Critical Analysis Team Report

CAT Report #25

13 February 2002

The Critical Analysis Team (CAT) has completed a review of the Silo 3 Conceptual Design package and design review comments are documented in Attachment 1 of this report.

The CAT's review was based on the following Silos Project requests:

- "The objective of the (CAT's) Independent Review is to support a determination that the project has sufficient information to proceed to the next phase of the project."[1]
- "Enclosed for your (CAT) formal review in accordance with the referenced letter, are the following Silo 3 Project Conceptual Design documents and drawings."[2]
- "Any comments generated from review for this package will be considered in the development of the Remedial Design Package, which is expected to include no on-site treatment."[2]
- "To aid your review of this package, notation has been added to the Flow Diagrams, Piping & Instrumentation Drawings, and General Arrangement Drawings to illustrate the treatment part of the design, which may be deleted from further design effort."[2]

In performing this design review, the CAT has attempted to follow the above directions as closely as possible, particularly evaluating whether the project is prepared to proceed to the next phase.

Many of the CAT's comments addressing treatment apply to the design whether the treatment is deleted or not. Therefore, the CAT chose to include all comments on the design as they may prove of value to the ongoing design.

---

[1] Letter DOE-0062-02, Nina Akgunduz, Team Leader, Silos Project, the Independent Review of the Silos Project, dated 6 November 2001.
[2] Letter C:SP:2002-0004, Stephen M. Beckman, Contract Technical Representative, Formal Critical Analysis Team (CAT) Review of Silo 3 Project Conceptual Design Package, dated January 23, 2002.

In addition to the attached comments, the CAT has the below key concerns that must be adequately addressed for Silo 3 project success. The CAT acknowledges the project has completed additional work that is not represented in the Conceptual Design package.

Key Technical Concerns:

- Design and construction of the Silo 3 side-wall opening including: a) cutting the concrete wall, the size of the wall sections being removed; b) removing, handling, storing, decontaminating and packaging the wall sections; and c) ultimate disposal of the wall sections.
- Pneumatic removal of Silo 3 solids including: a) the physical configuration of the pneumatic wand; b) movement of the wand within and without the silo; c) operation and maintenance of the wand; d) resources needed to support operation and maintenance of the wand; e) capabilities and limitations of the wand; and f) increasing and decreasing the length of the wand.
- The Dust Collectors including: a) performance specifications, particularly on sub-micron particles; b) the ability of the Collectors to remove sufficient fines to result in a reasonable HEPA filter life; and c) the ability to remove (by gravity) dust collected in the Dust Collector bins when the discharge valve is opened.
- The Silo 3 Enclosure Building including: a) design requirements; b) operating and maintenance requirements; c) requirements for and limitations on personnel entering and leaving the Building; d) ventilation and pressure (positive/negative) requirements; e) instrumentation requirements; f) utility requirements; and g) ultimate decontamination and disposal of the Building.
- Loading transport containers including: a) the interface between the loading devices and the containers; b) controlling the spread of contamination in the loading area including the containers; c) the ability to perform loading operations remotely, especially those associated with the container and inner liner; and d) the process for emptying, decontaminating and disposing of failed containers/liners.

Specific Comments

Attachment 1

1.0 CAT Comments on Design Basis and Requirements Document, Rev. D, Document No. 40430-DC-0001, January 14, 2002

*1.1 Design Basis and Requirements Document has not yet been approved. Proceeding with a design effort without approved requirements that are under change control violates basic project management principles and places both the Architect/Engineer and the project at risk.

1.2 Section 1.1: If the decision is made not to treat Silo 3 waste at Fernald, what are the ROD impacts? How will DOT requirements be met in this scenario? Also, there should be an in-depth study conducted to identify the added value of off-site treatment

1.3 Section 1.1, Third bullet, page 1-1: The ESD is quoted as requiring a 'transportation risk of less than $1x10^{-6}$. Has this requirement been evaluated and can it be met? Can it be met if the material is not stabilized on site?*

*1.4 Section 1.3.1: Identifies 'dry density' of Silo 3 material. Is this referring to in situ "bulk density"? Also, the density range varies by nearly 100% (from 29 lb/cubic foot to 58 lb/cubic foot). Does Fernald have characterization data that can narrow this density range?

*1.5 Section 1.3.1: The description of Silo 3 material is inadequate. It should include information on moisture content and particle size distribution, in particular, particle sizes that are <5 micron and <1 micron. Throughout the Conceptual Design Package there are references to the Silo 3 material that are incomplete and/or incompletely referenced. It would be beneficial for the reviewer were the breadth of information on Silo 3 material presented in one location and properly referenced.

*1.6 Section 1.4, item 5: Refers to disposal of wastewater at AWWT "when necessary." Define "when necessary" or reference where such definition can be found.

*1.7