively. Annual program evaluation, performed by our ECS, involves the following:

- A. Conducting evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.
- B. Regularly consulting employees required to use respirators to assess their views on program effectiveness and to identify any problems. Any problems that are identified during this assessment must be corrected. Factors to assess include, but are not limited to:
 - Respirator fit
 - Appropriate respirator selection for the hazards to which the employee is exposed
 - Proper respirator use under the workplace conditions the employee encounters
 - Proper respirator maintenance

13.0 Quality

Nonconformance with this procedure shall be handled in accordance with the appropriate Vortec Corporation policies and procedures including, but not limited to, Vortec Policy QP-11: Control of Nonconforming Conditions as listed in the Engineering Quality Assurance Plan.

14.0 References

- 29 CFR 1910.134 Respiratory Protection, and Appendices
- 42 CFR 84 Approval of Respiratory Protective Devices
- ANSI Z88.2 Respiratory Protection
- Vortec Engineering Quality Assurance Plan

15.0 Attachments

- 29 CFR 1910.134 Appendix B-1 "User Seal Check Procedures"
- 29 CFR 1910.134 Appendix B-2 "Respirator Cleaning Procedures"
- Sections 1 and 2, Part A of Appendix C of 29 CFR 1910.134 "OSHA Respirator Medical Evaluation Questionnaire"

VORTEC CORPORATION			
SAFETY AND HEALTH PROCEDURE			
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CHEMICAL HYGIENE PLAN (CHP)

WRITTEN BY: Christopher M. Holdridge 9/4/98
 Christopher M. Holdridge
 Environmental Compliance Specialist
 Date

REVIEWED BY: Edward J. Keenan 9/8/98
 Edward J. Keenan
 Quality Assurance Manager
 Date

REVIEWED BY: James C. Simpson 9/8/98
 James C. Simpson
 Laboratory Manager
 Date

ISSUED BY: Robert K. Hnat 9/8/98
 Robert K. Hnat
 Director of Operations
 Date

APPROVED BY: James G. Hnat 10/22/98
 James G. Hnat
 President
 Date

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CHEMICAL HYGIENE PLAN

1.0 Purpose and Scope

The purpose of the Chemical Hygiene Plan (CHP) is to provide a set of laboratory standards which are easily understood and act to protect the laboratory employees and the environment. The CHP also clearly defines the personnel responsible for each aspect of the chemical hygiene plan. The CHP must be reviewed annually so as to reflect recent laboratory changes and new understandings of chemical hazards. The annual review will be undertaken by the Environmental Compliance Specialist or designee. The Environmental Compliance Specialist is also responsible for the implementation of the CHP.

The CHP requires Vortec Corporation's management and employees to act responsibly towards chemical safety and develop specific guidelines and plans of action for various foreseeable circumstances. This planning ensures that the proper responses can be applied quickly and effectively, thus minimizing the risks of accidents.

The CHP is available for review by all employees, their representatives, and the Assistant Secretary of OSHA. The CHP is located at the Collegeville office, U-PARC facility, and other applicable Vortec worksites and may be obtained from the Environmental Compliance Specialist, Plant Manager, or designee, during normal working hours.

A Chemical Hygiene Plan is required for all laboratory facilities engaged in the use of hazardous chemicals, as specified in CFR Title 29 Part 1910.1450.

2.0 Definitions

- A. Action Level - a concentration designated in 29 CFR Part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.
- B. Assistant Secretary - the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.
- C. Environmental Compliance Specialist - an employee qualified by training or experience who provides technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.
- D. Chemical Hygiene Plan - a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and work practices that protect employees from the health hazards presented by hazardous chemicals used in the workplace and meets the regulatory requirements.
- E. Hazardous chemical - a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees.
- F. Laboratory - a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

G. Permissible Exposure Limit (PEL) - OSHA developed standard which dictates the time period for which a worker can be exposed to an airborne contaminant. Limits found in 29 CFR 1910 Subpart Z.

H. Threshold Limit Value (TLV) -

3.0 General Principles for Working with Laboratory Chemicals

3.1 It is prudent to minimize all chemical exposures.

Since most chemicals have some sort of hazard associated with them, all chemicals should be protected against. Goggles, safety glasses, gloves, laboratory coats, and other safety equipment should be used to minimize contact with the skin. Dust masks or respirators may be used to reduce inhalation of harmful particles.

3.2 Avoid underestimation of risk.

Even exposure to chemicals of no known significant hazard should be minimized. All unknown chemicals should be treated as if hazardous.

3.3 Adequate ventilation should be present in the laboratory.

Chemicals which are associated with dusts or fumes should be handled under a hood, so as to limit exposure to these hazards.

3.4 The chemical hygiene program must be followed regularly.

3.5 All laboratory workers should observe the permissible exposure limits (PELs) and Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists.

4.0 Chemical Hygiene Responsibilities

The following people are responsible for particular aspects of chemical hygiene.

4.1 Chief Executive Officer

Has ultimate responsibility for chemical hygiene within the company and must provide for continuing support of chemical hygiene practices.

4.2 Environmental Compliance Specialist

A. Works with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices.

B. Assesses hazards of all chemicals and designates the appropriate control measures and personal protective equipment.

C. Sees that appropriate audits are maintained.

D. Helps project directors develop safety precautions and precedents to ensure adequate facilities.

E. Knows the current legal requirements concerning regulated substances.

F. Seeks ways to improve the chemical hygiene program.

4.3 Laboratory Supervisor

A. Overall responsibility for chemical hygiene practices in the laboratory.

B. Ensures that: workers know and follow the chemical hygiene rules, protective equipment is available and in working order, and appropriate employee training has been provided.

C. Performs and documents regular chemical hygiene and housekeeping inspections, including routine inspections of emergency equipment.

D. Knows the current legal requirements concerning regulated substances.

E. Determines the required levels of protective apparel and equipment.

F. Ensures that the facilities and training for all materials used onsite is adequate.

G. Monitors procurement, use, and disposal of chemicals used in the lab.

4.4 Project Manager

Has primary responsibility for chemical hygiene procedures for that project.

4.5 Laboratory Worker

A. Plans and conducts each procedure in accordance with the established chemical hygiene plan.

B. Develops good personal chemical hygiene habits.

C. Notifies laboratory supervisors of unknown or recently developed hazards.

5.0 The Laboratory Facility

5.1 Design

The laboratory facility should have:

- An appropriate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air
- Adequate ventilation in stockrooms
- Laboratory hoods and sinks
- Eyewash facilities and safety showers
- Arrangements for waste disposal

5.2 Maintenance

Chemical hygiene related equipment, such as hoods and safety eyewear, shall be periodically evaluated, documented, and modified if found to be inadequate. All PPE will be inspected as per Vortec Corporation's *Personal Protective Equipment Plan*.

5.3 Usage

The type and scale of work conducted must be appropriate for the physical facilities available, as well as, the quality of ventilation.

5.4 Ventilation

A. General laboratory ventilation: This system should provide an adequate source of fresh air for breathing and for input to local ventilation devices. It should not be relied on for primary protection from toxic substances released into the laboratory. Furthermore, the ventilation system should ensure that laboratory air is continually replaced, thus preventing the increase in concentration of toxic substances during the work day. Lastly, the air flow into the laboratory should come from non-laboratory areas and then be exhausted out of the building.

B. Hoods: Laboratory hoods should provide 2.5 linear feet of hood space per person and have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use. If this is not possible, work with substances of unknown toxicity should be avoided or conducted under other local ventilation devices.

C. Local ventilation devices: Ventilated storage cabinets, canopy hoods, and snorkels should be provided as needed. Each canopy hood and snorkel should have separate exhaust ducts.

D. Modifications: Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne contaminants continues to be adequate.

E. Performance: 4-12 room air changes per hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control.

F. Quality: General air flow should not be turbulent and should be relatively uniform throughout the laboratory. Also, air flow into and within the hood should not be excessively turbulent.

G. Evaluation: Quality and quantity of ventilation shall be evaluated on installation, regularly monitored every six months, and reevaluated whenever a change in local ventilation devices is made. All evaluations must be documented.

6.0 Components of the Chemical Hygiene Plan

6.1 Basic Rules and Procedures as listed in section 6.0.

6.2 Chemical Procurement, Distribution, and Storage

A. Procurement: Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved. No container should be accepted without an adequate identifying label. Preferably, all substances should be received in the laboratory. New samples should be labeled with an identification number, entered into the lab inventory database, and stored properly, with respect to its properties.

B. Stockrooms: Toxic substances should be segregated in a well identified area with local exhaust ventilation. Chemicals which are highly toxic should be in unbreakable secondary containers. Stored chemicals should be examined periodically for replacement, deterioration, and container integrity. The stockrooms should be controlled by one person.

C. Laboratory storage: Storage on benchtops and in hoods is inadvisable. Exposure to heat and direct sunlight should be avoided. Periodic inventories should be conducted with unused material being sent back to waste generator, placed in stockroom, or appropriately discarded.

6.3 Environmental Monitoring

A. Regular instrumental monitoring for airborne contaminants is not usually necessary, but may be appropriate when changes are made to the ventilation system or when highly toxic substances are stored or in use.

B. Periodic inspections of engineering controls will be used to ensure that employees are not exposed to substances that are known to be or may be hazardous.

6.4 Housekeeping, Maintenance, and Inspections

A. Cleaning: The floors are cleaned weekly by janitorial services, but shall be swept up in a timely manner if excessive debris or hazardous substances come in contact with the floor. Cleanliness of the lab benches and instrumentation is the responsibility of the laboratory worker.

B. Maintenance: Eyewash stations and safety showers should be inspected monthly. Respirators should be inspected periodically by the laboratory supervisor and daily by laboratory employees. Other safety equipment should also be inspected regularly. All out-of-service equipment should be unplugged and labeled so that it can not be accidentally used. All formal safety inspections shall be documented to show conformance with the applicable regulations.

C. Passageways: Stairways and hallways should not be used as storage areas. Access to exits, emergency equipment, and utility controls should never be blocked.

6.5 Medical Program

A. Medical consultation and examinations:

Vortec will provide all employees who work with hazardous chemicals an opportunity to receive medical attention, and any follow-up examinations deemed necessary by the physician, for the following situations:

- Employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.
- Exposure monitoring reveals an exposure level routinely above the action level for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.
- Spill, leak, or other occurrence results in the likelihood of a hazardous exposure.

B. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

C. The employer shall provide the following information to the physician:

- Identity of hazardous chemical to which the employee may have been exposed.
- Description of the conditions under which the exposure occurred.
- Description of the signs and symptoms of exposure that the employee experienced.

D. The employer shall obtain a written opinion from the examining physician for examinations or consultations required by the regulations.

6.6 Protective Apparel and Equipment

The following articles are included in each laboratory facility:

- Protective apparel compatible with the required degree of protection for substances being handled
- An easily accessible drench-type safety shower
- An eyewash station
- A fire extinguisher
- Respiratory protection and telephone for emergency use
- Cotton laboratory coats, safety glasses, PVC gloves, fire resistant gloves, corrosion resistant lab coat/apron

6.7 Records

A. Accident records must be written and retained

B. *Chemical Hygiene Plan* records shall document that the facilities and precautions were compatible with current knowledge and regulations

C. Inventory and usage records for high-risk substances are regularly retained, as required by the regulations and as specified in section 6.0.

D. Medical records are retained by Vortec Corporation in accordance with the requirements of PA state and federal regulations

6.8 Signs and Labels

Signs and labels of the following types must be posted:

- Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers
- Identity labels, showing contents of containers and associated hazards
- Location signs for safety showers, eyewash stations, and first aid and burn kits
- Warnings at areas or equipment where special or unusual hazards exist

6.9 Spills and Accidents

A. A written emergency plan (Preparedness, Prevention, and Contingency Plan) has been established and communicated to all personnel. It includes procedures for ventilation failure, evacuation, medical care, and reporting.

B. An alarm system, such as the telephone paging system or other appropriate system, shall be activated when evacuation is necessary.

C. A spill control policy has been developed and includes consideration of prevention, containment, cleanup, and reporting.

D. All accidents or near accidents shall be carefully analyzed, documented, and the results will be distributed to all who might benefit.

6.10 Information and Training

A. Aim: To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an emergency occurs.

B. Emergency and personal protection training: Every laboratory worker shall be trained with the location and use of emergency protective apparel and equipment. Full time laboratory workers shall be advised of emergency procedures. First aid training should also be encouraged for such employees.

C. Frequency of training: All training classes will be held at least annually and whenever changes in the laboratory or chemicals used dictate changes in the safety procedures. Employees will be trained and provided safety information prior to initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations.

D. Training shall include:

- Methods and observations used to detect the presence or release of a hazardous chemical.
- The physical and health hazards of chemicals in the work area.
- Measures employees can take to protect themselves from chemical hazards.
- Applicable details of *Chemical Hygiene Plan* and other Vortec safety procedures deemed relevant.

E. Information provided to all employees includes:

- The contents of this OSHA standard and its appendices.
- The PELs for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard.
- Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.

F. Literature/consultation: Literature and consulting advice concerning chemical hygiene is readily available to laboratory personnel and all other interested parties through the Environmental Compliance Specialist. The use of these resources and others is encouraged.

6.11 Waste Disposal Program

A. Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals.

B. Content: Mostly inert and neutralized chemicals may be poured down the drain with voluminous quantities of water. Hazardous waste chemicals and by-products should be kept in separate corrosion resistant, properly labeled containers. After each project, the resulting hazardous wastes must be properly packaged, labeled, and disposed of according to DOT and RCRA regulations. Chemicals known to either be compatible or have a neutralizing effect upon the each other may be combined in order to save disposal costs by personnel trained and authorized to do so.

C. Discarding chemical stocks: Unlabeled containers of chemicals and solutions shall be disposed of properly. Such unknown substances are treated as if they are hazardous. Before a worker's employment in the laboratory ends, chemicals for which that person was responsible shall be discarded or returned to storage, as appropriate.

D. Frequency of disposal: Chemical wastes are collected and appropriately labeled at the end of each day. Waste containers must be compatible with the characteristics of the collected chemicals. Since the majority of Vortec's projects involve small amounts of materials, the hazardous wastes can either be kept and disposed of at the end of each project or more often if needed.

E. Method of disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste. Hazardous substances must be quantified and disposed of properly in a hazardous landfill. Disposal by recycling or chemical decontamination should be used when possible. Laboratory hoods should not be used as a means of disposal for volatile chemicals.

F. Documentation: All waste shall be disposed of and documented in accordance with the applicable local, state, and federal regulations regarding any aspect of its disposal.

7.0 Basic Rules and Procedures for Working with Chemicals

7.1 General Rules

The following rules shall be followed for all laboratory work with chemicals:

A. Accidents and spills

Follow the applicable procedures as found on the MSDS for the material of interest. If the MSDS does not specify the proper procedures, or if the material is a mixture of more than one chemical, then the following guidelines are recommended unless it is known that they will cause a greater harm.

- Eye contact: Promptly flush eyes with water for fifteen minutes and seek medical attention.
- Ingestion: Encourage the victim to drink large amounts of water.
- Skin contact: Promptly flush the affected area with water and remove any uncontaminated clothing. If symptoms persist after washing, seek medical attention.
- Clean-up: Promptly clean up spills, using appropriate protective apparel, equipment, and proper disposal techniques.

B. Avoidance of "routine" exposure: Develop and encourage safe habits. Avoid unnecessary exposure to all chemicals. Do not directly smell or taste chemicals. Vent equipment which may discharge toxic chemicals into hoods. Inspect gloves before use.

C. Choice of chemicals: Use only those chemicals that the ventilation system can handle.

D. Eating, smoking, etc.: Eating, drinking, gum chewing, smoking, application of cosmetics and the storage of any food or drinks in the laboratory area is prohibited. Wash hands before conducting any of the above actions. Do not use any glassware or utensils from the laboratory for storage or handling of food.

E. Equipment and glassware: Handle and store laboratory glassware with care to avoid damage. Do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus. Shield or wrap them to contain chemicals and fragments should implosion occur. Use equipment only for its designed purpose.

F. Exiting: Wash areas of exposed skin immediately upon leaving the laboratory.

G. Horseplay: Avoid practical jokes or other behavior which might confuse, startle, or distract another worker.

H. Mouth suction: Pipette bulbs are available, so there shall be no mouth suction pipetting.

I. Personal apparel: Confine long hair, dangling jewelry, and loose clothing. Wear shoes and long pants at all times in the laboratory. Sandals and all other perforated shoes are not permitted.

J. Personal housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored. Clean up work area after each day's operations.

K. Personal protection: Appropriate eye protection must be worn by all people in the laboratory, including visitors. Wear appropriate gloves when the potential for contact with harmful materials exists. Use appropriate respiratory equipment when fumes or particulate matter cannot be handled by the ventilation system. Use any other protective and emergency apparel and equipment as appropriate. Avoid use of contact lenses in the laboratory.

L. Planning: Seek information and advice about hazards, plan appropriate protective procedures, and plan positioning of equipment before beginning any new project.

M. Unattended experiments: Leave lights on, place an appropriate sign on the door, develop safety plan in the event of utility failure. Notify laboratory supervisor of all unattended operations.

N. Use of hood: Use the hood for actions which may result in the release of toxic vapors or dust. Always use a hood for any volatile substance with a TLV of less than 50 ppm. Keep equipment and materials stored in hoods to a minimum.

O. Vigilance: Be alert to unsafe conditions and make sure that they are corrected immediately.

P. Waste disposal: Deposit chemical waste in appropriately designed and labeled containers. Do not mix wastes if their compatibility is unknown. Do not discharge to the sewer highly toxic, malodorous, or any substance which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage or obstruct flow.

Q. Working alone: Do not work alone in the laboratory if the procedures being conducted are hazardous.

7.2 Working with Allergens and Embryotoxins

A. Allergens (ex. diazomethane, isocyanates, bichromates)

Wear suitable gloves to prevent hand contact with known and suspected allergens.

B. Embryotoxins (ex. organomercurials, lead compounds, formamide)

Women in childbearing years should avoid contact with such substances. Store these substances in an adequately ventilated area in an unbreakable secondary container. Notify laboratory supervisor of all incidents of exposure or spills. Contact a qualified physician when necessary.

7.3 Working with Chemicals of Moderate Chronic or High Acute Toxicity (ex. hydrofluoric acid and hydrogen cyanide)

A. Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions.

B. Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities.

C. Location: Use and store these substances only in areas of restricted access with special warning signs. Always use a hood for procedures which may result in the generation of aerosols or vapors containing the substance.

D. Personal protection: Always avoid skin contact by the use of appropriate gloves and other protective equipment. Always wash hands and arms immediately after use of these substances.

E. Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved.

F. Prevention of spills and accidents: Be prepared for accidents and spills. Assure that at least two people are present when using compounds that are either highly toxic or of unknown toxicity. Cover toxic substance work and storage areas with removable, absorbent, plastic backed paper. If a major spill occurs outside the hood, evacuate the laboratory and assure that cleanup personnel wear suitable protective apparel and equipment.

G. Waste: Thoroughly decontaminate or properly dispose of contaminated clothing and shoes. Store contaminated waste in closed, properly labeled, impervious containers.

7.4 Working with Chemicals of High Chronic Toxicity (ex. dimethylmercury, nickel carbonyl, carcinogens)

A. Access: Conduct all transfers and work with these substances in a "controlled area" designated for the use of highly toxic materials.

B. Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor.

C. Non-contamination/decontamination: Decontaminate equipment, including glassware, in the hood before removing them from the controlled area. Decontaminate the controlled area before work is resumed there.

D. Exiting: Upon leaving a controlled area, properly dispose of any contaminated apparel, and thoroughly wash hands, arms, face, and neck.

E. Housekeeping: Use the procedures recommended in the appropriate MSDS to clean up spills.

F. Medical surveillance: If using significant amounts of a highly toxic substance three or more times per week, consult a qualified physician concerning the desirability of regular medical surveillance.

G. Records: Keep accurate records of the amounts of highly toxic substances stored and used, the dates of use, and names of users.

H. Signs and labels: Assure that the controlled area is adequately marked with warning and restricted access signs. Make certain that all containers of these substances are appropriately labeled with identity and warning labels.

I. Spills: Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accidents are available.

J. Storage: Store containers of highly toxic chemicals only in ventilated, limited access areas in labeled, unbreakable, chemically resistant secondary containers.

K. Waste: Use chemical decontamination whenever possible. Ensure that containers of contaminated waste are transferred from the controlled area in a secondary container under the supervision of authorized personnel.

8.0 Safety Recommendations

Since failure of precautions against injury will often have the secondary effect of causing toxic exposures, the safety hazards mentioned below also have implications for chemical hygiene.

8.1 Corrosive Agents

These substances should be kept in corrosion resistant containers and have spill catchers under them so that they do not escape and react with other chemicals.

8.2 Electrically Powered Laboratory Equipment

This equipment should be checked periodically for wear and soundness of electrical connections to ensure that accidents do not happen. Any suspicious equipment must be taken out of service, as sparks from malfunctioning electrical appliances may cause fires or reactions with other nearby substances.

8.3 Fires and Explosions

All precautions to prevent fires and explosions from occurring should be maximized. Chemicals and pressurized gas tanks can greatly intensify and complicate the hazards of these events. All flammable and corrosive chemicals should be kept in closed safety cabinets.

8.4 Pressurized and Vacuum Operations

All pressurized tanks should be equipped with safety release valves. Vacuum operations must be properly separated from laboratory employees in case of implosion and resulting chemical release.

8.5 Glassware

Caution should be used when working with glassware so that it does not shatter in the hands of the laboratory worker. Proper gloves should be worn when cleaning up glass, otherwise, the shards may puncture the skin, thereby introducing the chemicals from the glass into the bloodstream.

8.6 High Temperature Equipment

Equipment used to fire, melt, or analyze a material by the use of high temperatures should be kept in good working order and only utilized with the proper heat resistant

apparel. Improper use may result in the accidental spilling of hot or hazardous materials. Fumes from such instruments should be vented so that volatile compounds are not emitted into the laboratory.

9.0 Material Safety Data Sheets

Vortec Corporation has a MSDS outline form which should be properly completed and used for the shipment of all chemicals and products produced by Vortec Corporation to receiving companies. The sender must ensure that distributors and employers are provided an appropriate MSDS with the initial shipment and the first shipment after a MSDS has been updated.

Not only must the proper MSDS be sent with all chemicals and products leaving the facility, but they must also be kept for those which are stored or in use at Vortec's facilities. The Environmental Compliance Specialist is responsible for keeping and maintaining this MSDS system.

10.0 Quality

Nonconformance with this procedure shall be handled in accordance with the appropriate Vortec Corporation policies and procedures including, but not limited to, Vortec Policy QP-11: Control of Nonconforming Conditions as listed in the Engineering Quality Assurance Plan.

11.0 References

- Vortec Respiratory Protection Program
- Vortec Personal Protective Equipment Plan
- Vortec Engineering Quality Assurance Plan
- OSHA 29 CFR 1910.1450

VORTEC CORPORATION			
SAFETY AND HEALTH PROCEDURE			
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PERSONAL PROTECTIVE EQUIPMENT PLAN

WRITTEN BY:

Christopher M. Holdridge
 Christopher M. Holdridge
 Environmental Compliance Specialist

9/4/98

Date

REVIEWED BY:

Edward J. Keenan
 Edward J. Keenan
 Quality Assurance Manager

9/4/98

Date

ISSUED BY:

Robert K. Hnat
 Robert K. Hnat
 Director of Operations

9/8/98

Date

APPROVED BY:

James G. Hnat
 James G. Hnat
 President

10/22/98

Date

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PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM

While OSHA's Personal Protective Equipment regulation, found at 29 CFR 1910.132-140 (Subpart I), does not explicitly require a written Personal Protective Equipment (PPE) Program, Vortec Corporation has developed a written PPE program to document and specify all information relative to our PPE needs. The Environmental Compliance Specialist (ECS) is the program coordinator, acting as the representative of the plant manager, who has overall responsibility for the program. The ECS will designate appropriate plant supervisors to assist in training employees and monitoring their use of PPE. The ECS will review and update the program as necessary. Copies of this program are kept at Vortec Corporation's Collegeville office and may be obtained from the ECS.

We at Vortec Corporation believe it is our obligation to provide a hazard free environment to our employees. Any employee encountering hazardous conditions must be protected against the potential hazards. The purpose of protective clothing and equipment (PPE) is to shield or isolate individuals from chemical, physical, biological, or other hazards that may be present in the workplace.

Establishing an overall written PPE program detailing how employees use PPE makes it easier to ensure that they use PPE properly in the workplace and document our PPE efforts in the event of an OSHA inspection. Vortec Corporation's PPE program covers:

- Purpose
- Hazard assessment
- PPE selection
- Employee training
- Cleaning and maintenance of PPE
- PPE specific information

If after reading this program, you find that improvements can be made, please contact your supervisor or the ECS. We encourage all suggestions because we are committed to the safety of our employees and the success of our Personal Protective Equipment Program. We strive for clear understanding, safe behavior, and involvement in the program from every level of the company.

1.0 Policy

All Vortec personnel and contractors who work in areas where there is a possibility of bodily injury or impairment due to hazards associated with the work being performed must utilize the appropriate PPE in accordance with 29 CFR 1910.132-140. PPE includes equipment for the eyes, face, head, extremities, protective clothing, respiratory devices, and protective shields and barriers.

Vortec Corporation shall provide their employees with all of the required PPE. All PPE shall be selected from the approved standards as determined by 29 CFR 1910.132-138. Vortec and its

employees will ensure that the PPE is maintained in a clean, sanitary, and reliable condition through implementation of this PPE plan. All employees are required to wear the proper PPE when it has been determined that such equipment is necessary.

Employee-owned PPE is permitted to be used as long as it meets the design and safety requirements of the job for which it will be used. Vortec must have a method of checking the adequacy, proper maintenance, and sanitation of all employee-owned protective equipment.

2.0 Application

This policy applies to all jobs, tasks, or conditions where personal protective equipment is required to prevent bodily harm to Vortec's full time, part time, and temporary employees or contractors from normal and emergency working conditions.

This program is a global policy that is intended to provide the specific PPE guidelines to be followed by all Vortec employees and contractors. In addition to these requirements, contractors working at construction sites have to abide by all the specialized PPE guidelines found in the Work Plan associated with their scope of work.

3.0 Administrative Duties

At Vortec Corporation, the Personal Protection Equipment Program Administrator is the ECS. This person is responsible for all facets of the plan and has the authority to make necessary decisions to ensure the success of the plan. His/Her authority includes maintaining the program and arranging for the purchase of equipment necessary to implement and operate the program. The Administrator or designee will develop written detailed instructions covering each of the basic elements in this program.

The Administrator is qualified by appropriate training and experience that is commensurate with the complexity of the program to administer or oversee the PPE Plan and conduct the required evaluations of program effectiveness.

Employees may review a copy of the PPE Plan either at the local worksite or at Vortec Corporation's Collegeville location. The Program Administrator reviews this program annually to ensure its effectiveness.

4.0 Purpose of Program

The basic element of any PPE program is an in-depth evaluation of the equipment needed to protect against the hazards at the workplace; this is the initial hazard assessment for which written documentation is required. The two basic objectives of this PPE program are to provide a set of standards for all of Vortec's employees and contractors which are easily understood and to protect the wearer from incorrect use and/or malfunction of PPE. The purpose of this Personal Protective Equipment (PPE) Program is to document the hazard assessment, protective measures in place, and PPE in use at this company. PPE devices are not to be relied on as the only means to provide protection against hazards, but are used in conjunction with guards, engineering controls, and sound manufacturing practices. If possible, hazards will be abated first through engineering controls, with PPE to provide protection against hazards which cannot reasonably be abated otherwise.

5.0 Hazard Assessment

Vortec Corporation must assess each of its facilities to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment. In order to assess the need for PPE the following steps are taken:

1. The ECS or other Health and Safety Officer identifies job classifications where exposures occur or could occur. The ECS may examine the following records and use his/her own judgement to identify and rank jobs according to exposure hazards:

- Injury/illness records
- First aid logs

2. The ECS conducts a walk through survey of workplace areas where hazards exist or may exist to identify sources of hazards to employees. The following basic hazard categories are considered:

- Impact
- Heat
- Penetration
- Harmful dust
- Compression (roll over)
- Light (optical) radiation
- Chemical

3. During the walk through survey, the ECS observes and records the equipment and processes which fall into one of the following hazards categories. After each category is a list which includes, but is not limited to, the typical hazards found at Vortec's work sites.

A. Sources of motion

Sources of motion include machinery or processes where any movement of tools, machine elements, or particles could exist, or movement of personnel that could result in collision with stationary objects. The following are typical sources of motion found at Vortec's laboratory and U-PARC facility :

- ◆ jar mill
- ◆ laboratory press
- ◆ belt sander
- ◆ diamond saw
- ◆ hand tools
- ◆ forklift
- ◆ ball mill
- ◆ grinding wheel
- ◆ rotating tile saw
- ◆ Ro-tap machine
- ◆ air pulse mixer
- ◆ glass fiber spinner

B. Sources of high temperatures

These are sources that could result in burns, eye injury, ignition of protective equipment, or other accidents. The following are sources of high temperature found at Vortec's laboratory and U-PARC facility:

- ◆ CMS and associated burners
- ◆ hot cooling water
- ◆ molten glass
- ◆ dilatometer
- ◆ hot plate
- ◆ welding tools
- ◆ air preheater
- ◆ furnaces
- ◆ DTA
- ◆ Bunsen burner
- ◆ COD reactor

C. Types of chemical exposures include:

- ◆ acids
- ◆ bases
- ◆ toxic compounds
- ◆ carcinogens

D. Sources of harmful dust are:

- ◆ silica
- ◆ glass batch additives
- ◆ vitrified product
- ◆ metal spiking materials

E. Sources of light radiation such as welding, brazing, cutting, furnaces, high intensity lights

- ◆ CMS
- ◆ welding equipment
- ◆ furnaces
- ◆ metal cutting tools

F. Sources of falling objects or potential for dropping objects:

- ◆ laboratory stock rooms
- ◆ high bay
- ◆ crane

G. Sources of sharp objects which might pierce the feet or cut the hands:

- ◆ glass shards
- ◆ metal objects
- ◆ hand tools (powered and manual)
- ◆ nails

H. Sources of rolling or pinching objects which could crush the feet:

- ◆ cullet carts
- ◆ forklift
- ◆ hand jacks

I. Sources of electrical hazards:

- ◆ high voltage areas
- ◆ powered hand tools
- ◆ electrical cords and equipment in pools of water

4. Following the walk through survey, the ECS organizes the data and information for use in the assessment of hazards to analyze the hazards and enable proper selection of protective equipment.

5. An estimate of the potential for injuries is then made. Each of the basic hazards is reviewed and a determination made as to the frequency, type, level of risk, and seriousness of potential injury from each of the hazards found. The existence of any situations where multiple exposures occur or could occur are considered.

6. The ECS documents the hazard assessment via a written certification that identifies the workplace evaluated, the person certifying that the evaluation has been performed, the date(s) of the hazard assessment, and that the document is a certification of hazard assessment.

6.0 PPE Selection Guidelines

Once any hazards have been identified and evaluated through hazard assessment, the general procedure for selecting protective equipment is to:

1. Become familiar with the various types of PPE, including their strengths and weaknesses.
2. Compare types of equipment to the hazards associated with the environment.

3. Select the PPE which ensures a level of protection greater than the minimum required to protect employees from the hazards.

4. Fit the user with proper, comfortable, well fitting protection and instruct employees on care and use of the PPE. It is very important that the users are aware of all warning labels and limitations of their PPE. (See the Employee Training guidelines outlined in the next section of this program for a more detailed description of training procedures.)

It is the responsibility of the ECS or designee to reassess the workplace hazard situation, identify and evaluate new equipment and processes, review accident records, and reevaluate the suitability of previously selected PPE. For each test at U-PARC, the Program Manager and ECS shall identify the project specific PPE requirements.

Elements which should be considered in the reassessment include:

- Adequacy of PPE program
- Accidents and illness experience
- Levels of exposure (this implies appropriate exposure monitoring)
- Adequacy of equipment selection
- Number of person hours that workers wear various protective ensembles
- Adequacy of training/fitting of PPE
- Program costs
- The adequacy of program records
- Recommendation for program improvement and modification
- Coordination with overall safety and health program

7.0 Employee Training

The ECS, Safety Manager, or designated appointee provides training for each employee who is required to use personal protective equipment. Training includes:

- When PPE is necessary
- What PPE is necessary
- How to properly wear and adjust assigned PPE
- Limitations of PPE
- The proper care, maintenance, useful life, and disposal of assigned PPE

Employees are prohibited from performing work without donning appropriate PPE to protect them from the hazards they will encounter in the course of that work.

Employees must demonstrate an understanding of the training and the ability to use the PPE properly before they are allowed to perform work requiring the use of the equipment. If the ECS has reason to

believe an employee does not have the understanding or skill required, Vortec will retrain the employee. Since an employee's supervisor is in the best position to observe any problems with PPE use by individual employees, the ECS will seek this person's input when making this determination. Retraining is required, but not limited to, situations where:

- Changes in the workplace or types of PPE to be used render previous training obsolete.
- Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the required understanding or skill.

It is the responsibility of the ECS or Safety Manager to certify in writing that each employee has received and understands the PPE training. The name of each employee, date(s) of training, and subject of the certification must be recorded.

Because failure to comply with company policy concerning PPE can result in OSHA citations and fines, as well as employee injury, an employee who does not comply with this program will be disciplined for noncompliance according to the following schedule:

1. Verbal warning for the first offense accompanied by retraining
2. Written reprimand for the second offense which goes in the employee's permanent record
3. Suspension without pay for a third offense and documentation in the permanent record
4. Dismissal as a last resort

8.0 Cleaning and Maintenance of PPE

It is important that all PPE be kept clean and properly maintained by the employee to whom it is assigned. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. PPE is to be inspected, cleaned, and maintained by employees at regular intervals as part of their normal job duties so that the PPE provides the requisite protection. Supervisors are responsible for ensuring compliance with cleaning responsibilities by employees.

If PPE is for general use, the ECS or designee has the responsibility for cleaning and maintenance of that equipment. If a piece of PPE is in need of repair or replacement it is the responsibility of the employee to bring it to the immediate attention of his or her supervisor or the ECS. It is against work policy to use PPE that is in disrepair or not able to perform its intended function. Contaminated PPE which cannot be decontaminated must be disposed of in a manner that protects employees from exposure to hazards.

9.0 PPE Specific Information

A. Eye and Face Protection -- Goggles and face shields

It is the policy of the company that as a condition of employment, all regular full time, part time, and temporary employees working in designated work areas and/or job assignments are required to wear ANSI Z87.1-1989 approved goggles/face shields to help prevent eye and face injuries, including those resulting from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or light radiation. Eye protection must provide side protection when there is a hazard from flying objects.

Vortec must ensure that all affected employees who wear prescription lenses while engaged in operations that involve eye hazards wear eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription or protective lenses.

Employees conducting work which requires filter lenses must use the shade number appropriate for the work being performed, as described in 29 CFR 1910.133.

Employees in the following work areas are required to wear safety eyewear at all times:

- Collegeville laboratory
- U-PARC facility
- Construction sites

Type of safety eyewear:

- Safety glasses or goggles for glass, liquids, solids, gases, metals, and flying objects
- Shaded face shield for furnaces, welding tools, and other intense light sources

Employees from temporary work agencies and contractors are required to wear safety eyewear if assigned to work in areas that pose a hazard to their eyes or face.

All supervisors and managers are responsible for ensuring employees under their charge are in compliance with this policy.

All employees who work in designated work areas and/or job assignments are responsible for wearing company provided safety eyewear to comply with this policy. Failure to comply will result in disciplinary action up to and including discharge.

All employees required to wear safety eyewear must routinely inspect and properly care for their safety eyewear.

B. Hand protection -- Gloves

It is the policy of the company that as a condition of employment, all regular full time, part time, and temporary employees working in designated work areas and/or job assignments are required to wear gloves to help prevent hand injuries, including cuts, burns, and chemical exposures.

Vortec must select, provide, and require employees to use the appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical and thermal burns, and harmful temperature extremes.

The ECS or designated appointee will base the glove selection on an evaluation of the tasks to be performed, conditions present, duration of use, and the hazards and potential hazards identified.

Employees in the following work areas are required to wear protective gloves when performing work which poses a hazard to their hands:

- Collegeville Laboratory
- U-PARC facility
- Construction sites

Hazards requiring gloves:

- Glass shards
- Acids, bases, solvents, and slurries
- Metal rods, tubes, and construction pieces
- Extremely hot or cold surfaces and equipment
- Hazardous chemicals, materials, and wastes
- Contaminated clothing, equipment, and materials

Type of gloves:

- Latex or PVC gloves for working with mild liquids and solids
- Rubber, Neoprene, or Nitrile gloves for acidic and caustic materials
- Silica fabric or aluminized gloves for the furnaces and other high temperature jobs
- Leather work gloves for welding and working with glass and other sharp objects

Employees from temporary work agencies and contractors must wear the required protective gloves if assigned to work in the designated work areas.

All supervisors and managers are responsible for ensuring employees under their charge are in compliance with this policy.

All employees who work in designated work areas and/or job assignments are responsible for wearing company provided gloves to comply with this policy. Failure to comply will result in disciplinary action up to and including discharge.

All employees required to wear protective gloves must routinely inspect and properly care for their assigned gloves.

C. Head protection -- Hard hats

It is the policy of the company that as a condition of employment, all regular full time, part time, and temporary employees working in designated work areas and/or job assignments are required to wear ANSI Z89.1-1986 approved hard hats to help prevent head injuries. The protective helmet must be designed to reduce electrical shock hazard if worn by an employee working near exposed electrical conductors which could contact the head.

Employees working in the following areas are required to wear head protection at all times:

- U-PARC
- Construction sites

D. Foot protection -- Leather safety-toe boots

It is the policy of the company that as a condition of employment, all regular full time, part time, and temporary employees working in designated work areas and/or job assignments are required to wear ANSI Z41-1991 approved leather steel-toe boots to help prevent foot injuries. These boots are meant to provide protection from falling or rolling objects, sharp objects, electrical hazards, molten glass, and hot water. Employees working in the following areas are required to wear foot protection at all times:

- U-PARC
- Construction sites

Employees from temporary work agencies and contractors are required to wear safety shoes if assigned to work in the designated work areas. It is the responsibility of the agency and/or contractor to ensure the employee reports to his/her temporary assignment at this company wearing approved safety shoes.

Those employees who work in non-designated areas of the company and vendors and visitors will be allowed to walk through the designated work areas without safety shoes as long as they remain in outlined aisles/walkways or are escorted by a Vortec employee.

All employees who work in designated areas and/or job assignments are responsible for purchasing and wearing safety shoes to comply with this policy. The plant manager will not allow any employee to work in the designated areas until the proper safety footwear is worn.

The Personnel Department is responsible for informing new employees who are assigned to the designated work areas of the safety shoe policy. The new employee is responsible for reporting to his/her first day of work wearing approved safety shoes.

E. Respiratory Protection - Refer to Vortec's *Respiratory Protection Program*

10.0 References

- 29 CFR 1910.132-138
- ANSI Z87.1-1989
- ANSI Z41-1991
- ANSI Z89.1-1986

VORTEC CORPORATION			
SAFETY AND HEALTH PROCEDURE			
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HAZARD COMMUNICATION PROGRAM (HAZCOM)

WRITTEN BY: Christopher M. Holdridge 9/4/98
 Christopher M. Holdridge
 Environmental Compliance Specialist
 Date

REVIEWED BY: Edward J. Keenan 9/4/98
 Edward J. Keenan
 Quality Assurance Manager
 Date

ISSUED BY: Robert K. Hnat 9/8/98
 Robert K. Hnat
 Director of Operations
 Date

APPROVED BY: James G. Hnat 10/22/98
 James G. Hnat
 President
 Date

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HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE

The purpose of the Hazard Communication Program is to ensure that the hazards of all chemicals located in Vortec's facilities are evaluated and that information concerning physical and health hazards is transmitted to potentially exposed employees. It is not only the intent of Vortec Corporation to fully comply with the OSHA Standard 29 CFR 1910.1200, but also to improve the overall safety of the company. A successful Hazard Communication Program will reduce potential incidents of chemical source illnesses and injuries. The program will be available in the Collegeville and Pittsburgh offices for review by all employees.

2.0 SCOPE AND APPLICABILITY

This program establishes the minimum Hazard Communicating requirements for all employees of Vortec Corporation. It applies to all chemicals procured and generated in the workplace; consumer products used in janitorial services; and pure chemicals associated with treatment, storage, and disposal facilities.

Exceptions to coverage under this standard are:

- Hazardous waste as designated under the Resource Conservation and Recovery Act (RCRA)
- Hazardous substances that are the focus of remediation or removal action under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- Tobacco or tobacco products
- Wood or wood products
- Articles
- Food, drugs, and cosmetics used by individuals
- Ionizing and nonionizing radiation
- Biological hazards

3.0 REFERENCES

- A. 29 CFR 1910.1200, "OSHA Hazard Communication Standard for General Industry"
- B. 29 CFR 1926.59, "OSHA Hazard Communication Standard for Construction Industry"
- C. Vortec Engineering Quality Assurance Plan

4.0 DEFINITIONS

- A. Article - A manufactured item which is formed to a specific shape or design during manufacture; which has end use function(s) dependent in whole or in part upon its shape or design during end use; and which does not release, or otherwise result in exposure to, a hazardous chemical under normal conditions of use.
- B. Chemical - Means any element, chemical compound or mixture of elements and/or compounds.
- C. Container - Means any bag, barrel, bottle, box, can, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. Pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.
- D. Material Safety Data Sheets (MSDS) - Written or printed material concerning information on a hazardous chemical.
- E. Non-routine task - Tasks which do not occur on a frequent basis or those tasks which are not identified as a normal production task.
- F. Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.
- G. Produce - To manufacture, process, formulate, blend, extract, generate, emit, or repackage.
- H. Work Area - A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

5.0 RESPONSIBILITIES

5.1 Site Operations Manager

- A. Ensure the Hazard Communication Program is established, maintained, and enforced.

5.2 Environmental Compliance Specialist (ECS)

- A. Ensure the Hazard Communication Program is established and maintained.
- B. Review MSDSs to ensure adequacy.
- C. Review new MSDS for compatibility with personal protective equipment (PPE) and recommend any necessary upgrading of personal protective equipment (PPE).

- D. Ensure that the chemical inventory is updated at least annually.
- E. Ensure that an MSDS is available for all chemicals on site.
- F. Maintain the MSDSs.
- G. Train all affected employees on the Hazard Communication Program.
- H. Exchange chemical information and MSDSs, as needed, with any contractors before they bring any chemicals on site.

5.3 Employees

- A. Attend and complete Hazard Communication Training.
- B. Apply a hazardous chemical label to unlabeled containers. Check with the ECS and MSDS before labeling containers.
- C. Report all unlabeled or inadequately labeled containers.
- D. Practice safe handling, usage, and storage of hazardous chemicals.

6.0 LABELING

- A. The Environmental Compliance Specialist (ECS) will be responsible for seeing that all containers coming in are properly labeled.
- B. All incoming labels shall be checked for: identity, hazard warning, and name and address of responsible party.
- C. The ECS will ensure that any defaced or damaged labels are replaced.
- D. Secondary containers of hazardous chemicals, which may be used by more than one person or which contains a quantity of the hazardous chemical that will extend beyond a shift, must be labeled, tagged, or marked with the identity of the hazardous chemical and an appropriate hazard warning.
- E. Each employee shall be responsible for seeing that all portable containers used in their work area are labeled with identity and hazard warning.
- F. Piping shall be labeled as to their contents.

7.0 MATERIAL SAFETY DATA SHEETS (MSDS)

MSDSs are the key to a successful hazard communication program. MSDSs are designed to provide the information needed to handle chemicals safely. They provide the necessary information for training, hazard evaluation, proper handling, emergency procedures, and employee personal protective equipment.

- A. The ECS will be responsible for compiling the master MSDS file. It will be kept in the plant office.
- B. The ECS will check all incoming MSDSs for accuracy.
- C. MSDSs will be available for review to all employees during each work shift. Copies will be available upon request.
- D. Requests shall be made for MSDSs on all purchase orders. A file of follow-up letters shall be maintained for all shipments received without MSDSs.
- E. Updated MSDSs will immediately be placed in the MSDS file and employees informed if there are any changes to the chemical.
- F. The hazard evaluations provided by the chemical manufacturers and importers will be used as the primary source of information on the hazards of the chemicals.

8.0 EMPLOYEE INFORMATION AND TRAINING

- A. The ECS shall coordinate and maintain records of training conducted.
- B. Before starting work, each new employee will be trained on the following:
 - Physical and health hazards of chemicals in their work areas.
 - How to lessen or prevent exposure to these hazardous chemicals.
 - What the company has done to lessen or prevent workers' exposure to these chemicals.
 - Procedures to follow if they are exposed to these chemicals.
 - How to read and interpret labels and MSDSs used on site.
 - Location and use of written hazard communication program, list of hazardous chemicals, and MSDS.
 - OSHA Hazard Communication requirements.
 - Methods and observations that may be used to detect the presence or release of a hazardous chemical.

- C. After attending the class each employee will sign a form stating that they received the Hazard Communication training.
- D. Before any new hazardous chemical is introduced on site, each employee will be given information in the same manner as during the training class. The ECS will be responsible for seeing that MSDSs on the new chemical(s) are available.
- E. Refresher training will be provided annually.

9.0 HAZARDS OF NON-ROUTINE TASKS

- A. No employee will begin work on any non-routine task without first receiving a safety briefing from the ECS.
- B. Maintenance tasks will be evaluated on a case-by-case basis to determine if they are to be considered a non-routine task.

10.0 INFORMING CONTRACTORS

- A. It is the responsibility of the ECS to provide the contractors and their employees with the following information:
 - Hazardous chemicals to which they may be exposed while on the job site
 - Measures the employees may take to lessen the risk
 - Steps the company has taken to lessen the risks
 - MSDSs for all hazardous chemicals are on file in the plant office
 - Procedures to follow if they are exposed
- B. The ECS will coordinate actions to ensure that contractor's employees are given this information prior to entering the work site.
- C. All contractors are required to notify Vortec of any hazardous chemicals they may bring on site and provide the appropriate MSDS.

11.0 LIST OF HAZARDOUS CHEMICALS

A list of hazardous chemicals used on the site will be maintained with the MSDSs. Further information on each hazardous chemical noted can be obtained by reviewing MSDSs.

12.0 QUALITY

Nonconformance with this procedure shall be handled in accordance with the appropriate Vortec Corporation policies and procedures including, but not limited to, Vortec Policy QP-11: Control of Nonconforming Conditions as listed in the Engineering Quality Assurance Plan.

VORTEC CORPORATION			
SAFETY AND HEALTH PROCEDURE			
QDP-211-0-006	REVISION NO. A	PAGE 1 OF 10	DATE: 11/6/98

HOT WORK PERMIT PROGRAM

WRITTEN BY: Christopher M. Holdridge 11/6/98
Christopher M. Holdridge
Environmental Compliance Specialist
Date

REVIEWED BY: Edward J. Keenan 11/6/98
Edward J. Keenan
Quality Assurance Manager
Date

ISSUED BY: _____
Robert K. Hnat
Director of Operations
Date

APPROVED BY: _____
James G. Hnat
President
Date

REVISION INDEX

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HOT WORK PERMIT

1.0 PURPOSE

This procedure provides safety guidance and a permit system for the safe performance of non-routine hot work operations. It is intended to reduce the risk of injury and property loss due to accidental fires or explosions caused by hot work.

2.0 APPLICABILITY

This procedure covers all non-routine hot work operations involving brazing, cutting, grinding, soldering, pipe thawing, welding, flame operations, and other work that could act as a source of ignition performed outside a designated weld area. Non-routine hot work operations can also include drilling, power sanding, or other operations that generate sparks and heat by friction in the presence of flammable gases and/or combustible powders and liquids.

This procedure also governs hot work performed by contractor employees.

3.0 DEFINITIONS

3.1 Combustibles - Any solid or liquid material that oxidizes under ambient conditions when combined with a source of ignition.

3.2 Explosive Atmosphere - When the ignitability of the atmosphere is in the range between the lower explosive limit (LEL) and upper explosive limit (UEL) of an identified flammable gas or vapor mixture.

3.3 Fire Watcher - A designated individual trained in fire prevention and suppression who observes welding/burning/hot work operations.

3.4 Designated Weld Area - A maintenance or construction area or shop defined and segregated from nonweld areas by easily identified boundaries and clear of combustible and flammable materials by a range of 35 feet.

3.5 Flammable Liquids - OSHA defines a flammable liquid as any liquid having a flash point below 100°F (38°C), except any mixture having components with flash points of 100°F (38°C) or higher which make up 99% or more of the total volume of the mixture.

3.6 Welding/Burning/Hot Work - All methods of welding: arc and torch cutting/open-flame brazing, burning, and soldering; other portable torch open-flame operations; and grinding operations that produce sparks.

3.7 Welding/Burning/Hot Work Permit - A form which provides authorization to perform welding, burning, and hot work outside a designated weld area. This permit specifies special precautions to be followed during work.

4.0 GENERAL REQUIREMENTS

This procedure contains basic requirements for the safe performance of welding, cutting, and brazing. It is not intended to cover all conditions which can conceivably be encountered. Appropriate protective equipment and actions to be taken may vary with the size, nature, and location of the work to be performed.

4.1 Protective Clothing and Equipment

Approved welding helmet with correct shade of filter lens must be worn. Goggles or safety glasses must also be worn for arc welding and cutting, gas welding, or oxygen-acetylene cutting operations. Welding goggles may be used on burning table operations.

Flameproof gloves with gauntlet cuffs shall be worn during all welding or cutting operations.

Long-sleeve shirts shall be worn and fastened.

Feet and ankles shall be protected by the use of approved safety shoes and welding spats.

Cape sleeves or shoulder covers with bibs made of leather or other flame-retardant resistant material shall be worn when it is necessary for welders to weld overhead or for prolonged exposure to arc radiation.

4.2 Fire Protection

Welding operations must not be conducted in (1) rooms or compartments containing flammable vapors, (2) closed tanks or other containers that have held flammable gases or liquids, or (3) locations where oxygen-enriched atmospheres may be encountered until the Facility Manager has determined that all such vapors have been eliminated and that a safe atmosphere is being maintained.

All combustible material must be removed from the area of welding and cutting. If the combustible material cannot be moved or if the object to be welded or cut cannot be readily relocated, steps must be taken to safeguard the area by confining the heat, sparks, and slag (e.g., use of flame retarding tarpaulin, fire watch, etc.)

4.3 Ventilation

In addition to general ventilation systems, local exhaust ventilation systems or personal respiratory protection equipment should be used to keep the amount of toxic fumes, gases, or dusts below the threshold limit values, specified in 29 CFR 1910.1000.

Containers that have held flammable liquid or gases should be purged with water or inert gas.

4.4 Requirements for Designated Weld Area

A. The designated weld area shall be located in noncombustible/fire resistive structures unless otherwise approved by the Supervisor.

B. The designated weld area must be inspected and approved by the Supervisor before performing welding, burning, and/or hot work.

C. The designated weld area must display an approved permit issued and signed by the Supervisor.

D. The immediate space surrounding the defined welding/burning/hot work area shall be kept clear of all combustibles for a minimum distance of 35 ft.

E. A fully-charged fire extinguisher of the appropriate size and type shall be available at the weld shop.

5.0 PROCEDURE

5.1 The person performing the hot work (hereafter referred to as the Hot Worker) must obtain a **HOT WORK PERMIT** from his/her Supervisor.

5.2 The Hot Worker then contacts the Supervisor about the hot work to be done.

5.3 The Supervisor and the Hot Worker shall review the work requirements and the necessary fire safety precautions and sign the PERMIT. If the review determines that flammable or

combustible vapors may be present, then combustible gas sampling is required as described in Section 8.

5.4 The Hot Worker then writes the time work is started on the PERMIT and posts it prominently at the job site. The PERMIT is in force until the end of the shift in which it was issued. If work is continued into the next shift, a new PERMIT must be issued. The expired permit must be attached to the new one.

5.5 Hot Work must stop if permitted conditions change in any way that affects safety. The PERMIT is then voided. A new PERMIT may be issued after reevaluation of the situation.

5.6 At the completion of the work, the HOT WORKER performs a fire safety inspection, writes the time completed on the PERMIT, and notifies the Supervisor that the job is done.

5.7 The Supervisor arranges for a final fire safety inspection about 60 minutes following the work, signs and notes the time on the PERMIT, and then files the PERMIT in the Supervisor's office.

5.8 A Fire Watch is required whenever Hot Work is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

5.8.1 Appreciable combustible material in building construction or contents is closer than 35 feet to the point of operation.

5.8.2 Appreciable combustibles are more than 35 feet away but are easily ignited by sparks.

5.8.3 Wall openings within 35 feet, or floor openings underneath the work expose combustible material in adjacent or underlying areas, including concealed spaces in walls or floors.

5.8.4 Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs, and could be ignited by conduction or radiation.

5.8.5 Whenever it is deemed necessary by the Supervisor and/or authorized person.

5.8.6 Fire Watchers will:

- Have fire extinguishing equipment readily available and be trained in its use.
- Know where the nearest fire alarm pull station or nearest phone is located to sound an alarm in the event of a fire.
- Watch for fires in all exposed areas and try to extinguish them in their beginning stage.

5.9 The Supervisor will decide who will provide the Fire Watch on a case-by-case basis.

5.10 If a fire Watch is used, he/she must remain as an observer, without interruption, for 30 minutes following the Hot Work to detect and extinguish possible smoldering fires. The Fire Watch and Supervisor must conduct the final fire safety inspection together, sign the bottom of the PERMIT, and write the time of the inspection. The PERMIT is then filed in the Supervisor's office.

6.0 SPECIAL HAZARDS

6.1 Natural gas

6.1.1 When performing hot work close to natural gas piping, a determination must be made by the Supervisor to shut down, lock out, purge, and monitor the area.

6.1.2 When work is required on natural gas pipelines, the natural gas feed must be positively blocked off to isolate the area of the line involved in the work. Blocking of the line can be accomplished with valves, if the closure is positive, or with flange blinds. Valves used for isolation must be locked and tagged as outlined by the Lockout/Tagout Procedure. The line must be thoroughly purged and combustible gas readings must be taken to ensure the line is clear of flammable gas.

6.1.3 Perform a combustible gas check of the hot work area. Check gas pipe connections, low lying areas, inside equipment, and any other confined areas where pockets of gas could have collected.

6.2 Painted surfaces

6.2.1 Painted surfaces must have the coating removed before any welding/burning/hot work can be performed. Refer to OSHA 29 CFR 1926.354 for regulatory guidance.

7.0 CONTRACTORS

7.1 Contractors must either have a Hot Work Procedure equivalent to this document or follow Vortec Corporation's Hot Work Procedure. The Supervisor or authorized personnel will determine which procedure is to be used.

7.2 When planned hot work can affect existing operations or is performed in operating buildings, the Supervisor must approve all Hot Work Permits.

7.3 Contractors are responsible for providing a Fire Watch as required

8.0 COMBUSTIBLE GAS SAMPLING INSTRUCTIONS

8.1 A Combustible Gas Detector (CGD) should be used whenever there is a concern that combustible/flammable vapors or gases may be present prior to or during the Hot Work task. Personnel should be aware that some Hot Work environments may need continuous monitoring if there is risk of a leak or introduction of combustible vapors from other operations.

8.2 Turn the CGD "On" and then "Zero" the CGD in combustible-free air of the same temperature as the area to be sampled. "Zero" both O₂ and combustible gas analyzers.

8.3 Follow manufacturer's instructions for sampling an area.

8.4 Pay particular attention to sampling low lying areas such as sumps, drain openings, and pits and high areas such as roofs and stacks when vapors that are heavier or lighter than air are suspected.

8.5 When sampling deep vessels such as towers, stacks, and tanks, pay attention to the meter as the sampling probe is lowered or inserted. It is possible to encounter an oxygen deficient atmosphere which would give inaccurate readings. Also, the atmosphere near the surface or opening may give a "safe" reading; however, a combustible atmosphere could exist deeper due to air mixing at the surface.

9.0 REFERENCES

9.1 American National Standards Institute (ANSI) Z49.1-1988, "Safety in Welding and Cutting"

9.2 American National Standards Institute (ANSI) Z87.1-1989, "Eye and Face Protection"

9.3 OSHA 29 CFR 1910, Subpart Q, "Welding, Cutting, and Brazing"

9.4 NFPA 51B, 1994, National Fire Protection Association, "Standard for Fire Prevention in Use of Cutting and Welding Processes"

**VORTEC CORPORATION
WELDING, CUTTING, AND BRAZING
HOT WORK PERMIT**

Date: _____	Work Location: _____
Work to be done: _____ _____	
Permit Starts: _____ (MILITARY TIME)	Permit Expires: _____ (24 hours MAXIMUM) (MILITARY TIME)
Necessary Fire Safety Precautions	yes n/a
1. Fire fighting equipment and nearest phone/fire alarm box identified.	☐ ☐
2. Hot Work equipment appears in good condition.	☐ ☐
3. Chemical hazards evaluated (coatings, paints, cleaners, metal fumes, etc.)	☐ ☐
4. Explosive atmosphere eliminated and air sampled.	☐ ☐
5. Floors swept clean of combustible debris.	☐ ☐
6. Combustible materials removed or protected with noncombustible shields if within 35 feet.	☐ ☐
7. No flammable liquids within 35 feet.	☐ ☐
8. Confined Space Entry Permit needed.	☐ ☐
9. Fire Watch required during and 30 minutes after work if combustibles are within 35 feet of work.	☐ ☐
The Work location has been examined. The precautions above have been taken to prevent fire. Permission is granted for this work by:	
Print Name	Signature
Hot Worker: _____	_____
_____	_____
Supervisor: _____	_____
Final Inspection	
Work area and all adjacent areas were inspected 30 minutes after the work was completed and were found firesafe by:	
Print Name	Signature
Supervisor: _____	_____
Fire Watch: _____	_____
Post this permit in the work area during the work and leave it posted until Final Fire Inspection. File in Supervisor's office after final inspection.	

Figure 1. Hot Work Permit

PERMIT EFFECTIVE TIME PERIODS

This permit may be renewed at the expiration of a 24 hour time period provided that precautions listed above have been reassessed and no changes have been made. If no changes have occurred, the Supervisor notifies the Hot Worker of the permit extension and enters start (date/time) and expiration (date/time) for the new time period. The Hot Worker and designated fire watcher(s) sign the permit for each approved 24 hour time period extension.

Time period extensions for welding/burning/hotwork operations are provided for up to (5) time periods before a new permit issuance is required. This is only effective providing no changes affecting this permit have occurred. Allowance for time intervals between time period extensions may be permitted, again, only if no changes occur during the interval.

Start: _____	Expires: _____		
Date/Time	Date/Time	Signature of Hot Worker	Signature(s) of Fire Watcher(s)
Start: _____	Expires: _____		
Date/Time	Date/Time	Signature of Welder	Signature(s) of Fire Watcher(s)
Start: _____	Expires: _____		
Date/Time	Date/Time	Signature of Welder	Signature(s) of Fire Watcher(s)
Start: _____	Expires: _____		
Date/Time	Date/Time	Signature of Welder	Signature(s) of Fire Watcher(s)
Start: _____	Expires: _____		
Date/Time	Date/Time	Signature of Welder	Signature(s) of Fire Watcher(s)

THIS PERMIT MUST BE KEPT WITH THE HOT WORKER OR POSTED AT THE WORKSITE

Figure 1. Hot Work Permit (cont.)

Vortec Corporation			
RECEIVING PROCEDURE			
QDP211-9-001	REVISION NO. 0	PAGE 1 OF 20	DATE: 05/22/97

**PROCEDURES FOR PLANT RECEIVING, INSPECTION, & MAINTENANCE
SURVEILLANCE AT THE PADUCAH KENTUCKY DEMONSTRATION PLANT**

	Name/Signature	Title/Position
Written by:	E. J. Keenan	<u>6/5/97</u> Quality Engineer
Revised by:	R. K. Hoat	
Issued by:	R. K. Hoat	<u>6/5/97</u> Director of Operations
Approved by:	J. S. Patten	<u>6/5/97</u> FETC Program Manager

REVISION INDEX

<i>Revision No.</i>	<i>Revision Date</i>	<i>Revision Description</i>
0	05/97	Original Issue

**PROCEDURES FOR PLANT RECEIVING, INSPECTION, & MAINTENANCE
SURVEILLANCE AT THE PADUCAH GASEOUS DIFFUSION PLANT: PADUCAH, KY**

PURPOSE

The purpose of this procedure is to establish a uniform method to control the proper receipt, storage, and maintenance surveillance of materials, items, and components by Vortec personnel.

SCOPE

This procedure applies to the materials, items and components received by and/or stored by the Vortec Corporation's Plant Receiving Department and/or their designees while performing work at the project site.

1.0 DEFINITIONS

Site Manager	Responsible for all aspects of management, construction and operation of the vitrification demonstration plant.
Receiving Coordinator	Individual charged with the responsibility of ensuring compliance with this department procedure. This definition is used generically throughout this procedure to state those requirements that will be done specifically by this person as well as those that designated to others while remaining under the authorization of this position.
Unique Requirements	Examples of <i>Unique Requirements</i> and special attachments: Material Test Reports, ASME code data forms, storage requirements, storage maintenance requirements, instruction manuals or other like items required by purchase order or specification.
Receiving/Inspection Checklist	Checklist(s) used by the Procurement Requester, responsible engineer, Material Coordinator, Receiving Coordinator or any other appropriate person as a means to communicate pertinent information to the Receiving Department to facilitate the completion this function. Form: QDP-9-001
DMRL	Daily Material Received Log - Form: QDP-9-002
Material Discrepancy Notice	A structured form used to document and advise the Hardware Coordinator of any receipts, which have incorrect quantity and/or price counts, damaged materials, or other supplier or carrier discrepancies. Form: QDP9-006.

Equipment Storage Area Checklist	A structured list used for general inspections of storage areas, and for the general conditions of materials, equipment, and components. Form: QDP-9-004
Material Receiving Report (MRR)	A structured form used to document materials received. Form: QDP-9-005
Storage Log	Storage Log maintained by the Receiving Coordinator depicting the location of items under this area's jurisdiction
Storage Tag	An identification tag that is used to facilitate storage and movement of items in this area.
Vortec Contact Person	The Receiving Coordinator is listed on Vortec purchase orders as the contact person for vendors.
Hardware Coordinator	Designated coordinator responsible to coordinate the flow of information & questions between Vortec engineering, procurement staff and others with the Receiving Coordinator, designees, and staff.
Noncompliance	Items and/or activities which fail to conform to applicable established codes, specifications, or standards.
Secured Storage	Designated as areas maintained under "Lock and Key".
Non-Secured Storage	Designated as areas not maintained under "Lock and Key".
Surveillance	A review, observation, or inspection for the purpose of verifying that stated procedures or activities are being accomplished as specified.

2.0 REFERENCE DOCUMENTS

- 2.1** Phase II Health and Safety Plan (HASP) for the Vortec Vitrification Demonstration Project.
- 2.2** Vortec Corporation Engineering Quality Assurance Plan for the Innovative Fossil Fuel Fired Vitrification Technology for Soil Remediation.

3.0 EQUIPMENT AND MATERIALS

3.1. EQUIPMENT

Initially basic office supplies as needed for site management and initial construction purposes (e.g. phone and computer systems, etc.).

4.0 SAFETY AND HEALTH

4.1 POSSIBLE SAFETY HAZARDS

Refer to Reference Document 2.1 (specifically Sections 5.0 through 9.3).

4.2 SAFETY EQUIPMENT

Refer to Reference Document 2.1 (specifically including, but not limited to, Sections 6.0 through 9.3).

4.3 SAFETY PROCEDURES

Refer to Reference Document 2.1 (specifically including, but not limited to, Sections 7.0 through 18.2).

5.0 ENVIRONMENTAL PROCEDURES

Read and be familiar with Reference Document 2.1 (specifically including, but not limited to, sections 9.0 through 17.3).

6.0 OPERATING PROCEDURES

6.1. PLANT RECEIVING

Purpose:

This procedure describes the receipt of materials, items and components by Vortec personnel.

Responsibilities:

Vortec Receiving Coordinator

- Receipt of all incoming goods as specified by this procedure
- Completion and forwarding of all required information as specified by this procedure

Procedures:

Receives no materials, items, or components without having first received the *Receiving/Inspection Checklist* from the Hardware Coordinator. Any exceptions to this requirement must be cleared through the Hardware Coordinator, or in critical circumstances with the approval of the Site Manager.

Maintains a file of anticipated materials, items, and components that are due to be received. Included as part of this file should be any information that has been included and/or communicated by the Hardware Coordinator. Examples of such items are special *"Receiving/Inspection Checklists"* and special Tagging and/or Labeling instructions. These requirements should be stipulated by the Procurement Requester, the Responsible Engineer or others in advance and sent to the site.

Checks the "Shipment" (delivered materials, items, and components) to verify agreement with the packing slips and "Bills of Lading". Inspects the delivered items per any instructions previously received, for damage and/or any other supplier or carrier discrepancies.

IF NO DISCREPANCIES EXIST:

1. Logs the receipt of delivered items on a Materials Receiving Report (MRR). Annotates any unique safety, handling, storage and/or maintenance requirements on the *"Receiving/Inspection Checklist"*.
2. Determines if a Storage Tag # and Tag is required.
3. Annotates all pertinent receiving documents with Storage Tag #, and applies Tag.
4. Forwards the MRR, a copy of the packing slips, "Bills of Lading" and all other pertinent information to the Hardware Coordinator.

This Completes the Initial Receipt Process Without Discrepancies.

IF DISCREPANCIES EXIST:

1. The discrepancies are described in detail on a Material Discrepancy Notice form.
2. If there is any damage or if it is felt that the discrepancy is such that immediate notification or guidance is required, contact the Hardware Coordinator. If the Hardware Coordinator cannot be contacted, receive the items ONLY after annotating on all shipping, receiving, packing documents and "Bills of Lading" of any and all discrepancies and/or damages found.
3. Ask the "Shipper" to countersign all Vortec shipping, receiving, packing documents and "Bills of Lading".
4. Take pictures of all damages.

5. Do not open or otherwise alter any "packaging" unless instructed, or it is determined necessary for receipt.
6. Clearly identify items as being in the status of "Hold" for later disposition. If possible, place these items in a secured and isolated area. This area can be defined as a "Hold Point" and/or "Quarantined" area. It can be designated as simply as with a "tag" or "tape", or it can be an entirely separate area as required. Leave in this "area" until others can be contacted.
7. Determine if a Storage Tag # and Tag is required, and if so annotate all pertinent receiving documents with the Storage Tag # and apply Tag.
8. Forward the MRR, Material Discrepancy Notice form, copies of all packing slips, "Bills of Lading" and all other pertinent information to the Hardware Coordinator.

This Completes the Initial Receipt Process Where Discrepancies Exist.

6.2. INSPECTION

Purpose:

This procedure describes the inspection of materials, items and components received and stored at locations by Vortec receiving personnel.

Responsibilities:

Receiving Coordinator:

- Performs and/or designates any inspections as required or instructed to ensure the proper movement, placement and storage of all materials received and under the jurisdiction and control of the Vortec Corporation.
- Completes and files all required information as specified by this procedure.

Procedures:

Reviews the receiving documents to determine if there are further inspections required in addition to the "normal" Receiving/Inspection Checklist items described above.

Reviews any special instructions to determine if there are additional specific instructions to follow.

Communicates any unresolved questions with Hardware Coordinator.

6.3. STORAGE

Purpose:

The purpose of this procedure is to establish a uniform means to ensure the short and long-term integrity of all materials, items, and components.

Responsibilities:

Vortec Receiving Coordinator

- Vortec Receiving Coordinator - Performs and/or designates responsibility for any and all movement of materials, items, and components to ensure the proper placement and storage of all items received and under the jurisdiction and control of the Vortec Corporation.
- Completes and files all required information as specified by this procedure.

Procedures:

A. Storage Requirements

1. The storage requirements of all materials, items, and component shall be based upon contract specifications, procurement documents, supplier recommendations, and/or "normal and good storage practices". Any questions or concerns shall be addressed with the Hardware Coordinator.
2. Storage Classifications:
 - a) Level A - Items classified to Level A are those that are sensitive to environmental conditions and require special measures for protection from one or more of the following effects: sudden temperature changes, humidity, physical damage, and airborne contamination (e.g. rain, snow, and dirt).
 - b) Level B - Items classified to Level B are less sensitive to environmental conditions than Level A items, but require indoor storage for protection from normal airborne contaminants (e.g. rain, snow, dirt,) and protection from physical damage.
 - c) Level C - Items classified to Level C are less sensitive to environmental conditions than Level B items, but require protection from physical damage as well as adequate tarping or covering for protection from airborne contamination (e.g. rain, snow, dust, dirt).

- d) Level D - Items classified to Level D are less sensitive to environmental conditions than Level C items, can be stored outdoors, and uncovered, but requiring protection from physical damage.

Designations for Storage Areas Currently Available:

- a) Level A: Rented space at "Wagner Moving & Storage Warehouse" provides adequate protection for items requiring this level of storage requirement.
- b) Level B: The on-site structure referred to as the "Clamshell" provides adequate protection for items requiring this level of storage requirement.
- c) Level C: The on-site areas referred to as "Outside Storage" provides adequate protection for items requiring this level of storage requirement. However, tarping or other adequate covering is required.
- d) Level D: The on-site areas referred to as "Outside Storage" and "On Pad" provide adequate protection for items requiring this level of storage requirement. Materials may be stored as received and uncovered.

B. Placement:

1. Reviews the "Receiving/Inspection Checklist" to determine if there are any specific instructions listed, and/or requirements necessary. If there are any questions, communicate them with the Hardware Coordinator. If unable to contact the Hardware Coordinator, or if there are unresolved questions and it is felt that specific security and/or storage measures are warranted, use the highest level available that is felt appropriate. Communicate this status at the next available opportunity.
2. Document what the item is, the storage tag #, the associated purchase order no., the date moved, the storage area moved to, and all other pertinent information on this item. The Receiving Coordinator or his designee will then file this information. Annotate any unique storage requirements. If the status of any materials, items, or components changes, it must be annotated along with this file.
3. Following "normal and acceptable methods and practices", move the items to their proper storage location.

C. Routine Storage Inspections/Surveillance:

1. On a scheduled basis specified by the Equipment Storage Area Checklist or any other pertinent requirement, it will be necessary to inspect the general conditions of all of the equipment and their storage areas. This will normally be accomplished by using the Equipment Storage Area Checklist.
2. Document any unusual circumstances found. Communicate all concerns relating to the integrity of the storage area structures to the Site Manager, and if there are concerns relating to the integrity of the equipment, items, and components, notify the Hardware Coordinator as well. The Receiving Coordinator or his designee will file documentation of findings.

D. In-Storage Maintenance Surveillance Requirements:

In-Storage Maintenance Surveillance will be performed per specific Vortec procedures, contract specifications, supplier recommendations, and/or "normal and good maintenance practices" as necessary to maintain the safety and integrity of items stored.

7.0 QUALITY

Nonconformance with this procedure shall be handled in accordance with the appropriate sections of the Vortec Corporation Engineering Quality Assurance Plan for the Innovative Fossil Fuel Fired Vitrification Technology for Soil Remediation.

8.0 SHUTDOWN**8.1 NORMAL**

The Receiving Coordinator or designees will perform normal shutdowns as required, and as trained.

8.2 EMERGENCY

Emergency shutdowns will be performed as required and trained, and in accordance with Reference Document 2.1 (Specifically sections 8.0 through 18.2).

9.0 ATTACHMENTS

Receiving and Inspection Checklist	Form: QDP-9-001
Daily Material Received Log (DMRL)	Form: QDP-9-002
Equipment Storage Area Checklist	Form: QDP-9-004
Material Receiving Report	Form: QDP-9-005
Storage Log (MISL)	Example of Storage Log
Material Discrepancy Notice	Form QDP9-006

Ortec Corporation		Receiving / Inspection Checklist	
Section 1. Receiving Checklist		Contract No.: 6	
P. O. No.: 1	ID/Stock No.: 7		
Manufacturer: 2	Vendor: 8		
Specification No.: 3	Inspection Report No.: 9		
Property Tag No.: 4	Quantity: 10		
Item Description: 5			
Storage Requirements: 11 ☐ Level "A" ☐ Level "B" ☐ Level "C" ☐ Level "D"			
Special Handling/Storage and/or Maintenance Requirements: 12 Yes ☐ No ☐			
Signature: 13		Date: 14	
Section 2. Inspection Checklist			
(A) VISUAL EXAMINATION	Reqd Y/N	Sat/Unsat S/U	Comments
Checklist Item			
A1 Evidence of Moisture			
A2 Fastener Type			
A3 Grease/Oil Filings			
A4 Loose, Missing, Binding Parts	15	16	17
A5 Position of Indicator/Actuator			
A6 Properly Sealed Protected			
A7 Internal Surface/Proper Preservative			
A8 External Surface/Proper Preservative			
A9 Workmanship			
A10 Oil Level			
OTHER:			
A11			
A12			
A13			
(B) MANUFACTURERS' MARKINGS	Reqd Y/N	Sat/Unsat S/U	Comments
Item Checked			
B1 Electrical Rating/Name-Plate Data			
B2 Press Rating/Temp. Range			
B3 Nameplate Data	15	16	17
B4 Material Type			
B5 Motor Size			
B6 Contract Marking Requirements			
OTHER:			
B7			
B8			
B9			
B10			
Signature: 18		Date: 19	
Attach additional sheets if required			
Form QDP9-001			

MATERIAL RECEIVING REPORT (MRR)
Instructions for Completing Form QDP9-001

Section 1 to be Completed by Equipment Coordinator.

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
1.	P.O. No.:	Enter the Vortec purchase order # that is authorized for this procurement.
2.	Manufacturer:	Enter the name of the vendor and sub-supplier, if any.
3.	Specification No.:	Enter the applicable Vortec specification #.
4.	Property Tag No.:	Enter (if available) the number assigned by the Property Manager which permanently identifies this government asset.
5.	Item Description:	Describe the item. Include information helpful in matching the item with vendor information.
6.	Contract No.:	Enter the contract number under which the shipment was purchased.
7.	ID/Stock No.:	Enter an item identifier to be used for the "Materials In-Storage Log".
8.	Vendor:	Enter the name of the Vortec vendor.
9.	Inspection Report No.:	Enter a sequential number to indicate additional information which supports this item. If none applicable, leave blank.
10.	Quantity:	Enter the quantity received.
11.	Storage Requirements:	Check block A, B, C, or D to define the storage level required.
12.	Special Handling/Storage:	Check Yes or No. If Yes, enter specific instructions for handling, storage and/or maintenance and in-storage maintenance for this item, or reference specific documents. Requirements which contain that information, attach additional sheets as required.
13.	Signature:	Signature of the Equipment Coordinator or his designee.
14.	Date:	Enter the date Section 1 information was completed.

Section 2 to be Completed by Engineering & Receiving

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
15.	Reqd Y/N:	(Engineering) For each check list item Enter "Y" for Yes or "N" for No. Add other items as appropriate to fully define inspection requirements.
16.	Sat/Unsat S/U:	(Receiving) For each "Y" item in from item 15, indicate acceptability by entering a "S" for Satisfactory or a "U" for Unsatisfactory.
17.	Comments:	(Receiving) Enter an explanation for each item marked "U" in item 16. Complete Form QDP9-002, Receiving Inquiry and submit to Equipment Coordinator.
18.	Signature:	Signature of the Receiving Coordinator
19.	Date:	Enter the date this checklist is completed.

Ortec Corporation		Daily Material Received Log			
No.	Date	Equipment I.D. No.	Vendor	Material Description	MRR No.
1	1	2	3	4	5
2					
3					
4					
5					
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12					
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Form QDP9-002

DAILY MATERIAL RECEIVED LOG REPORT
Instructions for Completing Form QDP9-002

To be completed by the Originator.

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
1.	Date:	Enter the date of receipt.
2.	Equipment ID No.:	Enter the equipment ID # as assigned by the data.
3.	Vendor:	Enter the name of the vendor.
4.	Material Description:	Describe the item received. Include information helpful from the documents received from the vendor.
5.	MRR No.:	Enter the Material Receipt No. (MRR). The MRR numbering system to be locally defined at the receiving site.

Ortec Corporation		Material Discrepancy Notice	
MRR No.: 1	Vendor: 7		
P.O. No.: 2			
Contract No.: 3			
Part Description: 4			
Part Number: 5	MDN Originator: 8		
Quantity Received: 6	Date: 9		
DISCREPANCY			
10			
☐ Overshipment of ordered material.			
☐ Undershipment of ordered material. (Quantity received less than packing slip quantity.)			
☐ Incorrect material.			
☐ Shipping damage discovered at time of receipt of material.			
☐ Latent damage discovered after acceptance of material.			
Specific details of Discrepancy:	11		
REMEDIAL ACTION			
12			
☐ Accept overshipment - Value \$ 13			
☐ Accept nonconforming material (with consideration from Seller).			
☐ Reject material and return to Seller.			
☐ File damage claim with common carrier.			
☐ Replacement / Additional material is required from Seller.			
☐ No Replacement material is required.			
☐ Other required action. 14			
Approved: 15	16		
Requesting Activity / Material Coordinator			
Approved: 17	18		
Procurement			
Date			
Form QDP 9-006			

MATERIAL DISCREPANCY NOTICE
Instruction for Completing Form QDP9-006

To be Completed by the Originator.

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
1.	MRR No.:	Enter the next available number from the MRR log.
2.	P.O. No.:	Enter the P.O. No. from the receiving data provided.
3.	Contract No:	Enter the applicable Contract No. for the material.
4.	Part Description.:	Enter the description of the affected part .
5.	Part Number:	Enter the part identification number.
6.	Quantity Received	Enter the quantity received.
7.	Vendor:	Enter the name of the vendor that appears on the purchase order.
8.	MDN Originator:	Enter the name of the person completing this form.
9.	Date:	Enter date the discrepancy is initiated.
10.	Discrepancy	Check the appropriate discrepancy item.
11.	Specific details:	Enter description of discrepancy, attach additional sheets if needed.

To be Completed by the P.O. Contact Person or the Material Coordinator.

12.	Remedial Action:	Check the appropriate remedial action item.
13.	Value \$:	If checked, enter the estimated over shipment value.
14.	Other required action:	If checked, describe the remedial action required.
15.	Approved:	The signature of the P.O. contact person or the Material Coordinator.
16.	Date:	Enter the date the remedial action is defined.
17.	Approved:	The signature of the Vortec Procurement Specialist.
18.	Date:	Enter the date approved.

[illegible]

STORAGE AREA CHECKLIST
Instruction for Completing Form QDP9-004

To be Completed by the Individual who does Surveillance in the Storage Area.

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
1.	Area:	Enter the name (location) of the storage area being inspected.
2.	Date:	Enter the date this inspection was requested or scheduled.
3.	Item #1, Level of Storage:	Circle the letter (A, B, C, or D) that defines the level of storage protection assigned to this storage area.
4.	Evaluation:	For items 1 through 17, indicate the acceptability of each by placing a "X" or "check mark" in the appropriate column. (N/A indicates not applicable).
5.	Signature:	Signature of individual completing this report
6.	Date:	Enter date report was completed.

[illegible]

MATERIAL RECEIVING REPORT (MRR)
Instruction for Completing Form QDP9-005

To be Completed by the Receiving Coordinator.

<u>Item</u>	<u>Description</u>	<u>Instruction</u>
1.	MRR No.:	Enter the next available number from the MRR log.
2.	Contract No.:	Enter the applicable Contract No. for the material.
3.	P.O. No.:	Enter the P.O. No. from the receiving data provided.
4.	Vendor:	Enter the name of the vendor that appears on the purchase order.
5.	Shipped By:	Enter the name of the company that shipped the item, from "freight bill".
6.	Date Shipped:	Enter date of shipment from "Freight Bill".
7.	Shipping Point:	Enter the name of city of origin, from "Freight Bill".
8.	P.O. Item No.:	Enter item number from Vortec purchase order.
9.	Quantity Received:	Enter the quantity received.
10.	Description/Remarks:	Describe item(s) received. Include information helpful in matching item with vendor's documents. Especially include information on any damage found.
11.	Delivery Carrier:	Enter name of carrier that made the delivery.
12.	F.B. No.:	Enter number of "Freight Bill".
13.	Date received:	Enter date delivery was received.
14.	Weight:	Enter weight, from "Freight Bill".
15.	Charges:	Enter amount of any charges due upon delivery. If none, leave blank.
16.	Prepaid:	Check block if <u>no</u> charges are due upon delivery. (True in most cases).
17.	Collect:	Check box if item(s) received <u>matches</u> list on packing slip.
18.	Packing Slip No.:	Enter packing slip no. from documents attached to the delivered item(s).
19.	Partial:	Check block if item(s) received <u>does not</u> match list on packing slip.
20.	Complete:	Check block if item(s) received <u>matches</u> match list on packing slip.
21.	Delivery Location:	Enter location where item(s) were delivered to.
22.	Checked and Counted By:	Enter initials of the person that verified items received. If this is the same person that signs line 25, then enter a "check mark".
23.	This Report By:	Enter initials of the person that compiled the information for this form. If this is the same person that signs line 25, then enter a "check mark".
24.	Received Above Items For:	Enter the name of the company that the item(s) were delivered to.
25.	By:	Enter signature of person submitting this report.
26.	Date:	Enter date that this report was signed.

EXAMPLE OF STORAGE LOG**Vortec Paducah Vitrification Plant
On Site Equipment Summary**

Skid No.	Tag No.	Pad No.	Government Property No.	Item	Received on Site	Storage Location	Serial Number
N/A	B-104			Primary Drum Shredder Fan	3/31/97	Outside Unsecured	
N/A	B-153			HPU Cooler Fan	3/31/97	Outside-Unsecured	
108	HX-108			Combustion Heat Exchanger	2/25/97	Outside-Unsecured	
N/A	ME-101	1		Primary Drum Shredder	3/31/97	Outside-Unsecured	60639
108	ME-108	3		Air Heater	2/26/97	Off-Site Warehouse	
N/A	ME-111	3		Dryer Dust Collector	3/24/97	Outside-Unsecured	96-2911-1A

Vortec Corporation			
PROPERTY MANAGEMENT PROCEDURE			
QDP211-13-001	REVISION NO. 0	PAGE 1 OF 19	DATE: 06/05/97

**PROCEDURES FOR PROPERTY MANAGEMENT
OF GOVERNMENT OWNED PROPERTY**

	Name/Signature	Title/Position
Written by:	E. J. Keenan	<u>6/18/97</u> Quality Engineer
Revised by:	_____	_____
Issued by:	R. K. Hnat	<u>6/18/97</u> Director of Operations
Approved by:	J. S. Patten	<u>6/18/97</u> FETC Program Manager

REVISION INDEX

<i>Revision No.</i>	<i>Revision Date</i>	<i>Revision Description</i>
0	06/97	Original Issue

PROCEDURES FOR PROPERTY MANAGEMENT OF GOVERNMENT OWNED PROPERTY

PURPOSE:

The purpose of this procedure is to establish a uniform method for the management of government property in the Possession of Vortec Corporation.

SCOPE:

This procedure applies to all property management activities performed by Vortec Corporation Program Manager and/or designees while performing work at the project site.

1.0 DEFINITIONS

SUBCONTRACTOR-ACQUIRED PROPERTY means property acquired or otherwise provided by the Subcontractor for performing a subcontract and to which the Government has title.

GOVERNMENT-FURNISHED PROPERTY means property in the possession of or directly acquired by the Government and subsequently made available to a Contractor or Subcontractor.

GOVERNMENT PROPERTY means all property owned by or leased to the Government or acquired by the Government under the terms of a contract or subcontract. It includes Government-furnished property.

PLANT EQUIPMENT means personal property of a capital nature (including equipment, machine tools, test equipment, furniture, vehicles, and accessory and auxiliary items) for use in manufacturing supplies, in performing services, or for any administrative or general plant purposes. It does not include special tooling or special test equipment.

MATERIAL means property that may be incorporated into or attached to a deliverable end item or that may be consumed or expended in performing a contract. It includes assemblies, components, parts, raw and processed materials, and small tools and supplies that may be consumed in normal use in performing a contract.

ACCESSORY ITEM means an item that facilitates or enhances the operation of plant equipment but is not essential for its operation.

AUXILIARY ITEM means an item without which the basic unit or plant equipment cannot operate.

PROPERTY means all property, both real and personal. It includes facilities, material, special tooling, special test equipment, and Government Agency peculiar property.

REAL PROPERTY means land and rights in land, ground improvements, utility distribution systems, and buildings and other structures. It does not include foundations and other work necessary for installing special tooling, special test equipment, or plant equipment.

SPECIAL TEST EQUIPMENT means either single or multi-purpose integrated test units engineered, designed, fabricated, or modified to accomplish special purpose testing in performing a contract or subcontract. It consists of items or assemblies of equipment that are interconnected and interdependent so as to become a new functional entity for special testing purposes. It does not include material, special tooling, facilities (except foundations and similar improvements necessary for installing special test equipment), and plant equipment items used for general plant testing purposes.

SPECIAL TOOLING means jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, all components of these items, and replacement of these items, which are of such a specialized nature that without substantial modification or alteration, their use is limited to development or production of particular supplies or parts thereof or to the performance of particular services. It does not include material, special test equipment, facilities (except foundations and similar improvements necessary for installing special tooling), general or special machine tools, or similar capital items.

NONCOMPLIANCE items and/or activities which fail to conform to applicable established codes, specifications, or standards.

SURVEILLANCE A review, observation, or inspection for the purpose of verifying that stated procedures or activities are being accomplished as specified.

2.0 REFERENCE DOCUMENTS

- 2.1** Phase II Health and Safety Plan (HASP) for the Vortec Vittrification Demonstration Project.
- 2.2** Vortec Corporation Engineering Quality Assurance Plan for the Innovative Fossil Fuel Fired Vittrification Technology for Soil Remediation.

3.0 EQUIPMENT AND MATERIALS

3.1. EQUIPMENT

Various plant and office equipment as required to complete the functions of this procedure.

4.0 SAFETY AND HEALTH

4.1 POSSIBLE SAFETY HAZARDS

Refer to Reference Document 2.1 (specifically Sections 5.0 through 9.3).

4.2 SAFETY EQUIPMENT

Follow site guidelines as applicable to complete the functions of this procedure. Refer to Reference Document 2.1 (specifically including, but not limited to, Sections 6.0 through 9.3).

4.3 SAFETY PROCEDURES

Follow site guidelines as applicable to complete the functions of this procedure. Refer to Reference Document 2.1 (specifically including, but not limited to, Sections 7.0 through 18.2).

5.0 ENVIRONMENTAL PROCEDURES

Follow site guidelines as applicable to complete the functions of this procedure. Read and be familiar with Reference Document 2.1 (specifically including, but not limited to, Sections 9.0 through 17.3).

6.0 PROPERTY MANAGEMENT PROCEDURES

6.1 INTRODUCTION

Vortec Corporation shall be responsible and accountable for all Government property in the company's possession. Responsibility includes establishing, maintaining, and administering an effective system for managing all Government property. The company shall comply with the Federal Acquisition Regulation (FAR Subpart 45.5 and DEAR Subparts 945.5 and 917.74).

Vortec Corporation's Property Management Procedures define responsibilities and accountability methods that shall be utilized for maintaining control over all Government property furnished to Vortec Corporation as well as other property to which title has passed to the Government by reason of allocation from stores or purchased for direct charge to a Government contract. It is through the application of this system that the company can be assured that Vortec Corporation's Property Manager is controlling, protecting, preserving and maintaining all Government-owned property furnished by the Government, or acquired by the contractor at Government expense in accordance with the provisions of the contract.

Certain matters relating to the control of Government property may arise where specific instructions are not set forth in company property control procedures. In such cases, these items will be handled in accordance with the Federal Acquisition Regulation (FAR Subpart 45.5 and DEAR Subparts 945.5 and 917.74, hereby referred to as FAR in this procedure) and the terms of the specific contract.

6.2 COMPANY RESPONSIBILITY

Vortec Corporation shall be responsible for the overall accountability and control of all Government property which has been assigned to Vortec Corporation under the terms of the contract. Property control functions at the project site location will rest with Vortec Corporation's Property Manager who may be the Program Manager or a person designated by the Program Manager. This individual shall be delegated the responsibility for administering the Property Management Procedures in accordance with the FAR and provisions of the contract. Delegation of authority to other personnel never relieves company management of its responsibility to ensure that Vortec Corporation's Property Managers maintain the integrity of the property control systems.

Vortec Corporation's Property Manager shall maintain liaison with the Government property Administrator on all Government property related matters. Appropriate action shall be taken by Vortec Corporation's Property Manager to provide for safeguarding of the assigned Government property. This includes implementing necessary action to prevent unauthorized use; assurance of proper documentation and authorization on all Government property transferred either temporarily or permanently; assurance that a complete preventive maintenance program is being followed; prevention of hazardous usage of the property; and assurance of proper storage of the property to prevent loss, wear or damage.

The Program Manager shall ensure that all of the company's operating personnel thoroughly understands the Government standards and instructions for control of Government property. The managers and supervisors shall be responsible for the Government property assigned to their location and under their cognizance. They shall ensure that employees under their supervision handle such property in a manner that minimizes the danger of loss, damage or hazardous usage. The Program Manager has overall responsibility and accountability for the control of Government property on the contract.

Vortec Corporation's Property Manager shall be responsible for ensuring that company owned property, if any is clearly identified and not commingled with the Government property. Vortec Corporation's Property Manager shall provide the Government Property Administrator with a list of company-owned property, if any, that shall be used in support of the contract.

6.3 ACQUISITION, RECEIVING, STORAGE AND ISSUANCE OF PROPERTY

The acquisition of property, title to which vests in the Government, shall be under the responsibility of the purchasing organization and controlled through prior review and approval of all petty cash procurements and purchase requisitions to ensure that the type and quantity of the proposed acquisition are appropriate and necessary for performance under the prime contract. Further, the contractual requirements for advance notice of intent to subcontract, and Contracting Officer's consent shall be strictly observed.

Personnel assigned to the property control duties by the Program Manager shall be responsible for the performance of the functions related to receiving, issuing and storage of property. Also, consolidation of the property records in this area shall ensure records are updated in accordance with company procedures, as property is added or deleted and shall provide easy access for auditing of the property records.

6.4 ACQUISITION OF PROPERTY

The company's Program Manager shall designate an individual to perform the actual buying function. It is to be clearly understood that the authority to purchase for the company is limited and such procurement activities shall be conducted in accordance with Vortec Corporation's policies and procedures (including, but not limited, to QP-8 and QDP211-8-001) and all other regulations prescribed by the company. Vortec Corporation's Program Manager authorized to conduct a procurement function is solely responsible and accountable for the actions of the appointed project buyer and shall ensure strict compliance with the regulations prescribed by Vortec Corporation.

6.4.1 Receipt of Property

Upon receipt of the materials, the receiving personnel shall make a careful examination of all boxes/containers/items received. Receiving personnel shall assure that receipt of property and all related activities shall be conducted in accordance with Vortec Corporation's policies and procedures (including, but not limited, to QP-9 and QDP211-9-001), as well as all other regulations prescribed by the company.

6.4.2 Storage of Property

Receiving personnel within Vortec Corporation shall be responsible for receiving all incoming property, documenting receipts, and storing the property. They shall be responsible for proper storage of the property in the designated locations to preclude damage, theft, or deterioration. They shall assure that storage of property and all related activities shall be conducted in accordance with Vortec Corporation's policies and procedures (including, but not limited, to QP-9 and QDP211-9-001), as well as all other regulations prescribed by the company.

6.5 PROPERTY RECORDS

6.5.1 General

Vortec Corporation's Property Manager shall be responsible for ensuring control records are maintained in accordance with the requirements of the FAR for all Government property provided under the contract, including property in the possession of its subcontractors. These property records will be kept up-to-date and retained in the Program Managers Office, or designated area, and shall be made readily accessible for review by the Government representative at any time during the term of the contract.

Special tooling and special test equipment, if any, that is fabricated from materials that are the property of the Government shall be appropriately recorded as Government-owned special tooling or special test equipment promptly after fabrication.

6.5.2 Material and Supplies

Stock control status records shall be kept up-to-date to account for all property in Vortec Corporation's possession. Vortec Corporation's Property Manager shall ensure the following information for all items of Government-owned property is recorded:

- Contract number or equipment code description;
- Description of item, including NSN when available;
- Quantity received;
- Quantity issued;
- Balance on hand;
- Posting reference;
- Date received or issued;
- Unit cost;
- Federal stock number and/or manufacturer's part number;
- Location; and
- Disposition action taken.

6.5.3 Custodial Records

Vortec Corporation's Property Manager shall ensure custodial records are maintained by managers and supervisors for tool crib items, non-disposable protective clothing, guard force items, and other items issued for the use by the individuals in the performance of their work under the contract. Custodial records shall reflect the signatures of the individuals to whom the property is assigned.

6.5.4 Noncapitalized Equipment

Individual item records shall be maintained in an up-to-date order by Vortec Corporation's Property Manager and include the following information:

- Contract number or equivalent code designation;
- Nomenclature or description of item;
- Manufacturer's model/part number, including NSN when available;
- Quantity received;
- Balance on hand;
- Posting reference and date of transaction;
- Unit cost;
- Location; and
- Disposition.

Vortec Corporation's Property Manager shall ensure the serial number and/or Government identification number for each item is recorded in the property records and, upon disposition, lined out or otherwise deleted from the record as necessary.

6.5.5 Capitalized Equipment

Vortec Corporation's Property Manager shall ensure individual item records are maintained in an up-to-date order and include the following information:

- Name of the equipment manufacturer;
- Manufacturer's model/part number, including NSN when available;
- Serial number and year built (when available);
- Government identification/tag number;
- Nomenclature of the item;
- Acquisition document reference and date;

- Location;
- Disposition document reference and date;
- Contract number or equivalent code designation; and
- Unit cost when equipment is Government-furnished or acquisition cost (f.o.b. manufacturer) when contractor-acquired. Unit cost will be reduced when accessory and auxiliary items are permanently separated from the basic item of capitalized equipment.

Vortec Corporation's Property Manager shall ensure maintenance and safeguarding of all manufacturing and assembly drawings; installation, operation, repair, and maintenance instructions; and other similar documentation and information that is furnished by the Government.

Upon approval to purchase property for the Government, Vortec Corporation's Property Manager shall ensure the necessary documentation is obtained and added to the documentation provided by the Government.

6.5.6 Records Of Accessory and Auxiliary Equipment

Vortec Corporation's Property Manager shall ensure accessory and auxiliary equipment, which is attached to or a part of an item of capitalized equipment or has been acquired for use in connection with a specific item, are recorded on the record of the item of capitalized equipment. In the event the accessory or auxiliary item is not attached to, a part of, or acquired for use with a specific item of capitalized equipment; it shall be recorded in accordance with the instructions under the noncapitalized or capitalized equipment categories

6.5.7 Records of Real Property

Vortec Corporation's Property Manager shall maintain, if assigned by the Government Property Administrator, a continuous itemized record of the description, location, acquisition cost, and disposition of all Government real property, all alterations, and all construction acquired by purchase, lease, or otherwise. He/she shall ensure that foregoing records are complete, showing the original cost of the property and improvements and the cost of changes and additions thereto, and are appropriately recorded.

6.5.8 Scrap and Salvage

Records shall be maintained for all scrap and salvage generated at the project location, unless the Government Property Administrator determines these records are not necessary. The records shall contain the following information.

SCRAP:

- Contract number, if practical, or equivalent code designation;
- Scrap classification (material content);
- Quantity on hand;
- Unit of measure;
- Posting reference and date of transaction; and
- Disposition.

SALVAGE:

- Contract number, if practical, or equivalent code designation;
- Description of item, including NSN when available;
- Quantity on hand;
- Posting reference and date of transaction; and
- Disposition.

6.5.9 Records of Related Data and Information

Property control and accountability shall be maintained by Vortec Corporation's Property Manager in accordance with sound business practices with respect to manufacturing or assembly drawings, installation, operation, repair or maintenance instructions, or other similar documentation and information furnished to the company by the Government.

6.6 FINANCIAL ACCOUNTS AND REPORTS

The financial control accounts and reports shall be maintained and furnished by Vortec Corporation's Property Manager in accordance with the following guidelines.

Financial Control:

Vortec Corporation's Property Manager shall maintain the financial control accounts and be able to provide at any time the dollar amount of Government property for which the company is accountable, in the following classifications:

- Real property;
- Capitalized equipment;
- Leased equipment (all categories);
- Land and rights therein;
- Buildings, structures, facilities, and improvements thereto;
- Noncapitalized equipment; and
- Materials in stock.

The financial control accounts shall be susceptible to local recognition in totals and subtotals as to whether contractor-acquired or Government-furnished.

Reports:

Vortec Corporation's Property Manager shall prepare a semiannual report as of February 28 and August 31 of each year, showing the dollar amount of Government real property and capitalized personal property and equipment in Vortec Corporation's possession and that of subcontractors. The reports shall be prepared in accordance with the format specified in FAR and furnished to the Government Property Administrator no later than 45 days after the reporting period. Vortec Corporation's Property Manager shall certify that the reports have been reconciled and are in balance with the contract property records. If specifically requested by the Government Property Administrator Vortec Corporation's Property Manager shall submit similar reports for Government noncapitalized and sensitive equipment or materials maintained in stocks.

7.0 IDENTIFICATION

All Government property shall be identified, marked, and recorded promptly after it is received. Property shall remain so identified as long as it is in the company's custody, possession, or control. Markings shall be removed or obliterated from the property when it is sold, scrapped, or donated. At a minimum, the following guidelines will govern identification of the property.

7.1 MATERIAL, NONCAPITALIZED AND SENSITIVE EQUIPMENT

All Government material, noncapitalized and sensitive equipment will be identified by Vortec Corporation's Property Manager as Government property except where:

Vortec Corporation, a subcontractor, a subcontractor's employees or other contracting agencies owns property.

Adequate physical control is maintained over sensitive items, tool crib items, guard force items, protective clothing, and other items issued for use by the individuals in the performance of their work under the contract.

Property is of a bulk type or by its general nature of packing or handling precludes adequate markings, as may be determined by the Government Property Administrator.

7.2 CAPITALIZED EQUIPMENT

Vortec Corporation's Property Manager shall ensure capitalized equipment is marked and identified as prescribed below:

Equipment Identification. Unless the equipment is already marked in compliance with these instructions, Vortec Corporation's Property Manager shall ensure that all Government-owned capitalized equipment be marked with a Government identification number, except where the manufacturer serial numbers are provided. Identification shall be effected by affixing a Government-numbered decal directly to the equipment with electric etch, steel dies, or any other legible, permanent, and tamper-proof methods that will identify the equipment. Exceptions may be granted by the Government Property Administrator on a case-by-case basis.

Position of Markings or Identification. Vortec Corporation's Property Manager shall ensure identification is affixed on the main body of an item (not on a removable part). Identification shall be placed where it is readily visible without requiring the item to be removed and where it will not interfere with the functioning, especially if it is sensitive equipment. If the manufacturer's identification plate or label is in a readily accessible position, a position immediately above or below it is preferable.

Managers and supervisors shall ensure that all Government property under their cognizance is properly tagged. This includes replacement of tags destroyed or lost, using the original number assigned. New and/or replacement tags shall be obtained from Vortec Corporation's Property Manager who shall coordinate the format of the tags and their utilization with the Government Property Administrator.

8.0 PHYSICAL INVENTORIES

Physical inventory of all Government property in Vortec Corporation's possession shall be conducted by Vortec Corporation's Property Manager as prescribed in the following paragraphs.

8.1 INITIAL INVENTORY

Vortec Corporation's Property Manager, in conjunction with the Government Property Administrator, shall perform a physical inventory of the Government property that shall be Vortec Corporation's responsibility prior to commencement of a contract. The physical inventory shall consist of sighting, marking if necessary, describing, recording, and verifying the existence and condition of the property to be assigned to the company.

Following the inventory, Vortec Corporation's Property Manager shall submit in a report to the Government Property Administrator the following information:

- A list of inventoried property identifying all discrepancies discovered.
- A signed statement attesting that the physical inventory of the Government property was completed on a given date and that the official property records were found to be in agreement with the physical inventory, except for the discrepancies reported.

8.2 ANNUAL INVENTORIES

An annual physical inventory shall be conducted by Vortec Corporation's Property Manager, on the anniversary of the initial contract start date and each year thereafter of all Government property in Vortec Corporation's custody and in the possession of their subcontractors. The physical inventory shall involve sighting, marking, and if necessary, describing, recording, and verifying the existence of property on hand and reconciling the physical inventory results with the property records.

Following the inventory, Vortec Corporation's Property Manager shall submit a report within 45 days after the aforementioned date of each year, to the Government Property Administrator the following information:

- A list identifying all discrepancies discovered during the physical inventory in all categories of Government property.
- A signed statement attesting that the physical inventory of all Government property under the contract was completed on a specified date and that the official property records were found to be in agreement with the physical inventory, except for the discrepancies reported.

8.3 INVENTORIES UPON TERMINATION OR COMPLETION OF CONTRACT

Upon termination or completion of a contract, Vortec Corporation shall perform a physical inventory of all Government property in its custody and in the possession of any of Vortec Corporation's subcontractors. The physical inventories shall be accomplished and submitted to the Government 120 days in advance of the contract expiration date regardless whether or not the contract will be extended, unless the Contracting Officer approves an extension of time. Separate reports shall be prepared and submitted for Government-furnished property and for company-acquired property for each of the following property categories:

- Real property;
- Noncapitalized equipment including sensitive equipment;
- Materials;
- Salvage; and
- Scrap

Each item of capital property shall be completely identified with sufficient detail to permit verification with reimbursement voucher or if furnished by the Government shipping or other documents. The following details shall be furnished for all items:

- Commercial description, adequate for screening and disposal purposes;
- Make, model, type, serial number, and national stock number (NSN) when available;
- Government identification if no serial number is available;
- Quantity;
- Acquisition cost;
- Condition; and
- Physical location (contractor's facility or other site).

Vortec Corporation shall furnish three copies of the inventory reports to the Government Property Administrator attesting that the reports are complete and accurately list and describe all items of equipment and materials furnished to the company by the Government.

The Contracting Officer shall be notified of any change affecting these inventory reports at any time prior to final disposition of the inventory.

9.0 CARE, MAINTENANCE, AND UTILIZATION

9.1 GENERAL

Vortec Corporation's Property Manager shall be responsible for ensuring the proper care, maintenance, and utilization of the Government property in Vortec Corporation's possession from the time of receipt until Vortec Corporation is properly relieved of this responsibility.

9.2 MAINTENANCE OF PROPERTY

A Preventive Maintenance Program shall be established by the Program Manager for the appropriate items. Vortec Corporation personnel shall perform regularly scheduled inspections and maintenance. This will be in accordance with, but not limited to: Vortec Corporation's Operation and Maintenance Procedures; QP-9; QDP211-9-001; and specific manufacturer's instructions to prevent the occurrence of defects, unnecessary wear, and to detect and correct defects before they result in serious problems.

The Program Manager shall ensure the need for major repair, replacement, and other rehabilitation work to Government property is coordinated with the Government Property Administrator and Contracting Officer.

The Program Manager shall ensure records of maintenance are kept up-to-date to disclose the maintenance actions performed and deficiencies discovered and corrected as a result of the inspections

9.3 UTILIZATION OF GOVERNMENT PROPERTY

Vortec Corporation's Property Manager shall be responsible for ensuring the proper utilization of Government property in Vortec Corporation's possession from the time of receipt of the property until he/she is properly relieved of this responsibility. He/she shall ensure the Government property is utilized only for those purposes specified in the contract.

Vortec Corporation's Property Manager shall adhere to the following procedures for effective utilization of Government-furnished property.

A. Property Utilization

- 1) The (specify controlling official or department) will ascertain that all or specific Government-furnished equipment is authorized for use on the contract prior to issuing the (sales order, work release etc.) to the (specify operating element)
- 2) The (specify controlling official or department) will identify the Government-furnished equipment authorized for use in performance of the work, and any limitation or special aspects of the authorization.

- 3) The (specify controlling official or department) will obtain all contractually required approvals through the Administrative Contracting Officer, prior to utilizing the Government-furnished equipment for commercial work more than 25% of available production time.
- B. Planned (forecasted) usage date is determined by (describe specific method).
- C. Actual usage date is determined by (describe specific method; i.e.. Usage Log).
- NOTE: Usage date (Paragraph B and C) may be by individual item or by equipment groups, but must be sufficiently adequate to permit evaluation of operating personnel compliance with Paragraph D.
- D. Government-furnished equipment will be declared excess to requirements:
- 1) After being idle (or forecasted idleness - specify a period of time, usually no longer than 30 days) without a firm follow-on requirement or Contracting Officer's approval.
 - 2) When duplicative equipment located in the same area is used (or planned) less than 35% of the available production time. (Duplicative equipment will not be retained for back-up or stand-by purpose without the approval of the contracting Officer.)
- E. The (specify controlling official or department) will evaluate (specify operating element) compliance to these procedures (specify a period of time, usually no longer than 90 days). Corrective action, as required, will be accomplished as directed by the (specify controlling official or department). Any exceptions to paragraph D will be fully documented, with justification for retention, by the (specify Controlling Official or Department).

9.4 PROPERTY IN POSSESSION OF SUBCONTRACTORS

Vortec Corporation's Property Manager shall ensure subcontractors having Government property, if any, in their possession or control are adequately caring for and maintaining the property and ensuring that it is utilized only as authorized by the contract.

In the event the scope of work to be accomplished is subcontracted and involves Government property usage, a copy of the purchase order, including a list of furnished Government property, will be furnished to the Government Property Administrator. Specific instructions for control of potential Government property usage that is involved in the subcontracted work shall be clearly defined in the purchase order agreement with the subcontractor. Vortec Corporation's Property Manager shall be notified when Government property has been placed in the custody of a Subcontractor as result of a subcontract issued by the company.

It should be noted that the above actions shall also be taken by the Program Manager when the Contracting Officer has consented to the Subcontractor's acquisition of property to which title shall vest in the Government. Upon termination or completion of the subcontract, the subcontractor shall be required to return all Government property to the company for disposition unless disposition has otherwise been directed by the Contracting Officer in writing.

9.5 PACKING, CRATING, AND SHIPPING

Vortec Corporation's Property Manager shall ensure that when shipment of Government property is required, Vortec Corporation personnel shall properly pack, crate, and handle the items to ensure they reach their destination in good condition. Vortec Corporation's Property Manager shall comply with the Contracting Officer's shipping instructions and notify the Government Property Administrator of the property shipped, name, and the waybill number immediately after the carrier's pickup.

9.6 PROPERTY EXCESS TO CONTRACT REQUIREMENTS

Excess of Government property under Vortec Corporation's custody shall rest with Vortec Corporation's Property Manager. All formal reports of excess property no longer needed, and the loan or transfer of property not being fully utilized shall be documented on the applicable excess property form in accordance with instructions received from the Government Property Administrator. The Vortec Corporation shall dispose of no property item until written approval has been received from the Government Property Administrator, or the designated representative. All property awaiting disposition instructions shall be tagged to indicate the identification number and serial number, if applicable, and the date it was turned in for excess. When disposition instructions are received, the item(s) shall be packed, labeled and shipped in accordance with the instructions from the Government Property Administrator. Once the Government Property Administrator has given the company relief from accountability, action shall be taken by Vortec Corporation's Property Manager to remove the item(s) from the official property records. A copy of all correspondence and records of all property transactions including relief from accountability will be kept in a separate file for proper identification.

10.0 UNSERVICEABLE, LOST, OR DAMAGED PROPERTY

10.1 GENERAL

For property that is unserviceable, lost or damaged under Vortec Corporation's custody, responsibility shall rest with Vortec Corporation's Property Manager. All formal reports of unserviceable, lost or damaged property shall be documented on the applicable Government survey report form within ten working days upon discovery of such loss, damage or unserviceable condition, or after notification by the Government Property Administrator that such a survey is required. A formal survey report shall be submitted by Vortec Corporation's Property Manager with the following information:

- Date of loss, damage or unserviceable condition;
- All circumstances surrounding the incident shall include who, what, when, where, and why;
- A complete description of the item(s) which is lost, damaged or unserviceable;
- Cost of the item(s);
- Action taken by the cognizant manager or supervisor to determine responsibility for the loss, damage or unserviceable condition;
- Action initiated by the cognizant manager or supervisor to preclude further loss, damage or unserviceable condition under similar circumstances; and
- Other facts relevant to the determination of liability and establishment of responsibility for repair and/or replacement.

Upon completion of the investigation by the Program Manager, Vortec Corporation's Property Manager shall forward to the Government Property Administrator a written report and a request for relief from accountable records. The survey report shall identify the affected Government property; the time and origin of the loss, damage or unserviceable condition; all known interests in commingled property of which the government property is a part; corrective measures initiated, if any; and projected timetables of events necessary to complete repair or disposal action on the property. Should the property records show an unacceptable level of inventory loss or damage, Vortec Corporation's Property Manager shall have more frequent inventories conducted to resolve the situation. Other forms of special management attention may also be prescribed.

11.0 QUALITY

Nonconformance with this procedure shall be handled in accordance with the appropriate Vortec Corporation policies and procedures including, but not limited to, Reference 2.2 with specific emphasis on Section QP-13.

12.0 SHUTDOWN

12.1 NORMAL

All personnel will perform any normal site shutdowns as required, and in accordance with site procedures.

12.2 EMERGENCY

Emergency shutdowns will be performed as required, and in accordance with site procedures and Reference Document 2.1 (specifically sections 8.0 through 18.2).

13.0 ATTACHMENTS

Semi-Annual Summary Report

DOE Form F 4300.3

Termination or Completion Inventories Forms

DOE Form SF 120

DOE Form SF 1428

Semi-Annual Summary Report of DOE-Owned Plant and Capital Equipment (P&CE)

Contractor Name _____ Contract No. _____
Address _____
Location of Property (City, State) _____
Contracting Office _____

1	2	3	4	5	6	7	8	9
Asset Type Code	Beginning Balance As of _____		Acquisitions		Dispositions		Ending Balance As of _____	
	No. of Items	\$	No. of Items	\$	No. of Items	\$	No. of Items	\$
Total Plant and Capital Equipment								

Prepared By _____
name (printed), title, telephone number, signature

Date of Last Physical Inventory of Capital Equipment _____

Contracting Officer Representative Signature _____

(Attach results of latest Physical Inventory if conducted since last reporting period)

Summary of Acquisitions & Dispositions by Type of Transactions

Acquisitions from Column (5) above

1. Purchases:
 - a. P&CE Budgeted Items \$ _____
 - b. Operating Expense Budgeted Items \$ _____
2. Fabrications
 - a. Beginning Balance \$ _____
 - b. Additions - P&CE Budgeted \$ _____
 - c. Additions - Operating Expense Budgeted \$ _____
 - d. Completions (\$ _____)
 - e. Ending Balance \$ _____
3. No-Charge-Transfers from Other DOE Offices or Contractors \$ _____
4. No-Charge-Transfers from Other Federal Agencies \$ _____
5. Other (Explain) \$ _____
6. Total Acquisitions \$ _____

Dispositions from Column (7) Above

7. Sales (Salvage Credit of \$ _____) \$ _____
8. Trade-ins (Salvage Credit of \$ _____) \$ _____
9. No-Charge-Transfers to Other DOE Offices or Contractors \$ _____
10. No-Charge-Transfers to Other Federal Agencies \$ _____
11. Other (Explain) \$ _____
12. Total Dispositions \$ _____

Note: Detail lines 1 through 12 above in accordance with the following columnar headings. Attach extra sheets if necessary.

[illegible]

General Instructions

This report provides DOE with financial data on Government-furnished or contractor-acquired property in which title is vested with the government and facilitates the reporting of changes to property accounts, and the reconciliation of physical inventories to property accounts. Preparation of the report requires a breakdown of the total number of items and total dollar value by asset type code (columns 1 through 9 of the form). Please note the requirement for the name, title, telephone number and signature of the person responsible for the preparation of the report. Dollar amounts shown shall be rounded to the nearest dollar. The report is designed to account for all DOE-owned P&CE purchased by or furnished to your organization under DOE contracts awarded to your organization.

This report will be completed as of February 28 and August 31 of each year, and as of the final date of the contract. These completion dates apply only to this report. The reports will be submitted to the property administrator, and are due not later than 45 days after the end of the reporting period.

The original and two copies of this report should be sent to the property administrator, who in turn will provide copies to the contracting officer and to the servicing financial organization.

Negative reports are required.

Plant and Capital Equipment Definition

Plant and Capital Equipment includes land, land rights, depletable resources, improvements to land, buildings and structures, utilities, and equipment. The reporting criteria are as follows:

Plant - Real property which includes land, buildings, related personal property, and other structures and facilities (Asset Codes 401 through 699 and 800). General Services Administration (GSA) regulations require the reporting of this property regardless of value.

Capital Equipment - Personal property items (Asset Codes 710 through 799) with a unit acquisition cost of \$5,000 or more, and a service life of two years or more per unit should be reported.

Generally, DOE Appropriation Acts differentiate between costs budgeted for plant and capital equipment and costs budgeted for operating expenses. Items meeting the P&CE criteria should be budgeted as such and reported on line 1a. Capital items purchased from operating funds should be reported on line 1b.

Instructions - Summary of Acquisitions and Dispositions by Type of Transactions

Acquisition

1. Purchases - The cost of equipment acquired by purchase includes net invoice cost less discount, plus transportation charges and installation costs.

The cost of land and land rights includes the purchase price, other acquisition costs, and net costs of demolition of facilities acquired with the land.

The cost of completed facilities purchased from non-Government sources includes the purchase price, other cost incident to the purchase, and the net cost incident to the purchase, and the net cost of converting the facilities to make them useful to DOE.

Equipment acquired by lease may qualify as DOE-owned plant and capital equipment. Contact the DOE Contracting Officer for specific reporting guidance on all equipment acquired by lease.

The cost of facilities constructed under contract includes all payments made to the construction contractor, the cost of items furnished by DOE and the payments made for architect-engineering contractor's services related to the construction work if not otherwise provided by DOE, the operating contractor, or the construction contractor.

2. Fabrications - Include equipment items fabricated by your shop, scientific personnel or subcontractors. Fabrications costed with Capital Equipment obligations (Program 35) that are incomplete should be identified separately from completed fabrications. Costs incurred for fabrication projects that are in progress at the end of the reporting period should be reported on lines 2b and 2c. For projects completed during a reporting period, the total project cost should be reported on line 2d.
3. No-Charge-Transfers from Other DOE Offices or Contractors - Record transferred P&CE at the original acquisition cost. All costs of normal packing, handling, etc., and any costs of removal, including dismantling of items transferred, shall be borne by the transferor. All costs of transportation shall be borne by the transferee. Where purchasing and warehousing activities are centralized with one DOE contractor at a given location to provide routinely for the needs of other DOE contractors at that location, a pro rata share of the cost of such activities shall be borne by the transferee. Under no circumstances will such costs be recorded by the transferee in an inventory account, nor will such costs be transferred for incidental transactions with a DOE contractor at another location.
4. No-Charge-Transfers from Other Federal Agencies - such transfers are treated in the same manner as transfers from another DOE organization as in 3 above.
5. Other - Include a brief explanation of the transaction such as physical inventory adjustments or any other additions not included in items 1 through 4 above.
6. Total Acquisitions - Total of lines 1 through 5.

Dispositions

7. Sales - Includes P&CE sold as scrap or as a reuseable item. Cash collections from the sale of P&CE shall be handled as reductions to contractor's immediate cash requirements, and are to be credited to the operating activity or as salvage credits if credited to the P&CE budget activity. When the sale is to be made by the General Services Administration (GSA), no entries shall be made until the sale has been completed.
8. Trade-Ins - Includes P&CE traded-in for purchased P&CE which were included on line 1, Purchases.
9. No-Charge-Transfers to Other DOE Offices or Contractors - Remove transferred P&CE at the original acquisition cost. See line 3, No-Charge-Transfers from Other DOE Offices or Contractors for transfer or responsibilities.
10. No-Charge-Transfers to Other Federal Agencies - Such transfers are treated in the same manner as transfers to another DOE organization as in 9 above.
11. Other - Include a brief explanation of the transaction such as extraordinary obsolescence, physical inventory adjustment, transfer of title, etc., not included in 7 through 10 above. If property was lost, damaged or destroyed, give date relief of accountability was granted.
12. Total Dispositions - Total of lines 7 through 11.

Additional instructions for the management of Government property in the possession of offsite contractors are in FAR 45.5 and DEAR 945.5. Contracts issued prior to April 1, 1984, will continue to reference DOE-PMR 109-60.

OMB Burden Disclosure Statement

Public reporting burden for this collection of information is estimated to average 3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, Records Management Division, HR-422 - GTN, Paperwork Reduction Project (1910-0500), U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget (OMB), Paperwork Reduction Project (1910-0500), Washington, DC 20503.

STANDARD FORM 120# REV. APRIL 1957 GEN. SERV. ADMIN. FPMR (41 CFR) 101-43.311		REPORT OF EXCESS PERSONAL PROPERTY		1. REPORT NO.		2. DATE MAILED		3. TOTAL COST	
4. TYPE OF REPORT		(Check one only of "a," "b," "c," or "d.") ☐ a. ORIGINAL ☐ b. CORRECTED		☐ c. PARTIAL W/D ☐ d. TOTAL W/D		(Also check "e" and/or "f" if appropriate) ☐ e. OVERSEAS ☐ f. CONTRACTORS INV			
5. TO (Name and Address of Agency to which report is made) THRU						6. APPROP. OR FUND TO BE REIMBURSED (if any)			
7. FROM (Name and Address of reporting agency)						8. REPORT APPROVED BY (Name and Title)			
9. FOR FURTHER INFORMATION, CONTACT (Title, Address and Telephone No.)						10. AGENCY APPROVAL (if applicable)			
11. SEND PURCHASE ORDERS OR DISPOSAL INSTRUCTIONS TO (Title, Address and Telephone No.)						12. GSA CONTROL NO.			
13. FSC GROUP NO.		14. LOCATION OF PROPERTY (if location is to be abandoned, give)		15. REIM/REQD ☐ YES ☐ NO		16. AGENCY CONTROL NO.		17. SURPLUS RELEASE DATE	
18. EXCESS PROPERTY LIST									
ITEM NO. (a)	DESCRIPTION (b)	COND. (c)	UNIT (d)	NUMBER OF UNITS (e)	ACQUISITION COST		FAIR VALUE % (h)		
					PER UNIT (f)	TOTAL (g)			

INVENTORY SCHEDULE B (See FAR Section 45.606 for instructions)		TYPE	TYPE OF CONTRACT		DATE	OMB No.: 9000-0015 Expires: 05/31/98
☐ PARTIAL	☐ FINAL	☐ TERMINATION	☐ NONTERMINATION			

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVR), Federal Acquisition Policy Division, GSA, Washington, DC 20405.

TYPE OF INVENTORY		PROPERTY CLASSIFICATION		PAGE NO.	NO. OF PAGES
☐ RAW MATERIALS (Other than metals)	☐ PURCHASED PARTS	☐ FINISHED COMPONENTS			
☐ FINISHED PRODUCT	☐ PLANT EQUIPMENT	☐ MISCELLANEOUS			
THIS SCHEDULE APPLIES TO (Check one)					
☐ A PRIME CONTRACT WITH THE GOVERNMENT		☐ SUBCONTRACT OR PURCHASE ORDER			
GOVERNMENT PRIME CONTRACT NO.		SUBCONTRACT OR P.O. NO.	REFERENCE NO.		

CONTRACTOR WHO SENT NOTICE OF TERMINATION	
NAME	
ADDRESS (Include ZIP Code)	
PRODUCT COVERED BY CONTRACT OR ORDER	

FOR USE OF CONTRACTING AGENCY ONLY	ITEM NO. (a)	DESCRIPTION		QUANTITY (d)	UNIT OF MEASURE (d1)	COST (For finished product show contract price instead of cost)		CONTRACTOR'S OFFER (g)	FOR USE OF CONTRACTING AGENCY ONLY
		ITEM DESCRIPTION (b)	GOVERNMENT PART OR DRAWING NUMBER AND REVISION NUMBER (b1)			UNIT (e)	TOTAL (f)		

INVENTORY SCHEDULE

This inventory Schedule has been examined, and in the exercise of the signer's best judgment and to the best of the signer's knowledge, based upon information believed by the signer to be reliable, said Schedule has been prepared in accordance with applicable instructions; the inventory described is allocable to the designated contract and is located at the places specified; if the property reported is termination inventory, the quantities are not in excess of the reasonable quantitative requirements of the terminated portion of the contract; this Schedule does not include any items reasonably usable, without loss to the Contractor, on its other work; and the costs shown on this Schedule are in accordance with the Contractor's records and books of account.

The Contractor agrees to inform the Contracting Officer of any substantial change in the status of the inventory shown in this Schedule between the date hereof and the final disposition of such inventory.

Subject to any authorized prior disposition, title to the inventory listed in this Schedule is hereby tendered to the Government and is warranted to be free and clear of all liens and encumbrances.

NAME OF CONTRACTOR	BY (Signature of Authorized Official)	TITLE	DATE
NAME OF SUPERVISORY ACCOUNTING OFFICIAL		TITLE	

APPENDIX L

Vortec Corporation

Selected Operational Forms

Vortec Corporation
Selected Operational Forms

Prepared by: R.K. Hnat
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	5/1/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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APPENDIX L-1

Vortec Corporation

Hazardous Materials Trainee Qualification Record

HAZARDOUS MATERIALS TRAINEE QUALIFICATION RECORD

NAME: _____

SIGNATURE: _____

EMPLOYMENT START DATE: _____

SOCIAL SECURITY NUMBER: _____

THIS COMPLETED RECORD INDICATES THE ABOVE-NAMED INDIVIDUAL HAS RECEIVED THE INITIAL TRAINING TO ALLOW HIM/HER TO ASSUME THE DUTIES OF HIS/HER JOB POSITION.

A. The above-named individual received the following safety equipment training.

	Employee's Initials	Date
1. Respirator (fit test satisfactorily completed)	_____	_____
2. Safety Glasses	_____	_____
3. Hard Hat	_____	_____
4. Work Uniform	_____	_____
5. Shoes	_____	_____
6. Contingency Plan Overview	_____	_____
7. Other (specify)	_____	_____

B. The above-named individual attended the 3-day (24-hour minimum) training and satisfactorily demonstrated an understanding of the subject material.

Employee's Initials _____

Instructor's Initials _____

Date _____

	Employee's Initials	Instructor's Initials	Date
1. Respirator Fit Test			
2. Respirator Training			
3. Basic Facility Safety Requirements			
4. Facility Tour-Explanation of Operations			
5. Contingency Plan Location and use of:			
a. Emergency Communication Equipment			
b. Various contingencies (i.e., fire, spill, gas release) and the appropriate response to each.			
c. Agreements with off-site response agencies			
6. Location and Use of SCBA			
7. General Overview of Permit			
8. Fire Extinguisher - Locations/Use/Limitations			
9. Location and Use of Emergency Eyewash/Shower			
10. General Overview of EPA/DOT Markings & Labeling			
11. Hazard Communication			
12. Personal Protective Equipment- Locations/Uses/Limitations			
13. Medical Surveillance Requirements			
14. Decontamination Procedures			
15. Rad Worker I & II			
16. Waste Analysis Plan Overview			
17. Other			

INSTRUCTOR'S NAME: _____

INSTRUCTOR'S SIGNATURE: _____

C. If the above-named individual is an equipment operator, he/she has received on-the-job training regarding the operations of heavy equipment. The individual has satisfactorily demonstrated his/her knowledge regarding the safe operations of the following heavy equipment applicable to his/her job as noted by the appropriate supervisor, and is qualified to operate the equipment indicated by the Supervisor's initials.

	Supervisor's Initials	Date
1. Grader	_____	_____
2. Compactor	_____	_____
3. Front-End Loader	_____	_____
4. Forklift	_____	_____
5. Primary Shredder	_____	_____
6. Secondary Shredder	_____	_____
7. Skip Hoist	_____	_____
8. Conditioned Material Discharge Area	_____	_____
9. ST-90 Handling	_____	_____
10. Drum Handling	_____	_____
11. PCB Requirements	_____	_____
12. Electrical Safety General	_____	_____
13. Confined Space	_____	_____
14. Lifting	_____	_____
15. Hot Work Permit	_____	_____
16. Lock-Out/Tag-Out	_____	_____
17. Basic Chemistry	_____	_____

SUPERVISOR'S NAME: _____

SUPERVISOR'S SIGNATURE: _____

APPENDIX L-2

Vortec Corporation

Visitor/Contractor On-Site Authorization Record

VISITOR/CONTRACTOR ON-SITE AUTHORIZATION RECORD

[illegible]

APPENDIX L-3

Vortec Corporation

Safety Meeting Record

SAFETY MEETING RECORD

Safety Meeting Attendance Sheet

Date: ____/____/____

Subject: _____

Instructor: _____

	Printed Name	Signature	Company	Badge or SS#
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____

Continuation Sheet
Page ____ of ____

APPENDIX L-4

Vortec Corporation

Hazardous Materials Worker Qualification Record

HAZARDOUS MATERIALS WORKER QUALIFICATION RECORD

NAME: _____

EMPLOYMENT START DATE: _____

SOCIAL SECURITY NUMBER: _____

A. The above-named individual has attended the following safety training meetings and has satisfactorily demonstrated an understanding of the subject material.

Subject		Lesson Plan Code (If Applicable)	Instructor's Initials	Date
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Subject		Lesson Plan Code (If Applicable)	Instructor's Initials	Date
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				
37.				

Subject		Lesson Plan Code (If Applicable)	Instructor's Initials	Date
38.				
39.				
40.				
41.				
42.				
43.				
44.				
45.				
46.				
47.				
48.				
49.				
50.				
51.				
52.				

B. The above-named individual has satisfactorily demonstrated his/her ability to safely operate, inspect and maintain the following heavy equipment as noted.

Supervisor's Initials	Date	
1. Grader	_____	_____
2. Compactor	_____	_____
3. Front-End loader	_____	_____
4. Shredder	_____	_____
5. Scraper	_____	_____
6. Backhoe	_____	_____
7. Yard Tractor	_____	_____
8. Forklift	_____	_____
9. Crane	_____	_____
10. Tractor/ Trailer	_____	_____
11. Other (Specify)	_____	_____

APPENDIX L-5

Vortec Corporation

Chain-of-Custody Record

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APPENDIX L-6

Vortec Corporation

**Laboratory Potential Analytical Methods
for a Contracted Laboratory**

INTRODUCTION

Analytical laboratories perform a wide variety of chemical services. To support the demonstration project, it will be the laboratory's (which ever one is contracted for the project) responsibility to perform analyses on a wide variety of waste samples using the most applicable approved analytical methods (i.e. EPA, NIOSH, ASTM, DOE, Standard Methods etc.) available.

The following table lists some potential analytical methods that may be required of the contract laboratory. The list is arranged alphabetically according to the desired parameter. Other information supplied includes the associated regulatory method, if applicable, the sample matrix, and the anticipated reporting limits for that matrix. Additional services or analyses, which may be performed, may not be listed. Arrangements for performing an analysis or service not listed will be made by the DOE or its representative.

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
1,1-Dichloroethane	RCRA-8260	Water	5 µg/l
1,1-Dichloroethane	EPA-624	Water	5 µg/l
1,1-Dichloroethane	RCRA-8260	Soil	1 mg/kg
1,1-Dichloroethane	EPA-624	Water	5 µg/l
1,1-Dichloroethane	RCRA-8240	Water	5 µg/l
1,1-Dichloroethene	EPA-624	Water	5 µg/l
1,1-Dichloroethene	RCRA-8240	Water	5 µg/l
1,1-Dichloroethene	RCRA-8260	Water	5 µg/l
1,1-Dichloroethene	RCRA-8260	Soil	1 mg/kg
1,1-Dichloroethane	RCRA-8260	TCLP	0.07 mg/l
1,1-Dichloroethene	EPA-624	Water	5 µg/l
1,1-Dichloropropene	RCRA-8260	Soil	mg/kg
1,1-Dichloropropene	RCRA-8260	Water	5 µg/l
1,1,1-Trichloroethane	RCRA-8240	Water	5 µg/l
1,1,1-Trichloroethane	EPA-624	Water	5 µg/l
1,1,1-Trichloroethane	RCRA-8260	Soil	1 mg/kg
1,1,1-Trichloroethane	EPA-624	Water	5 µg/l
1,1,1-Trichloroethane	RCRA-8260	Water	5 µg/l
1,1,1,2-Tetrachloroethane	RCRA-8260	Soil	1 mg/kg
1,1,1,2-Tetrachloroethane	RCRA-8260	Water	5 µg/l
1,1,2-Trichloroethane	EPA-624	Water	5 µg/l
1,1,2-Trichloroethane	RCRA-8260	Soil	1 mg/kg
1,1,2-Trichloroethane	EPA-624	Water	5 µg/l
1,1,2-Trichloroethane	RCRA-8240	Water	5 µg/l
1,1,2-Trichloroethane	RCRA-8260	Water	5 µg/l
1,1,2,2-Tetrachloroethane	EPA-624	Water	5 µg/l
1,1,2,2-Tetrachloroethane	RCRA-8260	Water	5 µg/l
1,1,2,2-Tetrachloroethane	EPA-624	Water	5 µg/l
1,1,2,2-Tetrachloroethane	RCRA-8240	Water	5 µg/l
1,1,2,2-Tetrachloroethane	RCRA-8260	Soil	1 mg/kg
1,2-Dichloroethene,trans-	RCRA-8240	Water	5 µg/l
1,2-Dichloroethene,trans-	EPA-624	Water	5 µg/l
1,2-Dichloroethene,trans-	RCRA-8260	Soil	1 mg/kg

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
1,2-Dichloroethene,trans-	EPA-624	Water	5 µg/l
1,2-Dichloroethene,trans-	RCRA-8260	Water	5 µg/l
1,2-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l
1,2-Dichlorobenzene	RCRA-8260	Water	5 µg/l
1,2-Dichlorobenzene	RCRA-8270	Water	50 µg/l
1,2-Dichlorobenzene	RCRA-8260	Soil	1 mg/kg
1,2-Dichlorobenzene	EPA-624	Water	5 µg/l
1,2-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l
1,2-Dichloroethane	RCRA-8260	Soil	1 mg/kg
1,2-Dichloroethane	NIOSH-1003	Air	0.10 mg/l
1,2-Dichloroethane	RCRA-8260	TCLP	0.05 mg/l
1,2-Dichloroethane	EPA-624	Water	1 µg/l
1,2-Dichloroethane	EPA-624	Water	1 µg/l
1,2-Dichloroethane	RCRA-8260	Water	1 µg/l
1,2-Dichloroethane	RCRA-8240	Water	1 µg/l
1,2-Dichloroethene,cis-	RCRA-8260	Water	5 µg/l
1,2-Dichloroethene,cis-	RCRA-8260	Soil	1 mg/kg
1,2-Dichloropropane	RCRA-8260	Water	5 µg/l
1,2-Dichloropropane	EPA-624	Water	5 µg/l
1,2-Dichloropropane	RCRA-8240	Water	5 µg/l
1,2-Dichloropropane	EPA-624	Water	5 µg/l
1,2-Dichloropropane	RCRA-8260	Soil	1 mg/kg
1,2,3-Trichlorobenzene	RCRA-8260	Water	5 µg/l
1,2,3-Trichlorobenzene	RCRA-8260	Soil	1 mg/kg
1,2,3-Trichloropropane	RCRA-8260	Water	5 µg/l
1,2,3-Trichloropropane	RCRA-8260	Soil	1 mg/kg
1,2,4-Trichlorobenzene	RCRA-8260	Soil	1 mg/kg
1,2,4-Trichlorobenzene	RCRA-8260	Water	5 µg/l
1,2,4-Trichlorobenzene	RCRA-8270	Water	50 µg/l
1,2,4-Trimethylbenzene	RCRA-8260	Soil	1 mg/kg
1,2,4-Trimethylbenzene	RCRA-8260	Water	5 µg/l
1,3-Dichloropropene,trans-	RCRA-8240	Water	5 µg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
1,3-Dichloropropene,cis-	EPA-624	Water	5 µg/l
1,3-Dichloropropene,cis-	RCRA-8240	Water	5 µg/l
1,3-Dichloropropene,cis-	EPA-624	Water	5 µg/l
1,3-Dichloropropene,cis-	RCRA-8260	Water	5 µg/l
1,3-Dichloropropene,cis-	RCRA-8260	Soil	1 mg/kg
1,3-Dichloropropene,trans-	EPA-624	Water	5 µg/l
1,3-Dichloropropene,trans-	EPA-624	Water	5 µg/l
1,3-Dichloropropene,trans-	RCRA-8260	Soil	1 mg/kg
1,3-Dichloropropene,trans-	RCRA-8260	Water	5 µg/l
1,3-Dichlorobenzene	RCRA-8260	Soil	1 mg/kg
1,3-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l
1,3-Dichlorobenzene	RCRA-8270	Water	50 µg/l
1,3-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l
1,3-Dichlorobenzene	EPA-624	Water	5 µg/l
1,3-Dichlorobenzene	RCRA-8260	Water	5 µg/l
1,3-Dichloropropane	RCRA-8260	Soil	1 mg/kg
1,3-Dichloropropane	RCRA-8260	Water	5 µg/l
1,3,5-Trimethylbenzene	RCRA-8260	Water	5 µg/l
1,3,5-Trimethylbenzene	RCRA-8260	Soil	1 mg/kg
1,4-Dichloro-2-butene,cis-	RCRA-8260	Soil	1 mg/kg
1,4-Dichloro-2-butene,cis-	RCRA-8260	Water	5 µg/l
1,4-Dichlorobenzene	RCRA-8260	Soil	1 mg/kg
1,4-Dichlorobenzene	EPA-624	Water	5 µg/l
1,4-Dichlorobenzene	RCRA-8260	Water	5 µg/l
1,4-Dichlorobenzene	RCRA-8270	Water	50 µg/l
1,4-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l
1,4-Dichlorobenzene	RCRA-8270	TCLP	50 µg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
2-Chloroethoxy methane, bis-	RCRA-8270	Water	50 µg/l
2-Chloroethylether, bis-	RCRA-8270	Water	50 µg/l
2-Chloroisopropylether, bis-	RCRA-8270	Water	50 µg/l
2-Chloronaphthalene	RCRA-8270	Water	50 µg/l
2-Chlorophenol	RCRA-8270	Water	50 µg/l
2-Chlorotoluene	RCRA-8260	Soil	1 mg/kg
2-Chlorotoluene	RCRA-8260	Water	5 µg/l
2-Ethylhexylphthalate, bis	RCRA-8270	Water	50 µg/l
2-Hexanone	RCRA-8260	Water	5 µg/l
2-Hexanone	RCRA-8260	Soil	1 mg/kg
2-Methylnaphthalene	RCRA-8270	Water	50 µg/l
2,2-Dichloropropane	RCRA-8260	Soil	1 mg/kg
2,2-Dichloropropane	RCRA-8260	Water	5 µg/l
2,4-Dichlorophenol	RCRA-8270	Water	50 µg/l
2,4-Dimethylphenol	RCRA-8270	Water	50 µg/l
2,4-Dinitrophenol	RCRA-8270	Water	50 µg/l
2,4-Dinitrotoluene	RCRA-8270	Water	50 µg/l
2,4-Dinitrotoluene	RCRA-8270	TCLP	50 µg/l
2,4-Dinitrotoluene	RCRA-8270	TCLP	50 µg/l
2,4,5-Trichlorophenol	RCRA-8270	TCLP	50 µg/l
2,4,5-Trichlorophenol	RCRA-8270	Water	50 µg/l
2,4,5-Trichlorophenol	RCRA-8270	TCLP	50 µg/l
2,4,6-Trichlorophenol	RCRA-8270	TCLP	50 µg/l
2,4,6-Trichlorophenol	RCRA-8270	Water	50 µg/l
2,4,6-Trichlorophenol	RCRA-8270	TCLP	50 µg/l
2,6-Dinitrotoluene	RCRA-8270	Water	50 µg/l
4-Bromophenyl phenyl ether	RCRA-8270	Water	50 µg/l
4-Chlorophenyl phenyl ether	RCRA-8270	Water	50 µg/l
4-Chlorotoluene	RCRA-8260	Water	5 µg/l
4-Chlorotoluene	RCRA-8260	Soil	1 mg/kg

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
4-Methyl-2-pentanone	RCRA-8260	Soil	1 mg/kg
4-Methyl-2-pentanone	RCRA-8260	Water	5 µg/l
4-Nitrophenol	RCRA-8270	Water	50 µg/l
4,6-Dinitro-o-cresol	RCRA-8270	Water	50 µg/l
Acenaphthene	RCRA-8270	Water	50 µg/l
Acenaphthylene	RCRA-8270	Water	50 µg/l
Acetone	RCRA-8260	Water	1000 µg/l
Acetone	RCRA-8260	Soil	1000 mg/kg
Acetone	RCRA-3810	Water	1000 µg/l
Alkalinity	EPA-310.1	Water	5 mg/l as CaCO ₃
Aluminum	EPA-200.7	Surface Waters	0.10 mg/l
Aluminum	RCRA-6010	Solids	<6 mg/kg
Aluminum	NIOSH-7300	Air	1 µg/filter
Aluminum	RCRA-6010	Water	0.10 mg/l
Americium -241	—	Water	<3 pCi/l
Americium -241	—	Solids	<0.5 pCi/g
Ammonia Nitrogen	EPA-350.3	Water	0.2 mg/l
Anthracene	RCRA-8270	Water	50 µg/l
Antimony	EPA-200.7	Surface Waters	0.06 mg/l
Antimony	NIOSH-7300	Air	2 µg/filter
Antimony	RCRA-6010	Water	0.06 mg/l
Antimony	RCRA-6010	TCLP	<0.5 mg/l
Arsenic	RCRA-7060	Ground Waters	0.005 mg/l
Arsenic	NIOSH-7901	Air	0.13 µg/filter
Arsenic	RCRA-7060	TCLP	<0.5 mg/l
Arsenic	EPA-206.2	Surface Waters	0.005 mg/l
Arsenic	RCRA-7060	Solids	<0.5 mg/kg
Asbestos ID	NIOSH-9002	Bulk	1%
Asbestos	NIOSH-7400	Air	0 fibers/field
Barium	RCRA-6010	TCLP	<10 mg/l
Barium	RCRA-6010	RCRA Solids	<10 mg/kg
Barium	RCRA-6010	Solids	<0.04 mg/kg
Barium	EPA-200.7	Surface Waters	0.005 mg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Benzene	RCRA-8240	Water	5 µg/l
Benzene	RCRA-8260	TCLP	0.05 mg/l
Benzene	RCRA-8260	Soil	1 mg/kg
Benzene	RCRA-8260	Water	5 µg/l
Benzene	EPA-624	Water	5 µg/l
Benzene	NIOSH-1501	Air	0.09 mg/ml
Benzene	EPA-624	Water	5 µg/l
Benzo(a)anthracene	RCRA-8270	Water	50 µg/l
Benzo(a)fluoranthene	RCRA-8270	Water	50 µg/l
Benzo(a)pyrene	RCRA-8270	Water	50 µg/l
Benzo(g,h,i)perylene	RCRA-8270	Water	50 µg/l
Benzo(k)fluoranthene	RCRA-8270	Water	50 µg/l
Beryllium	EPA-200.7	Surface Waters	0.005 mg/l
Beryllium	NIOSH-7300	Air	0.03 µg/filter
Beryllium	RCRA-6010	Solids	<0.1 mg/kg
Betz 2020	Turbidimetric	Water	NA
Biological Oxygen Demand, (BOD ₅)	Standard Method 507	Water	5 mg/l
Bismuth	NIOSH-7300	Air	2 µg/filter
Bromide	EPA-300.0	Water	1 mg/l
Bromobenzene	RCRA-8260	Soil	1 mg/kg
Bromobenzene	RCRA-8260	Water	5 µg/l
Bromodichloromethane	EPA-624	Water	5 µg/l
Bromodichloromethane	EPA-624	Water	5 µg/l
Bromodichloromethane	RCRA-8260	Soil	1 mg/kg
Bromodichloromethane	RCRA-8260	Water	5 µg/l
Bromodichloromethane	RCRA-8240	Water	5 µg/l
Bromoform	RCRA-8260	Soil	1 mg/kg
Bromoform	RCRA-8260	Water	5 µg/l
Bromoform	EPA-624	Water	5 µg/l
Bromoform	EPA-624	Water	5 µg/l
Bromoform	RCRA-8240	Water	5 µg/l
Butyl benzyl phthalate	RCRA-8270	Water	50 µg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Butylbenzene,n-	RCRA-8260	Soil	1 mg/kg
Butylbenzene,n-	RCRA-8260	Water	5 µg/l
Butylbenzene,sec-	RCRA-8260	Water	5 µg/l
Butylbenzene,sec-	RCRA-8260	Soil	1 mg/kg
Butylbenzene,tert-	RCRA-8260	Soil	1 mg/kg
Butylbenzene,tert-	RCRA-8260	Water	5 µg/l
Cadmium	RCRA-6010	TCLP	<0.1 mg/l
Cadmium	NIOSH-7300	Air	0.3 µg/filter
Cadmium	EPA-200.7	Surface Waters	0.01 mg/l
Cadmium	RCRA-6010	Solids	<0.6 mg/kg
Cadmium	RCRA-6010	RCRA Solids	<5.0 mg/kg
Calcium	EPA-200.7	Surface Waters	0.01 mg/l
Calcium	NIOSH-7300	Air	1 µg/filter
Calcium	RCRA-6010	Solids	<2.0 mg/kg
Carbazole, 9H	RCRA-8270	Water	50 µg/l
Carbon Tetrachloride	RCRA-8260	Water	5 µg/l
Carbon Disulfide	RCRA-8260	Water	5 µg/l
Carbon Tetrachloride	RCRA-8260	TCLP	0.05 mg/l
Carbon Tetrachloride	NIOSH-1003	Air	0.20 mg/ml
Carbon Disulfide	RCRA-8240	Water	5 µg/l
Carbon Tetrachloride	EPA-624	Water	5 µg/l
Carbon Tetrachloride	EPA-624	Water	5 µg/l
Carbon Tetrachloride	RCRA-8240	Water	5 µg/l
Carbon Tetrachloride	RCRA-8260	Soil	1 mg/kg
Carbon Disulfide	RCRA-8260	Soil	1 mg/kg
Cesium-137	—	Water	<3 pCi/l
Cesium-137	—	Solids	<0.5 pCi/g
Chemical Oxygen Demand, (COD)	HACH-8000	Water	5 mg/l
Chloride	EPA-300.0	Water	2 mg/l
Chlorine	EPA-325.3	Water	10 mg/l
Chlorine	EPA-325.3	Stack Samples	10 mg/l
Chloro-m-cresol,p-	RCRA-8270	Water	50 µg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Chlorobenzene	RCRA-8260	Soil	1 mg/kg
Chlorobenzene	RCRA-8260	TCLP	10 mg/l
Chlorobenzene	RCRA-8260	Water	5 µg/l
Chlorobenzene	EPA-624	Water	5 µg/l
Chlorobenzene	RCRA-8240	Water	5 µg/l
Chlorobenzene	EPA-624	Water	5 µg/l
Chloroform	RCRA-8240	Water	5 µg/l
Chloroform	RCRA-8260	Water	5 µg/l
Chloroform	RCRA-8260	TCLP	0.60 mg/l
Chloroform	EPA-624	Water	5 µg/l
Chloroform	RCRA-8260	Soil	1 m/g
Chloroform	EPA-624	Water	5 µg/l
Chromium	RCRA-6010	Solids	<5.0 mg/kg
Chromium	RCRA-6010	Solids	<0.4 mg/kg
Chromium	RCRA-6010	TCLP	<0.5 mg/l
Chrysene	RCRA-8270	Water	50 µg/l
Cobalt	RCRA-6010	Solids	<0.4 mg/kg
Cobalt-60	—	Solids	<0.5 pCi/g
Cobalt-60	—	Water	<3 pCi/g
Conductivity	EPA-120.1	Water	0.5 umhos/cm
Copper	NIOSH-7300	Air	0.3 µg/filter
Copper	RCRA-6010	Solids	<0.2 mg/kg
Copper	EPA-200.7	Surface Waters	0.01 mg/l
Cresol (Total)	RCRA-8270	Water	50 µg/l
Cresol (Total)	RCRA-8270	TCLP-1	50 µg/l
Cresol (Total)	RCRA-8270	TCLP-2	50 µg/l
Cresol, m- or p-	RCRA-8270	TCLP-2	50 µg/l
Cresol, m- or p-	RCRA-8270	TCLP-1	50 µg/l
Cresol, m- or p-	RCRA-8270	Water	50 µg/l
Cresol, o-	RCRA-8270	TCLP-1	50 µg/l
Cresol, o-	RCRA-8270	TCLP-2	50 µg/l
Cresol, o-	RCRA-8270	Water	50 µg/l
Cyanide	EPA-335.2	Water	0.02 mg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Di-n-butyl phthalate	RCRA-8270	Water	50 µg/l
Dibenz(a,h)anthracene	RCRA-8270	Water	50 µg/l
Dibenzofuran	RCRA-8270	Water	50 µg/l
Dibromochloromethane	RCRA-8260	Soil	1 mg/kg
Dibromochloromethane	RCRA-8260	Water	5 µg/l
Dibromochloromethane	RCRA-8240	Water	5 µg/l
Dibromochloromethane	EPA-624	Water	5 µg/l
Dibromochloromethane	EPA-624	Water	5 µg/l
Dibromomethane	RCRA-8260	Water	5 µg/l
Dibromomethane	RCRA-8260	Soil	1 mg/kg
Diethyl phthalate	RCRA-8270	Water	50 µg/l
Dimethyl phthalate	RCRA-8270	Water	50 µg/l
Dioxane, p-	NIOSH-1602	Air	0.2 mg/ml
Dis, Alpha	EPA-900.0	Water	<1 pCi/l
Dis, Beta	EPA-900.0	Water	<4 pCi/l
Ethylbenzene	RCRA-8260	Water	5 µg/l
Ethylbenzene	RCRA-8240	Water	5 µg/l
Ethylbenzene	EPA-624	Water	5 µg/l
Ethylbenzene	RCRA-8260	Soil	1 mg/kg
Flame Test	SW-846 7.1,7.3	Solid	NA
Fluoranthene	RCRA-8270	Water	50 µg/l
Fluorene	RCRA-8270	Water	50 µg/l
Fluoride	Distillation, SIE	Water	Sample Size Dependent
Fluoride	Distillation, SIE	Solids	Sample Size Dependent
Fluoride	EPA-340.2	Stack Samples	0.1 mg/l
Fluoride	EPA-340.2	Water	0.1 mg/l
Freon R-114	—	Water	5 µg/l
Grease, Oil	EPA413.1	Water	5 mg/l
Gross Alpha	—	Air	3 dpm/filter
Gross Alpha	EPA-900.0	Aqueous Water	<1 pCi/l
Gross Beta	EPA-900-0	Aqueous Water	<4 pCi/l
Gross Beta	—	Air	5 dpm/filter

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Hardness (Total)	Volumetric	Water	5 mg/l as CaCO ₃ -
Hexachlorobutadiene	RCRA-8270	TCLP-2	50 µg/l
Hexachlorobutadiene	RCRA-8270	Water	50 µg/l
Hexachlorobutadiene	RCRA-8270	TCLP-1	50 µg/l
Hexachlorobutadiene	RCRA-8260	Soil	1 mg/kg
Hexachlorobutadiene	RCRA-8260	Water	5 µg/l
Hexachloroethane	RCRA-8270	Water	50 µg/l
Hexane	NIOSH-1500	Air	3.56 mg/ml
Hexavalent Chromium	Standard Method 312B	Water	0.01 mg/l
Indeno(1,2,3-cd)pyrene	RCRA-8270	Water	50 µg/l
Iron	EPA-200.7	Surface Waters	0.01 mg/l
Iron	NIOSH-7300	Air	2 µg/filter
Iron	RCRA-6010	Solids	<1.0 mg/kg
Isopropanol	RCRA-3810	Water	1000 µg/l
Isopropylbenzene	RCRA-8260	Soil	1 mg/kg
Isopropylbenzene	RCRA-8260	Water	5 µg/l
Isopropyltoluene, p-	RCRA-8260	Soil	1 mg/kg
Isopropyltoluene, p-	RCRA-8260	Water	5 µg/l
Kjeldahl Nitrogen	EPA-351.3	Water	0.2 mg/l
Lead	EPA-200.7	Surface Waters	0.2 mg/l
Lead	RCRA-6010	Solids	<4.0 mg/kg
Lead	RCRA-6010	TCLP	<0.5 mg/l
Lead	NIOSH-7300	Air	5 µg/filter
Lithium	NIOSH-7300	Air	1 µg/filter
Magnesium	EPA-200.7	Surface Waters	0.002 mg/l
Magnesium	RCRA-6010	Solids	<0.1 mg/kg
Magnesium	NIOSH-7300	Air	1 µg/filter
Manganese	EPA-200.7	Surface Waters	0.005 mg/l
Manganese	RCRA-6010	Solids	<0.01 mg/kg
Manganese	NIOSH-7300	Air	1 µg/filter
Mercury	EPA-245.1	Surface Waters	0.0002 mg/l
Mercury	RCRA-7470	TCLP	<0.02 mg/kg

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Mercury	NIOSH-6009	Air	0.05 µg/filter
Mercury	RCRA-7470	Solids	<0.02 mg/kg
Methyl Ethyl Ketone	RCRA-8260	Water	10 µg/l
Methyl Ethyl Ketone	RCRA-8260	Soil	2 mg/kg
Methyl Ethyl Ketone	NIOSH-2500	Air	0.15 mg/ml
Methyl Isobutyl Ketone	NIOSH-1300	Air	0.6 mg/ml
Methyl Ethyl Ketone	RCRA-8260	TCLP	20 mg/l
Methyl Chloroform	NIOSH-1003	Air	0.60 mg/ml
Methylene Chloride	RCRA-8260	Water	5 µg/l
Methylene Chloride	EPA-624	Water	5 µg/l
Methylene Chloride	EPA-624	Water	5 µg/l
Methylene Chloride	NIOSH-1005	Air	0.30 mg/ml
Methylene Chloride	RCRA-8260	Soil	1 mg/kg
Methylene Chloride	RCRA-8240	Water	5 µg/l
Molybdenum	RCRA-6010	Solids	<1.6 mg/kg
Molybdenum	EPA-200.7	Surface Waters	0.05 mg/l
Molybdenum	NIOSH-7300	Air	2 µg/filter
Naphthalene	RCRA-8260	Water	5 µg/l
Naphthalene	RCRA-8270	Water	50 µg/l
Naphthalene	RCRA-8260	Soil	1 mg/kg
Neptunium-237	—	Water	<3 pCi/l
Neptunium-237	—	Solids	<0.5 pCi/l
Nickel	RCRA-6010	TCLP	<0.5 mg/l
Nickel	RCRA-6010	Solids	<0.8 mg/kg
Nickel	RCRA-6010	RCRA Solids	<5.0 mg/kg
Nickel	EPA-200.7	Surface Waters	0.05 mg/l
Nickel	NIOSH-7300	Air	2 µg/filter
Niobium	NIOSH-7300	Air	2 µg/filter
Nitrate/Nitrite	EPA-353.3	Water	0.01 mg/l
Nitrate-n	EPA-300.0	Water	1 mg/l
Nitrobenzene	RCRA-8270	Water	50 µg/l
Nitroso-di-n-propylamine,n	RCRA-8270	Water	50 µg/l
Nitrosodimethylamine, n-	RCRA-8270	Water	50 µg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Nitrosodiphenylamine, n-	RCRA-8270	Water	50 µg/l
Oxygen, o	—	Air	17%
Paint Filter Test	SW-846 9095	Sludge/Solids	NA
Polychlorinated biphenyl	EPA-608	Water	0.1 µg/l
Polychlorinated biphenyl	RCRA-8080	Oil	2.0 mg/kg
Polychlorinated biphenyl	RCRA-8080	Solids	0.1 mg/kg
Polychlorinated biphenyl	RCRA-8080	Water	0.1 µg/l
Polychlorinated biphenyl	RCRA-8080	Wipes	0.5 µg/wipe
Pentachlorophenol	RCRA-8270	TCLP	50 µg/l
Pentachlorophenol	RCRA-8270	Water	50 µg/l
pH	EPA-150.1	Water	NA
pH	SW-846 9040	Solid	NA
pH	SW-846 9045	Solid	NA
Phenanthrene	RCRA-8270	Water	50 µg/l
Phenol	RCRA-8270	Water	50 µg/l
Phenols	EPA-420.1	Water	0.005 mg/l
Phosphate-p	EPA-300.0	Water	1 mg/l
Phosphorous	NIOSH-7300	Air	10 µg/filter
Phosphorous	EPA-365.3	Water	0.05 mg/l
Potassium	EPA-200.7	Surface Waters	2.0 mg/l
Potassium	NIOSH-7300	Air	10 µg/filter
Potassium	RCRA-6010	Solids	<10.0 mg/kg
Potassium-40	—	Aqueous Water	<3 pCi/l
Potassium-40	—	Solids	<0.5 pCi/g
Propylbenzene, n-	RCRA-8260	Water	5 µg/kg
Propylbenzene, n-	RCRA-8260	Soil	1 mg/kg
Plutonium-239	—	Aqueous Water	<3 pCi/l
Plutonium-239	—	Solids	<0.5 pCi/g
Pyrene	RCRA-8270	Water	50 µg/l
Pyridine	RCRA-8270	TCLP-1	50 µg/l
Pyridine	RCRA-8270	Water	50 µg/l
Quad Uranium	Volumetric	Solids	Dependent on Sample Size

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Radium-226	—	Aqueous Water	<3 pCi/l
Radon-222	—	Aqueous Water	< 100 pCi/l
Releasable HS	SW-846 7.3.4.2	Waste	150 mg/kg
Releasable HCN	SW-846 7.3.3.2	Waste	10 mg/g
Selenium	RCRA-7740	Solids	<0.5 mg/kg
Selenium	RCRA-7740	TCLP	<0.5 mg/kg
Selenium	EPA-270.2	Surface Waters	0.005 mg/l
Selenium	RCRA-7740	Air	2 mg/filter
Semivolatiles	RCRA-8270	TCLP	—
Semivolatiles	RCRA-8270	Water	—
Silica	NIOSH-7300	Air	1 µg/filter
Silver	RCRA-6010	TCLP	<0.5 mg/kg
Silver	NIOSH-7300	Air	1 µg/filter
Sodium	NIOSH-7300	Air	3 µg/filter
Sodium	EPA-200.7	Surface Waters	0.04 mg./l
Sodium	RCRA-6010	Solids	<1.0 mg/kg
Solids (Total Suspended)	EPA-160.2	Water	4 mg/l
Solids (Total Dissolved)	EPA-160.1	Water	10 mg/l
Solids (Total)	EPA-160.3	Water	10 mg/l
Strontium	NIOSH-7300	Air	0.5 µg/filter
Styrene	RCRA-8260	Soil	1 mg/kg
Styrene	RCRA-8240	Water	5 µg/l
Styrene	RCRA-8260	Water	5 µg/l
Sulfate	EPA-300.0	Water	5 mg/l
Sulfide	EPA-376.1	Water	1 mg/l
Sulfite	EPA-377.1	Water	3 mg/l
Sus Alpha	EPA-900.0	Water	<1 pCi/l
Sus Beta	EPA-900.0	Water	<4 pCi/l
Tantalum	NIOSH-7300	Air	20 µg/filter
Technetium-99	—	Water	<25 pCi/l
Technetium-99	—	Solids	<17 pCi/g
TCLP Metals Extraction	SW-846 1311	Sludge/Solids	NA
TCLP Volatiles Extraction	SW-846 1311	Water	NA

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
TCLP Semivolatiles Extraction	SW-846 1311	Water	NA
TCLP Metals Extraction	SW-846 1311	Water	NA
TCLP Semivolatiles Extraction	SW-846 1311	Sludge/Solids	NA
TCLP Volatiles Extraction	SW-846 1311	Sludge/Solids	NA
Tetrachloroethene	EPA-624	Water	5 µg/l
Tetrachloroethene	NIOSH-1003	Air	0.40 mg/ml
Tetrachloroethene	RCRA-8260	Soil	1 mg/kg
Tetrachloroethene	RCRA-8260	TCLP	0.07 mg/l
Tetrachloroethene	EPA-624	Water	5 µg/l
Tetrachloroethene	RCRA-8260	Water	5 µg/l
Tetrachloroethene	RCRA-8240	Water	5 µg/l
Thorium-230	—	Water	<3 pCi/l
Thorium-230	—	Solids	<3 pCi/g
Thallium	NIOSH-7300	Air	10 µg/filter
Thallium	RCRA-6010	Solids	<2.0 mg/kg
Thallium	EPA-200.7	Surface Waters	0.01 mg/l
Thallium	RCRA-6010	TCLP	<0.5 mg/l
Thallium	RCRA-6010	RCRA Solids	<5.0 mg/kg
Ibrium	NIOSH-7300	Air	1 µg/filter
Tin	NIOSH-7300	Air	5 µg/filter
Titanium	NIOSH-7300	Air	1 µg/filter
Toluene	EPA-624	Water	5 µg/l
Toluene	RCRA-8260	Water	5 µg/l
Toluene	NIOSH-1501	Air	1.13 mg/ml
Toluene	RCRA-8240	Water	5 µg/l
Toluene	EPA-624	Water	5 µg/l
Toluene	RCRA-8260	Soil	1 mg/kg
Total Residual Chlorine	EPA-330.1	Water	0.01 mg/l
Total Organic Carbon (TOC)	EPA-415.1	Water	1 mg/l
TPH	EPA-418	Water	0.1 mg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Trichloroethene	RCRA-8260	Soil	1 mg/kg
Trichloroethene	EPA-624	Water	1 µg/l
Trichloroethene	EPA-624	Water	1 µg/l
Trichloroethene	RCRA-8260	Water	1 µg/l
Trichloroethene	NIOSH-1022	Air	0.50 mg/ml
Trichloroethene	RCRA-8240	Water	1 µg/l
Trichloroethene	RCRA-8260	TCLP	0.05 mg/l
Tungsten	NIOSH-7300	Air	10 µg/filter
Turbidity	EPA-180.1	Water	0.05 NTU
Uranium	Titrimetric	Impure Solids	Dependent on Sample Size
Uranium	Titrimetric	Liquids	Dependent on Sample Size
Uranium	Field Test	Water	200 µg/l
Uranium	—	Solids	<1.5 pCi/g
Uranium	—	Solids	<0.01 µg/ml
Uranium	NIOSH-7300	Air	50 µg/filter
Uranium	—	Aqueous Water	<1.5 pCi/l
Uranium	—	Solids	<1.5 pCi/l
Uranium	Field Test	Air	1 µg Total
Uranium	—	Liquids	<0.01 µg/ml
Uranium	Calorimetric	Safety Samples (Air)	0.5 ppm
Uranium-234	—	Solids	by weight 5%
Uranium-234	—	Liquids	by weight 0.5%
Uranium-235	—	Solids	by weight 0.5%
Uranium-235	—	liquids	by weight 0.5%
Uranium-236	—	Liquids	by weight 0.5%
Uranium-236	—	Solids	by weight 0.5%
Uranium-233	—	Solids	by weight 0.5%
Vanadium	RCRA-6010	Solids	<0.6 mg/kg
Vanadium	NIOSH-7300	Air	1 µg/filter
Vanadium	EPA-200.7	Surface Waters	0.05 mg/l

PARAMETER	METHOD	MATRIX	REPORTING LIMITS
Vinyl Chloride	RCRA-8260	Water	10 µg/l
Vinyl Chloride	RCRA-8260	TCLP	0.02 mg/l
Vinyl Chloride	RCRA-8260	Soil	2 mg/kg
Volatile Organics	RCRA-8260	TCLP	—
Volatile Organics	EPA-624	Water	—
Volatile Organics	EPA-624	Water	—
Volatile Organics	RCRA-8260	Water	—
Volatile Organics	RCRA-8260	Soil	—
Volatile Organics	RCRA-8240	Water	—
Water Absorption Test	SW-846 7.1,7.3	Solid	NA
Xylene (Total)	RCRA-8260	Water	10 µg/l
Xylene (Total)	RCRA-8260	Soil	2 mg/kg
Xylene (Total)	RCRA-8240	Water	10 µg/l
Xylene, o-	NIOSH-1501	Air	2.60 mg/ml
Zinc	RCRA-6010	Solids	<0.4 mg/kg
Zinc	EPA-200.7	Surface Waters	0.005 mg/l
Zinc	NIOSH-7300	Air	2 µg/filter
Zirconium	NIOSH-7300	Air	2 µg/filter
Flue Gas Sampling	EPA- Method 5	Stack Emissions	—
Volatile Organic Compounds	EPA- Method 18	Stack Emissions	—
Gas Velocity Stationary Source	EPA- Method 1	Stack Emissions	—
Gas Stack Velocity and Volume	EPA- Method 2	Stack Emissions	—
CO ₂ , O ₂ , Excess Air	EPA- Method 3	Stack Emissions	—
Moisture Content	EPA- Method 4	Stack Emissions	—
Oxides	—	Soil	—
Oxides	—	Glass	—
Product Consistency Test (PCT)	—	Glass (Frit)	—

Dashes indicate specific methods are lab-specific protocols.

APPENDIX L-7

Vortec Corporation

Examples of Potential Sampling Equipment

EXAMPLES OF POTENTIAL SAMPLING EQUIPMENT

LIQUIDS, SLURRIES (Not applicable to Ltd Demo Test)

Open Tube (Thief)

COLIWASA

Powered Pump

SLUDGES, SEDIMENTS

Open Tube

POWDERED OR GRANULAR SOLIDS

Sampling Trier

Trowel/Scoop/Spoon

SOIL

Trowel/Scoop/Spoon

Posthole Digger/Shovel/Pickax

APPENDIX L-8

Vortec Corporation

Waste Receipt Verification Form

APPENDIX L-9

Vortec Corporation

**Demonstration Lot Request Attachment:
Container Identification Form**

Demonstration Lot Request Form

Date: _____ Demonstration Lot Number _____

Please supply the following wastes for conditioning by _____
(Date)

	Waste Stream Identification Number	Number of Containers Requested	Container Number Provided (Site to Complete)
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____
9.	_____	_____	_____
10.	_____	_____	_____
11.	_____	_____	_____
12.	_____	_____	_____
13.	_____	_____	_____
14.	_____	_____	_____
15.	_____	_____	_____
16.	_____	_____	_____
17.	_____	_____	_____
18.	_____	_____	_____
19.	_____	_____	_____
20.	_____	_____	_____

Signature/Date: _____
(Vortec Receiving)Signature/Date: _____
(Vortec Site Manager)Signature/Date: _____
(DOE Site Representative)

Demonstration Lot Request Attachment: Container Identification Form

Date: _____

Waste Stream Number: _____ Page _____ of _____

Container Identification Numbers

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Individual Completing this form: _____ Date: _____

Checked by (Initials): _____ Date: _____

APPENDIX L-10

Vortec Corporation

**Waste Conditioning Technical Review Sheet
and Approval/Rejection Notification Form (sample)**

Vortec Waste Conditioning Technical Review Sheet and Approval/Rejection Notification

General Information

Waste stream (WS) Name: _____

Identification number: _____ List of container #s attached: yes no

Estimated waste stream quantity: _____ kgs, Est. weight per container: _____

Total Number of Containers: _____

Specify number of containers of different sizes: _____
(est. weight/each container size) _____

EPA Waste Codes: _____

Waste Characteristic Reviewed	Information sufficient (circle appropriate response)	Acceptable for Waste Conditioning (check box)	Unacceptable for Waste Conditioning (check box)	Additional comments
Physical Characteristics	Yes No			
Metal Concentration(s)	Yes No			
Organic content and Concentration(s)	Yes No			
Radiological contamination	Yes No			

This waste stream is approved for waste conditioning for the _____ Vortec waste conditioning demonstration:

Signature: _____ Date: ____/____/____
Title: _____

This waste stream is not approved for waste conditioning for the _____ Vortec waste conditioning demonstration:

Signature: _____ Date: ____/____/____
Title: _____

Reason for disapproval: _____

Site Manager review (or designee):

Signature: _____ Date: ____/____/____
Title: _____

APPENDIX L-11

Vortec Corporation

Generic Land Disposal Restriction Form

ATTACHMENT L11-1

TREATMENT STANDARDS FOR F001 - F005 SPENT SOLVENTS

GENERATOR: _____ EPA I.D. NO.: _____

WASTE STREAM NO.: _____

Check the appropriate box or boxes and circle the individual constituents which are likely to be present in the waste.

NON-WASTE WATER

Hazardous waste description	Constituents of Concern	Total Composition mg/kg	TCLP mg/kg	Waste Water, Total Composition mg/l
[] F001- Spent halogenated solvents used in degreasing	Carbon tetrachloride	5.6	---	0.057
	Methylene chloride	33	---	0.089
	Tetrachloroethylene	5.6	---	0.056
	1, 1, 1-trichloroethane	5.6	---	0.054
	Trichloroethylene	5.6	---	0.054
	1, 1, 2-trichloro- 1,2,2-trifluoroethane	28	---	0.057
	Trichloromonofluoromethane	33	---	0.02
[] F002 - Spent halogenated solvents	Chlorobenzene	5.7	---	0.057
	o-Dichlorobenzene	6.2	---	0.088
	Methylene chloride	33	---	0.089
	Methylene chloride (waste water from the pharmaceutical industry)	---	---	0.44
	Tetrachloroethylene	5.6	---	0.056
	1, 1, 1-trichloroethane	5.6	---	0.054
	1, 1, 2-trichloroethane	7.6	---	0.030
	Trichloroethylene	5.6	---	0.054
	1, 1,2-trichloro-1,2,2-trifluoroethane	28	---	0.057
	Trichloromonofluoromethane	33	---	0.02
[] F003 - Spent non-halogenated solvents	Acetone	160	---	0.28
	n-Butyl alcohol	2.6	---	5.6
	Cyclohexanone	---	0.75	0.36
	Ethyl acetate	33	---	0.34
	Ethyl benzene	6.0	---	0.057
	Ethyl ether	160	---	0.12
	Methanol	---	0.75	5.6
	Methyl isobutyl ketone	33	---	0.14
[] F004 - Spent non-halogenated solvents	Xylenes (total)	2.8	---	0.32
	Cresol (m- and p-isomers)	3.2	---	0.77
	o-Cresol	5.6	---	0.11
[] F005 - Spent non-halogenated solvents	Nitrobenzene	14	---	0.068
	Benzene	3.7	4.8	0.070
	Carbon disulfide	---		0.014
	2-ethoxyethanol	Incineration		Biological degradation or incineration
				5.6
	Isobutyl alcohol	170	---	0.28
	Methyl ethyl ketone	36	---	(wet oxidation or chemical oxidation)
	2-nitropropane	Incineration		followed by carbon adsorption; or incineration
				0.014
	Pyridine	16	---	0.08
	Toluene	28	---	

ATTACHMENT L11-2

TREATMENT STANDARDS FOR UNDERLYING HAZARDOUS CONSTITUENTS FOR D001, D002, D0012-D043
CHARACTERISTIC CODES AND F039 MULTI-SOURCE LEACHATEGENERATOR: _____ EPA I.D. NO.: _____
WASTE STREAM NO.: _____

Circle ALL hazardous constituents which are expected to be present.

Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)	Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)
Acetone	160	0.28	2-sec-Butyl-4,6-dinitrophenol	2.5	0.066
Accnaphthenc	3.4	0.059	Carbon tetrachloride	6.0	0.057
Acenaphthylene	3.4	0.059	Carbon disulfide	4.8 mg/l TCLP	3.8
Acetonitrile	1.8	5.6	Chlordane (alpha and gamma isomers)	0.26	0.0033
Acetophenone	9.7	0.010	p-Chloroaniline	16	0.46
2-acetyl amino-fluorene	140	0.059	Chlorobenzene	6.0	0.057
Acrolein	NA	0.29	Chlorobenzilate	NA	0.10
Acrylamide	23	19	2-chloro-1,3-butadiene	0.28	0.057
Acrylonitrile	84	0.24	Chlorodibromo-methane	15	0.057
Aldrin	0.066	0.021	Chloroethane	6.0	0.27
4-aminobiphenyl	NA	0.13	bis(2-chloroethoxy) methane	7.2	0.036
Aniline	14	0.81	bis-(2-chloroethyl) ether	6.0	0.033
Anthracene	3.4	0.059	Chloroform	6.0	0.046
Aramite	NA	0.36	bis(2-chloroisopropyl) ether	7.2	0.055
alpha-BHC	0.066	0.00014	p-chloro-m-cresol	14	0.018
beta-BHC	0.066	0.00014	2-chloroethyl vinyl ether	NA	0.062
delta-BHC	0.066	0.023	Chloromethane (Methyl Chloride)	NA	0.062
gamma-BHC	0.066	0.0017	2-Chloro-naphthalene	30	0.19
Benzene	10	0.14	2-chlorophenol	5.7	0.44
Benz (a)anthracene	3.4	0.059	3-chloropropylene	30	0.36
Benzal chloride	6.0	0.055	Chrysene	3.4	0.059
Benzo(b)fluoranthene	6.8	0.11	o-Cresol	5.6	0.11
Benzo(k)fluoranthene	6.8	0.11	m-Cresol	5.6	0.77
Benzo(g,h,i) perylene	1.8	0.0055	p-Cresol	5.6	0.77
Benzo(a)pyrene	3.4	0.061	Cyclohexanone	0.75 mg/l TCLP	0.36
Bromodichloromethane	15	0.35	1,2-dibromo-3-chloropropane	15	0.11
Bromomethane (methyl bromide)	15	0.11	Ethylene dibromide (1,2-dibromoethane)	15	0.028
4-bromophenyl phenyl ether	15	0.055	Dibromomethane	15	0.11
n-Butyl alcohol	2.6	5.6	2,4-D (2,4-dichlorophenoxy-acetic acid)	10	0.72
Butyl benzyl phthalate	28	0.017	o,p'-DDD	0.087	0.023

ATTACHMENT L11-2 (Continued)

TREATMENT STANDARDS FOR UNDERLYING HAZARDOUS CONSTITUENTS FOR D001, D002, D012-D043
CHARACTERISTIC CODES AND F039 MULTI-SOURCE LEACHATE

GENERATOR: _____ EPA I.D. NO.: _____
WASTE STREAM NO.: _____

Circle ALL hazardous constituents which are expected to be present.

Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)	Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)
p,p'-DDD	0.087	0.023	2,6-dinitrotoluene	28	0.55
o,p'-DDE	0.087	0.031	Di-n-octyl phthalate	28	0.017
p,p'-DDE	0.087	0.031	p-Dimethyl-aminobenzene	NA	0.13
o,p'-DDT	0.087	0.0039	Di-n-propyl-nitrosoamine	14	0.40
p,p'-DDT	0.087	0.0039	1,4-dioxane	170	NA
Dibenz(a,h)anthracene	8.2	0.055	Diphenylamine	13	0.92
Dibenzo(a,e)pyrene	NA	0.061	1,2-diphenyl hydrazine	NA	0.087
m-Dichlorobenzene	6.0	0.036	Diphenylnitrosamine	13	0.092
o-Dichlorobenzene	6.0	0.088	Disulfoton	6.2	0.017
p-Dichlorobenzene	6.0	0.090	Endosulfan I	0.066	0.023
Dichlorodifluoromethane	7.2	0.23	Endosulfan II	0.13	0.029
1,1-dichloroethane	6.0	0.059	Endosulfan sulfate	0.13	0.029
1,2-dichloroethane	6.0	0.21	Endrin	0.13	0.0028
1,1-dichloroethylene	6.0	0.025	Endrin aldehyde	0.13	0.025
trans-1,2-dichloroethylene	30	0.054	Ethyl acetate	33	0.34
2,4-dichlorophenol	14	0.044	Ethyl cyanide	360	0.24
2,6-dichlorophenol	14	0.044	Ethyl benzene	10	0.57
1,2-dichloropropane	18	0.85	Ethyl ether	160	0.12
cis-1,3-dichloropropene	18	0.036	bis(2-ethylhexyl) phthalate	28	0.28
trans-1,3-dichloropropene	18	0.036	Ethyl methacrylate	160	0.14
Dieldrin	0.13	0.017	Ethylene oxide	NA	0.12
Diethyl phthalate	28	0.20	Famphur	15	0.017
2,4-dimethyl phenol	14	0.036	Fluoranthene	3.4	0.068
Dimethyl phthalate	28	0.047	Fluorene	3.4	0.059
Di-n-butyl phthalate	28	0.057	Heptachlor	0.066	0.0012
1,4-dinitrobenzene	2.3	0.32	Heptachlor epoxide	0.066	0.016
4,6-dinitro-o-cresol	160	0.28	Hexachlorobenzene	10	0.055
2,4-dinitrophenol	160	0.12	Hexachlorobutadiene	5.6	0.055
2,4-dinitrotoluene	140	0.32	Hexachlorocyclopentadiene	2.4	0.057

ATTACHMENT L11-2 (Continued)

TREATMENT STANDARDS FOR UNDERLYING HAZARDOUS CONSTITUENTS FOR D001, D002, D012-D043
CHARACTERISTIC CODES AND F039 MULTI-SOURCE LEACHATE

GENERATOR: _____ EPA I.D. NO.: _____

WASTE STREAM NO.: _____

Circle ALL hazardous constituents which are expected to be present.

Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)	Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)
Hexachloro-dibenzo-furans	0.001	0.000063	p-Nitroaniline	28	0.028
Hexachlorodi-benzo-p-dioxins	0.001	0.000063	Nitrobenzene	14	0.068
Hexachloro-ethane	30	0.055	5-nitro-o-toluidine	28	0.32
Hexachloro-propene	30	0.035	o-Nitrophenol	13	0.028
Indeno(1,2,3-c,d)pyrene	3.4	0.0055	p-Nitrophenol	29	0.12
Iodomethane	65	0.19	N-Nitrosodi-ethylamine	28	0.40
Isobutanol	170	5.6	N-Nitrosodi-methylamine	2.3	0.40
Isodrin	0.066	0.021	N-Nitroso-di-n-butylamine	17	0.40
Isosafrole	2.6	0.081	N-Nitrosome-thylethylamine	2..3	0.40
Kepone	0.13	0.0011	N-Nitrosomor-pholine	2..3	0.40
Methacrylonitrile	84	0.24	N-Nitro-sopyrrolidine	35	0.013
Methanol	0.75 mg/l TCLP	5.6	N-Nitro-sopiperidine	35	0.013
Methapyrilene	1.5	0.081	Parathion	4.6	0.014
Methoxychlor	0.18	0.25	Total PCBs	10	0.10
3-methyl-cholanthrene	15	0.0055	Pentachloro-benzene	10	0.055
4,4-methylene-bis-(2-chloroaniline)	30	0.50	Pentachlorodi-benzo-p-dioxans	0.001	0.000063
Methylene chloride	30	0.089	Pentachlorodi-benzo-furans	0.001	0.000063
Methyl ethyl ketone	36	0.28	Pentachloro-ethane	6.0	0.055
Methyl isobutyl ketone	36	0.28	Pentachloro-nitrobenzene	4.8	0.055
Methyl methacrylate	160	0.14	Pentachloro-phenol	7.4	0.089
Methyl methan-sulfonate	NA	0.018	Phenacetin	16	0.081
Methyl parathion	4.6	0.014	Phenanthrene	5.6	0.059
Naphthalene	5.6	0.059	Phenol	6.2	0.039
2-naphthyl-amine	NA	0.52	Phorate	4.6	0.021
o-Nitrolaniline	14	0.27	Phthalic acid	28	0.055

ATTACHMENT L11-2 (Continued)

TREATMENT STANDARDS FOR UNDERLYING HAZARDOUS CONSTITUENTS FOR D001, D002, and D012-D043 CHARACTERISTIC CODES AND F039 MULTI-SOURCE LEACHATE

GENERATOR: _____ EPA I.D. NO.: _____

WASTE STREAM NO.: _____

Circle ALL hazardous constituents which are expected to be present.

Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)	Regulated Constituent	Non-waste water total composition (mg/kg)	Waste water total composition (mg/l)
Phthalic anhydride	28	0.055	1,2,3-trichloropropane	30	0.85
Pronamide	1.5	0.093	1, 1,2-trichloro- 1,2,2-tri-fluoroethane	30	0.057
Pyrene	8.2	0.067	tris(2,3-dibromopropyl) phosphate	0.10	0.11
Pyridine	16	0.014	Vinyl chloride	6.0	0.27
Safrole	22	0.081	Xylene(s)	30	0.32
Silvex (2,4,5-TP)	7.9	0.72	Antimony	2.1 mg/l TCLP	1.9
2,4,5-tetrachlorobenzene	7.9	0.72	Arsenic	5.0 mg/l TCLP	1.4
1,2,4,5-tetrachlorobenzene	14	0.055	Barium	7.6 mg/l TCLP	1.2
Tetrachloro-dibenzo-furans	0.001	0.000063	Beryllium	0.014 mg/l TCLP	0.82
Tetrachlorodibenzo-p-dioxins	0.001	0.000063	Cadmium	0.19 mg/l TCLP	0.69
1, 1, 1, 2-tetrachloroethane	6.0	0.057	Chromium (Total)	0.86 mg/l TCLP	2.77
1, 1, 2, 2-tetrachloroethane	6.0	0.057	Cyanides (Total)	590	1.2
Tetrachloroethylene	6.0	0.056	Cyanides (amenable)	30	0.86
2,3,4,6-tetrachlorophenol	7.4	0.030	Fluoride	NA	35
Toluene	10	0.080	Lead	0.37 mg/l TCLP	0.69
Toxaphene	2.6	0.0095	Mercury-Non-waste water from Retort	0.20 mg/l TCLP	NA
Bromoform (Tribromomethane)	15	0.63	Mercury-All others	0.025 mg/l TCLP	0.15
1,2,4-trichlorobenzene	15	0.63	Nickel	5.0 mg/l TCLP	3.98
1, 1, 1-trichloroethane	19	0.055	Selenium	0.16 mg/l TCLP	0.82
1, 1,2-trichloroethane	6.0	0.054	Silver	0.30 mg/l TCLP	0.43
Trichloroethylene	6.0	0.054	Sulfide	NA	14
Trichloromonofluoromethane	30	0.020	Thallium	0.078 mg/l TCLP	1.4
2,4,5-trichlorophenol	7.4	0.18	Vanadium	0.23 mg/l TCLP	4.3
2,4,6-trichlorophenol	7.4	0.035	Zinc	5.3 mg/l TCLP	2.61

ATTACHMENT L11-3

CALIFORNIA LIST CONSTITUENTS

GENERATOR: _____

EPA I.D. NO.: _____

WASTE STREAM NO.: _____

Circle the constituents which are likely to be present in the waste.

<u>Constituent</u>	<u>Concentration</u> (mg/l)
Cyanides	=1,000
Arsenic	=500
Cadmium	=100
Chromium VI	=500
Lead	=500
Mercury	=20
Nickel	=134
Selenium	=100
Thallium	=130
Liquid waste with pH	=2.0
Liquid waste with PCBs	=50 ppm
Waste containing HOCs	=1,000 mg/kg

APPENDIX L-12

Vortec Corporation

Vortec Waste Information Summary (WIS) Form (sample)

Vortec Waste Information Summary Form

General Information

Waste stream Name: _____

Identification number: _____ (Attach list of container #s associated with this waste stream)

Estimated waste stream quantity: _____ kgs, Number of Containers: _____

Specify number of containers of different sizes: _____

EPA Waste Codes: _____

Physical Characteristics:

General description (% soil, % gravel, % ppe, etc.): _____

% moisture (wt): _____ % visible free liquid: _____ Sample type(s) Individual Composite

Chemical Composition

Metal	Concentration (mg/kg)			Organics (Attach list of organics detected)	Concentration (mg/kg)		
	Ave	Low	High		Ave	Low	High
Arsenic	_____	_____	_____	PCB	_____	_____	_____
Barium	_____	_____	_____	VOAs	_____	_____	_____
Cadmium	_____	_____	_____	Semi-VOAs	_____	_____	_____
Chromium	_____	_____	_____	TOX	_____	_____	_____
Lead	_____	_____	_____	TOC	_____	_____	_____
Mercury	_____	_____	_____	LOI	_____	_____	_____
Selenium	_____	_____	_____	Radionuclides (pCi/g)	_____	_____	_____
Silver	_____	_____	_____	Gross alpha	_____	_____	_____
Iron	_____	_____	_____	Gross Beta	_____	_____	_____
Nickel	_____	_____	_____	Am	_____	_____	_____
Copper	_____	_____	_____	Co	_____	_____	_____
Zinc	_____	_____	_____	Cs	_____	_____	_____
Aluminum	_____	_____	_____	²³⁷ Pu	_____	_____	_____
<u>Other elements</u>	_____	_____	_____	²³⁷ Np	_____	_____	_____
Sodium	_____	_____	_____	²³⁰ Th	_____	_____	_____
Silicon	_____	_____	_____	⁹⁹ Tc	_____	_____	_____
Calcium	_____	_____	_____	²³⁸ U	_____	_____	_____
Chlorides	_____	_____	_____	% ASSAY ²³⁵ U	_____	_____	_____
Fluorides	_____	_____	_____				
Potassium	_____	_____	_____				
Magnesium	_____	_____	_____				
Phosphorus	_____	_____	_____				

Attach analytical data where available. Note if data is based on generator knowledge. Also attach or note any other known contaminants

Signature of person completing this form: _____

Date: ____ / ____ / ____

Phone: (____) ____ - ____

APPENDIX L-13

Vortec Corporation

Representative Data Acknowledgement (sample)

Representative Data Acknowledgment

In order for Vortec to determine that it can accept the waste whose chemical and physical properties are described on the WIS, for waste conditioning it must be ascertained that the data presented is representative of the waste. Since Vortec is relying on the DOE (or its representative) to supply the information necessary for Vortec to condition the waste, Vortec is requesting that DOE (or its representative) warrant that the data supplied to Vortec are representative of the waste stream (taken as per approved methods in the "Test Methods for Evaluating Solid Waste, SW-846" or appropriate process knowledge). Completion of this form acknowledges such.

Waste Stream Name: _____

Waste Stream Number: _____

Acknowledgment:

I warrant that the data that was supplied for the afore noted waste stream was obtained from sample(s) that were obtained in accordance with sampling procedures specified by the United States Environmental Protection Agency or appropriate process knowledge. I further warrant that the above information is true and correct to the best of my knowledge.

Authorized Signature: _____ Date: _____

APPENDIX L-14

Vortec Corporation

Shift Changeover Checklist (sample)

Shift Changeover Checklist

This checklist is to be used as a guide in communicating condition of the work area and keep personnel informed as to the current status of the operational work area. This checklist should be readily available for QA / Safety Inspections.

	Work Area:	Date:	Day:	
Item	Description	Yes or No or Not Applicable (Y, N, NA)	Comment or Description	Discussed (check √)
1	Lockout / Tagouts Issued			
2	Confined Space Permits Issued			
3	Equipment Problems			
4	Unusual readings in gauges			
5	Maintenance conducted			
6	Radiological work permits issued			
7	Control Panel problems			
8	PLC problems			
9	Other (describe)			
10	Other (describe)			
Departing Operator Signature:				
Receiving Operator Signature:				

APPENDIX M

Vortec Corporation Personal Protection Equipment

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Vortec Corporation
Personal Protection Equipment

Prepared by: R.K. Hnat
Approved by: *James G. Hnat*
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

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M1. PURPOSE

This procedure defines the required Personal Protection Equipment (PPE) available from Bechtel-Jacobs and the PPE that will be used by employees at various work stations.

M2. APPLICABILITY

This procedure applies to all activities associated with operation of the plant for the Limited Demonstration at the Vortec Corporation Pretreatment and Conditioning Plant adjacent to the Paducah Gaseous Diffusion Plant.

M3. REFERENCES AND DEFINITIONS

PDGP Paducah Gaseous Diffusion Plant
PPE Personal Protection Equipment

BFA-4110-904-002 Site Specific H&S Plan for Construction of the Ltd Demo Plant.
BFA-4110-904-001 Operational H&S Plan for the Pretreatment and Conditioning Plant.

M4. RESPONSIBILITIES

The Site Manager is responsible for coordinating PPE for the Paducah Plant.

Each employee is responsible to ensure that he/she is dressed with the proper PPE when performing their work at the Paducah Plant.

The Site Manager or designee is responsible that visitors or subcontractors addressed with the proper PPE for the areas they will be visiting or working.

M5. ACTION STEPS

See information with each PPE Item.

M6. RECORDS

Not Applicable

M7. PPE AVAILABLE AT BECHTEL-JACOBS

The equipment listed in Table M-1 is a list of the PPE available from Bechtel-Jacobs at the PGDP. The equipment is not supplied by Bechtel-Jacobs, but is listed to enable Vortec Corporation to utilize common equipment and assist in procurement of needed PPE.

Table M-1 PPE available at PGDP, Bechtel Jacobs

Personal Protective Equipment Available at Bechtel-Jacobs	
Bechtel Jacobs ITEM #	DESCRIPTION
HEARING PROTECTION	
16-090-1900	EARMUFFS, One size fits all, plastic construction with foam filled earcups, wearable in 3 positions: ANSI S3-19-1974: Mfg: E.A.R., No sub item.
16-087-4500	EARMUFF, complete with foam-filled ear seals, MSA 95635, Wilson 365, or approved equal, must have spherical bearing in both ear cups to allow the suspension band on a 360 degree angle to any desired position *see matl cntl spec*
16-090-1796	EARPLUG, Three-flange, rubber, ultrafit (NRR 27) E.A.R. 3404003, no sub
16-090-1799	EARPLUG, Three-flange, rubber, ultrafit (NRR 21) with cord **no substitute*
16-090-1801	EARPLUG, Washable, re-usable foam plastic earplug, E.A.R.; no sub
16-090-1805	EARPLUG, Moldex Pura-fit earplugs, foam, tapered ends, NRR 31, lime green, uncorded only, no substitution items
EAR PROTECTION	
16-055-1200	GOGGLES, Rubber mask, molded rubber frame, resistant to corrosives, broad inner rolled edges for comfortable and air tight fit, nose pieces broad bearing surface for complete seal, Wilson X41 or approved equal See matl cntl spec
16-055-1615	GOGGLES, Chemical, flexible mask, softsides with ventilation, to fit over regular RX glasses, AO 4B4B
16-055-1620	GOGGLES, Acid, clear lens/bronze body, fog-proof, fit over prescription glasses (VPC), must meet ANSI Z87.1, Lab Safety Supply model RB-11354, American Allsafe P/N 10191, style211, no substitutions
APRONS	
16-085-4200	APRON, Welders, chrome leather, 24 x 42 in. G D Genter No. 202
BELTS	
16-010-1990	BELT, Safety, made of yellow nylon webbing, 1 ¾" wide, rope leep reinforced when attached to belt, with 6 foot long ½", nylon rope lanyard with forged steel snap, 32-40 Miller P/N 6391 See mtl cntl spec
16-010-2000	BELT, Safety, made of yellow nylon webbing, 1 3/3" wide, with 6 foot long ½", nylon rope lanyard with forged steel snap, 36-44, (Klein Belt No. 87201 w/ no. 87429 lanyard)
SAFETY SHOES	
12-921-0100	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 7 M
12-921-0105	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 7 ½ M
12-921-0110	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 8 M
12-921-0115	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 8 ½ M
12-921-0120	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 9 M
12-921-0125	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 9 ½ M
12-921-0130	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 10 M

Table M-1, Personal Protective Equipment Available at Bechtel-Jacobs, Continued	
12-921-0140	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 10 ½ M
12-921-0145	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 11 M
12-921-0150	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 11 ½ M
12-921-0155	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 12 M
12-921-0160	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 13 M
12-921-0165	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 14 M
12-921-0170	Mens steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 7 W
12-921-0175	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 7 ½ W
12-921-0180	Mens Steel-toe Safety SHOE, Iron Age Part No. 707, black leather tie casual shoe, Size 8 W
HAND & ARM PROTECTION	
12-020-9808	GLOVES, Containment, Latex Rubber, 15 inches in length, wit Anti-C symbol, Size 8, No substitute item
12-020-9809	GLOVES, Containment, Latex Rubber, 15 inches in length, wit Anti-C symbol, Size 9, No substitute item
12-020-9810	GLOVES, Containment, Latex Rubber, 15 inched in length, wit Anti-C symbol, Size 10, No substitute
12-020-9811	GLOVES, Containment, Latex Rubber, 15 inched in length, wit Anti-C symbol, Size 11, No substitute
16-055-8705	GLOVE PROTECTOR, electricians, grade A, buffed horseride flare gauntlet with std wt rubber cuff, designed to fit curved finger electricians gloves, W H Salisbury No. 132, Norton LP-35, size: 10
16-055-8710	GLOVE PROTECTOR, electricians, grade A, buffed horseride flare gauntlet with std wt rubber cuff, designed to fit curved finger electricians gloves, W H Salisbury No. 132, Norton LP-35, size: 11
16-055-8715	GLOVE PROTECTOR, electricians, grade A, buffed horseride flare gauntlet with std wt rubber cuff, designed to fit curved finger electricians gloves, W H Salisbury No. 132, Norton LP-35, size: 12
16-055-8740	GLOVES, Containment, latex rubber, 15 in., LGTR, with Anti-C symbol, color orange, Nuclear Power Outfitters P/N G14R011S, size: 8
16-055-8080	SLEEVES,SARAANEX (100 per case) no sub item
16-055-8090	SLEEVE, Protective, 4-H, 20" length, 1 pair/pkg, Lab Safety P/N YB17573, ns item
HOODS	
12-025-2000	Hood, Anti-C, yellow, Nuclear Power Outfitters No. A07CY213
COVERALLS	
12-016-0040	COVERALLS, disposable, TYVEK, zip front, elastic hood, elastic wrist, attached booties, serged seams, Mar Mac 14122, Size: Small
12-016-0042	COVERALLS. Disposable, TYVEK, zip front, elastic hood, elastic wrist, attached booties, serged seams, Mar Mac 14122, Size: Medium
12-016-0044	COVERALLS. Disposable, TYVEK, zip front, elastic hood, elastic wrist, attached booties, serged seams, Mar Mac 14122, Size: Large
12-016-0046	COVERALLS. Disposable, TYVEK, zip front, elastic hood, elastic wrist, attached booties, serged seams, Mar Mac 14122, Size: X-Large
12-016-0052	COVERALLS. Disposable, TYVEK, zip front, elastic hood, elastic wrist, attached booties, serged seams, Kappler brand no subs, Size: 4X-Large
12-016-8700	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-SW, Size: Small
12-016-8710	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-MW, Size: Medium
12-016-8720	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-LW, Size: Large

Table M-1, Personal Protective Equipment Available at Bechtel-Jacobs, Continued

12-016-8730	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-XLW, Size: X-Large
12-016-8740	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-XXLW, Size: XX-Large
12-016-8750	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Waggoner P/N 44414-XXXLW, Size: XXX-Large
12-016-8760	COVERALLS, Saranex 23-p coated TYVEK, coveralls with drawstring hood (or elastic hood), booties, elastic wrists, Size: 4X-Large
BOOTIES	
12-010-3500	BOOTIES, PVC, disposable, yellow, 200 percent stretch, 17" high, 10.5 "top, 15.25" long, 400/case
SHOE COVERS	
12-015-7510	COVER, SHOE, yellow, rubber construction,, ambidextrous, "Totes" No. 663, Size: Med/Lg
12-015-7525	COVER, SHOE, yellow, rubber construction,, ambidextrous, "Totes" No. 663, Size: Lg/XL
ANTI-C COVERALLS	
12-015-9550	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, Small – FLAME RETARDANT
12-015-9555	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, Medium – FLAME RETARDANT
12-015-9560	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, Large– FLAME RETARDANT
12-015-9565	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, X-Large– FLAME RETARDANT
12-015-9570	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, XX-Large– FLAME RETARDANT
12-015-9575	COVERALL, ANTI-C, yellow, Norvell style 9201, or Waggoner wear, XXX-Large– FLAME RETARDANT

M8. PPE FOR THE LIMITED DEMONSTRATION

The PPE required may change depending upon the process operation at any given time. The PPE listed below is for the Limited Demonstration Activity when no radioactive material is processed. Locations and Zones listed below are defined in Table 3.3-1 Site Control Zone List and Figure 3.3-1 Paducah Control Area Site Map in the main Ltd Demo Operational Plan.

BARREL LOADING AND SHREDDING SYSTEM

Location	Zone	Activity	PPE
Pad 1, Shredding Tower	F1	Plant Idle or Shutdown	Steel Toe Shoes, Safety Glasses
Pad 1, Shredding Tower	F1	Processing Material	Steel Toe Shoes, Safety Glasses, Hard Hat, Hearing Protection may be required (TBD after testing for sound levels)

PROCESSED COLLECTION INTO ST-90 BOXES

Location	Zone	Activity	PPE
Pad 4, Treated Soil and Metals Collection	F4	Plant Idle or Shutdown	Steel Toe Shoes, Safety Glasses
Pad 4, Treated Soil and Metals Collection	F4	Processing Material	Steel Toe Shoes, Safety Glasses, Hard Hat

GENERAL PLANT

Location	Zone	Activity	PPE
NW Lot, Open Property	A	All	Steel Toe Shoes
Propane Area, Open Property	B	All	Steel Toe Shoes, Safety Glasses
Fenced Propane Storage Area	B1	All	Steel Toe Shoes, Safety Glasses
Center Lot, Open Property	C	All	Steel Toe Shoes, Safety Glasses
Center Lot, when propane is delivery	C1	All	Steel Toe Shoes, Safety Glasses
NE Lot	D	All	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D1	All	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D2	All	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D3	All	Steel Toe Shoes, Safety Glasses
SE Lot	E	All	Steel Toe Shoes, Safety Glasses
SE Lot, ST-90 Storage	E1	All	Steel Toe Shoes, Safety Glasses
Processing Lot, Open Property	F	All	Steel Toe Shoes
Pad 1, Shredding Tower	F1	General	Steel Toe Shoes, Safety Glasses, Hard Hat (when material processing, Hearing Protection may be required (TBD after testing for sound levels) (when material processing)
Pad 3, Dust Collection	F2	All	Steel Toe Shoes, Safety Glasses
Pad 3A, Dryer, Air Heater, Dryer Inlet Tower	F3	All	Steel Toe Shoes, Safety Glasses
Pad 4, Treated Soil and Metals Collection	F4	General	Steel Toe Shoes, Safety Glasses, Hard Hat (when material processing)
Operations Trailer	F5	All	Steel Toe Shoes
SW Lot, Open Property	G	All	Steel Toe Shoes

Maintenance when Plant Operating

Location	Zone	Activity	PPE
NW Lot, Open Property	A	All	Steel Toe Shoes
Propane Area, Open Property	B	All	Steel Toe Shoes, Safety Glasses
Fenced Propane Storage Area	B1	Maintenance	Steel Toe Shoes, Safety Glasses, Hard Hat
Center Lot, Open Property	C	All	Steel Toe Shoes, Safety Glasses
Center Lot, when propane is delivery	C1	Maintenance	Steel Toe Shoes, Safety Glasses
NE Lot	D	Maintenance	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D1	Maintenance	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D2	Maintenance	Steel Toe Shoes, Safety Glasses
NE Lot, Drum Storage	D3	Maintenance	Steel Toe Shoes, Safety Glasses
SE Lot	E	Maintenance	Steel Toe Shoes, Safety Glasses
SE Lot, ST-90 Storage	E1	Maintenance	Steel Toe Shoes, Safety Glasses
Processing Lot, Open Property	F	All	Steel Toe Shoes
Pad 1, Shredding Tower	F1	Maintenance	Steel Toe Shoes, Safety Glasses, Hard Hat, Respirator (when inside shredder) , and Hearing Protection may be required (TBD after testing for sound levels)
Pad 3, Dust Collection	F2	Maintenance	Steel Toe Shoes, Safety Glasses, Hard Hat, Respirator (when changing filters)
Pad 3A, Dryer, Air Heater, Dryer Inlet Tower	F3	Maintenance	Steel Toe Shoes, Safety Glasses, Hard Hat, Respirator (when inside dryer)
Pad 4, Treated Soil and Metals Collection	F4	Maintenance	Steel Toe Shoes, Safety Glasses, Hard Hat
Operations Trailer	F5	Maintenance	Steel Toe Shoes
SW Lot, Open Property	G	All	Steel Toe Shoes

APPENDIX N

Vortec Corporation Operational Sampling and Analysis Plan

Operational Sampling and Analysis Plan

Prepared by: J. Simpson
Approved by:
Effective Date: 7/5/01

Record of Changes

Change Letter	Affected Page(s)	ECR	Effective Date	Change Approved by (Initial)
0	All	4110-2013	7/5/01	

This procedure has been verified for adequacy.

The next 1-year periodic review date is 7/31/02.

**Operational Sampling and Analysis Plan
For Vortec Material Conditioning System**

Prepared by: Vortec Corporation

July 5, 2001

I. INTRODUCTION

In the Vortec material conditioning process, continuous sampling of a stream of material from a number of drums will be performed as the material exits the homogenizer in the process and is introduced into an ST-90 box. The concentration of hazardous species in the conditioned material stream is required for disposal of the material or subsequent treatment of the material. For the case of disposal, the average concentration of hazardous components, chemical and radioactive, must be reported to the landfill for each container. For treatment of the material the composition of the conditioned material is required to determine if there will be a negative impact on the treatment process.

Benefits for changing from sampling individual drums to continuous sampling during processing are:

- less worker exposure during sampling
- less involved sampling procedure
- simplification of sampling procedure
- more representative sampling
- improved error associated with reported concentration

The objective of this paper is to provide a rationale for the sampling design with a comparison to the case of sampling a single drum. This paper includes the following sections; Description of Process, Proposed Sampling Design, and Support from Demonstration Testing.

II. DESCRIPTION OF PROCESS

A schematic of the Vortec material conditioning system is shown in Figure 1. Drums of material are fed into a lift, passed through a series of two shredders and a rotary homogenizer, and then dumped into an ST-90 container. The full ST-90 box can be shipped off site for disposal. Under current regulations, the average concentration of hazardous compounds, metals, and radioactive isotopes must be determined for each container shipped to the disposal site. The average composition of the material in the container will be determined from a composite sample formed from a set number of grab samples. The grab samples will be collected by diverting the complete stream of material entering the ST-90 box into a collection container.

During the processing of the material through the Vortec material conditioning system, blending of the material within the individual drums and between consecutive drums will occur. This blending is a result of the cutting in the shredder and tumbling in the homogenizer. The cutting action of the shredder will break apart larger pieces to reduce the maximum particle size to approximately 2 in. The shredder will not necessarily mix and blend the materials together. The tumbling action of the homogenizer will mix and blend the particles together, but not necessarily reduce the particle size. Figure 2 illustrates the actions of the shredder and homogenizer.

Figure 1 Schematic of Vortec material conditioning system.

The blocks represent solid particles at various stages in the system. Between a and b in Figure 2, the large blocks are reduced in size through the action of the shredder. Between b and c, the blocks are mixed randomly to form a more uniform sample.

Figure 1 Illustration of shredding and blending action in the Vortec conditioning system and the resulting increase in uniformity of components through the system.

III. PROPOSED SAMPLING DESIGN

The purpose of the sampling design is to provide the information required to collect samples that characterize the material to the extent required and the reasoning to support the plan. The sampling information contained in the sampling design includes the type of samples, method of collection, the number and frequency of samples, sample collection location, and sample size. For the Demonstration Testing, the requirements are set forth in the Test Plan. For the processing of actual waste material, the requirements (i.e. required minimum error) are set by the waste receiver. It is anticipated, for the disposal scenario, that the average concentration and range of hazardous components will be required. The following describes the reasoning and the resulting sampling design for the processing of waste materials.

Based on a review of sample design guidance from the EPA¹ and the disposal objective of obtaining an average for the container, a composite sample was deemed suitable for the program. The primary idea behind using the composite samples is the reduction of the number of samples to be analyzed and thus the analysis cost. It is important to note that information regarding the distribution of components is lost in the preparation of composite. In the comparison of the anticipated results from a single drum sampling scenario and the continuous stream sampling in the Vortec system, composite samples were assumed in both cases. In these cases, the result of the analysis of the composite sample is considered the average for the container or drum.

The goal of the proposed sampling plan is to provide a sample which could be analyzed to give the average and error of a specific characteristic. The sampling plan would provide benefits over the existing plan through a reduced number of samples to be analyzed, a decrease in the reported error, and a simpler method for collecting the samples with less worker exposure compared to sampling and characterizing every drum.

A. ERROR IN THE REPORTED VALUE

The error in a reported value is proportional to the square root of the variance. The variance is the square of the standard deviation of a population or group. Basic statistics can be used to determine the variance associated with an average for a group selected from a population with a given average and standard deviation. ASTM standards E 300² and E 122³ provide guidance in the application of basic statistics to sampling. ASTM Method E 300 was specifically selected for a basis for determining the variance, and thus the error, in the reported averages for both cases; i.e. sampling every drum and continuous sampling.

One of the objectives of ASTM E 300, section 5.1.1 specifically, is “to estimate the average quality characteristic of a given lot of material and to establish confidence limits for this average.” The variance of a lot can be determined from analyses of samples collected from units making up the lot by the following equation:

$$\sigma_{\bar{x}}^2 = \frac{\sigma_b^2}{n_b} \left[\frac{N - n_b}{n_b} \right] + \frac{\sigma_w^2}{n_b n_w} + \frac{\sigma_t^2}{n_t} \quad [1]$$

where:

$\sigma_{\bar{x}}^2$ = variance of mean for lot,

σ_b^2 = variance between primary units,

σ_w^2 = variance between secondary units,

σ_t^2 = variance of test/analysis on homogeneous sample,

N = number of primary units in lot,

n_b = number of primary units selected for analysis,

n_w = number of secondary units selected from each primary unit,

n_t = total number of tests performed.

For the case of a single barrel being shipped for disposal, the lot of material shipped for disposal consists of a single primary unit (i.e. one drum), $N = 1$. Since the single drum in this lot is sampled, the number of primary units sampled, n_b , is 1. From this drum a set number of samples, the secondary units, are selected, n_w . The total number of analyses to be performed in this case would be 1 if the individual samples are combined to form a composite sample ($n_t = 1$), or if the samples are analyzed individually, $n_t = n_w$. For $n_t = 1$, Equation 1 reduces to:

$$\sigma_{\bar{x}}^2 = \frac{\sigma_w^2}{n_w} + \sigma_t^2 \quad [2a]$$

and for $n_t = n_w$,

$$\sigma_{\bar{x}}^2 = \frac{\sigma_w^2 + \sigma_t^2}{n_w} \quad [2b]$$

For the case of material processed through the Vortec material conditioning system, the lot of material is the ST-90 container shipped to the disposal site. In this case, it is assumed that each ST-90 container is filled with N drums, the number of primary units in the lot. The sampling period of the stream entering the ST-90 box can be set to the time required to process a single drum. Therefore, a sample from every drum is collected and $n_b = N$. Additionally, the samples are combined to form a single composite sample for a single analysis resulting in $n_t = 1$. Under these conditions, Equation 1 reduces to

$$\sigma_{\bar{x}}^2 = \frac{\sigma_w^2}{N} + \sigma_t^2. \quad [3]$$

An important observation in this calculation is that if every drum in the lot is effectively sampled during processing, the variance between the drums does not have an impact on the variance of the lot. Only the variance within the drums, σ_w^2 , and the variance of the analysis method, σ_t^2 , have an impact on the variance of the lot.

A comparison of the error calculated from the single drum composite sample and the composite sample generated from the stream to the ST-90 box can be made by considering Equations 2a and 3. In both cases, the variance within the drums is the same. Therefore, the variance is inversely proportion to the number of samples collected in the composite samples. In the Vortec material conditioning process, it is assumed that at least 10 drums will be required to fill an ST-90 box; thus $N > 10$. In collecting samples from a single drum, it is assumed that less than 10 representative samples are collected from the drum; thus $n_w < 10$. Therefore, the variances and the errors of the averages reported for the lots from the Vortec conditioning system would be less than those associated with single drums.

For both cases, the variance within a drum, σ_w^2 , needs to be defined to determine the variance associated with a lot. ASTM standards E 300 and E 122 describe methods for determining the variances of units. These methods are based on initial surveys of the populations and investigating their distributions.

A final consideration is the blending which occurs during the conditioning of the material in the Vortec system. This is not taken into account in the above calculation. During the Vortec process, material within a drum will be blended at least with itself to form a more uniform material by the rotary action in the system. This blending will lead to a more homogeneous mixture and thus a decrease in the variance within a drum, σ_w^2 . The decrease in the variance within the drum will lead to a decrease in the variance of the lot, as in accordance with Equation 3.

B. NUMBER OF SAMPLES COLLECTED

Based on the methods outlined in ASTM standard E 300, and summarized for the Vortec system in Equation 3, the number of samples collected and analyzed is dependent on the on the desired confidence in the reported average, the variance within a drum, and the variance of the analytical method. The calculated error of the reported average is inversely proportional to the number of samples compiled into the composite. The minimum number of samples collected per ST-90 box will equal the number of drums required to fill an ST-90 box.

Comparing the single drum disposal approach with the ST-90 box disposal approach of the Vortec system, the error in the reported average for the Vortec system would be less than that of the single drum approach for the same number of samples combined in a composite. Details of this comparison are given in the Error in the Reported Value section of this paper.

C. SIZE OF SAMPLES COLLECTED

The amount of material collected from a container or stream must insure that the resulting characteristics provided by the analysis are representative of the material being sampled. Typically, the size of a representative sample is dependent on the particle size of the material to be sampled. In the single drum and Vortec system scenarios, the material particle size must be consider when determining the sample size similarly. For the Vortec material conditioning system, the maximum particle size to be sampled is 2 in. in diameter. This value is based on the shredder operating specifications.

The representative sample size was determined by a review of the ASTM standards associated with the sampling of materials in drums^{10,11}, methods of sampling materials^{4,5}, analysis methods of soils^{6,7}, and sampling of aggregates⁸. The ASTM standards directed at sampling of drums and methods of sampling did not define the amount of material to consider as a representative sample size. ASTM D 75, Standard Practice for Sampling Aggregates, tentatively gives the representative sample size for an aggregate sample with a 50mm (2 in.) maximum particle diameter to be 100 kg (220 lb.). Considering the amount of material in a drum, this sample size is too large.

ASTM standards covering analytical methods on soils give sample sizes for analysis based on particle size. The size of a sample required for analysis was used as a basis to determine the representative sample size from the conditioned material stream in the Vortec process. ASTM standard D 2216 requires the sample size for soil moisture content analysis with particle size of 37.5 mm (1.5 in.) to be 10 kg to achieve 0.1 % accuracy and 1 kg to achieve 1% accuracy; and for a particle size of 75mm (3mm), 50 kg to achieve 0.1 % accuracy and 5 kg to achieve 1% accuracy. Interpolating to 2 in. particle size results in sample sizes of 25 kg to achieve 0.1 % accuracy and 2.5 kg to achieve 1% accuracy. Considering the desired accuracy of the measurement to be 0.5 %, a typical value in the test plan, then a representative sample would be on the order of 5 kg. Therefore, the size of a representative sample collected from the conditioned material stream is 5 kg (11 lb.).

In the Vortec material conditioning system, the shredders reduce the particle size of all of the material in a drum to less than two inches and blend the material together. Therefore, the maximum particle size of the material being sampled is 2 in. In the case of a single drum, large particles that are encountered must be manually broken, then sampled or taken as a whole sample. This sampling method would tend to lead to either somewhat biased samples or very large sample sizes requiring reduction of the particle size. Therefore, for the same sample size, due to the reduction of particle size through the shredding of large (greater than 2 inches) solid pieces, the Vortec material conditioning system should provide more representative samples.

D. METHOD OF SAMPLE COLLECTION

The method of sampling proposed for the Vortec material conditioning system is a gate that would completely intercept the conditioned material stream and divert the stream to a collection container. This method is based on sampling schemes for sampling material falling off a conveyor belt in the chemical industry (ASTM standard E 300). The processing of the material through reducing the particle size and removing the free water to produce a relatively free flowing material allows for the application of this procedure. The resulting sample would be blended and split according to ASTM standard 702⁹ to reduce the amount of material to a size required for laboratory testing.

ASTM standards D5680¹⁰ and D5679¹¹ provide methods and guidance for sampling unconsolidated and consolidated samples in drums. Suitable methods for sampling the drums or containers include auger, triers, thieves, and scoops. In these methods, it is stated that the sampling technique will minimize the variation between measurements through sampling the different fraction present proportional to their amounts in the container. Additionally, the person collecting the sample must be trained and experienced to recognize when the sampling method in use will not collect a representative sample and develop corrective actions.

The sampling method used with the Vortec material conditioning system provides benefits over the single drum method in that the material is removed from the drum,

blended, and made relatively free flowing, thus allowing for the collection of representative samples from the stream. This process removes the problems associated with sampling personnel encountering difficult to sample drummed materials and materials that are inappropriate for the selected sampling devices. Additionally, the sampling personnel's safety and work conditions are improved through removing the close contact with hazardous materials in the open drums.

IV. SUPPORT FROM DEMONSTRATION TESTING

During the proposed demonstration testing, the nature/extent of the homogenization that occurs in the homogenizer will be characterized through the use of a tracer. The impact of this homogenization on the decrease in the variance within a drum and the amount of blending between drums will be determined. This information will validate that the sample collection method is obtaining a representative sample. The following narrative address the rational behind the blending tests during the demonstration testing.

The blending process can be illustrated by considering the concentration at specific points in the system as a function of time. Figure 3 illustrates the case where a spike occurs in the concentration of one of the constituents. In this case, the concentration into the system rises very quickly to the arbitrary level of 1 and is maintained for a specific amount of time. This rise could be the result of a container or a part of a container introduced into the system with this concentration and is represented by the Initial Curve in Figure 3. As the material with this initial concentration passes through the system, it is blended with the material fed prior to and after the container. The resulting distributions, at the system exit, shown as curves 1 through 3 in Figure 2, are dependent on the amount of blending that occurs while the material passes through the system. Curve 1 is the result of the least amount of blending while curve 3 is the result of the greatest amount of blending. At a constant feed rate, the area under the concentration distribution curves is constant. Therefore, as the distribution becomes wider, the maximum concentration decreases.

Figure 2 Illustration of blending as material passes through the Vortec material conditioning system.

During the demonstration testing, a drum spiked with a tracer material will be introduced into the system and the distribution of the tracer at the system exit will be determined through a series of grab samples. The results of the tracer test will be reported as a tracer concentration as a function of time plot, similar to Figure 3 and a homogenization effectiveness, E_H , expressed as

$$E_H = \frac{P_{T_{max}}}{P_{T_{feed}}}$$

Where

$P_{T_{max}}$ = Maximum concentration of tracer in conditioned material

$P_{T_{feed}}$ = Concentration of tracer in feed.

The homogenization effectiveness is a measure of the decrease in the concentration of the tracer material from the initial to the conditioned materials. Using these factors, an impact on the variance within a drum will be made.

V. REFERENCES

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- ¹ Guidance for Choosing a Sampling Design for Environmental Data Collection, EPA QA/G-5S, prepared by Quality Staff Office on Environmental Information United States Environmental Agency, August 2000.
- ² ASTM Standard E 300 "Standard Practice for Sampling Industrial Chemicals," 1996.
- ³ ASTM Standard E 122 "Standard Practice for Choice of Sample Size to Estimate the Average for Characteristic of a Lot or Process," 1997.
- ⁴ ASTM D 5633 "Standard Practice for Sampling with a Scoop," 1994.
- ⁵ ASTM D 5451 "Standard Practice for Sampling with a Trier Sampler," 1993.
- ⁶ ASTM D2216 "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock," 1992.
- ⁷ ASTM D 422 "Standard Test Method for Particle Analysis of Soils," 1990.
- ⁸ ASTM D 75 "Standard Practice for Sampling Aggregates," 1997.
- ⁹ ASTM Standard C702 "Standard Practice for Reducing Samples of Aggregate to Testing Size," 1993.
- ¹⁰ ASTM Standard D5680 "Standard Practice for Sampling Unconsolidated Solids in Drums or Similar Containers," 1995.
- ¹¹ ASTM Standard D5679 "Standard Practice for Sampling Consolidated Solids in Drums or Similar Containers," 1995.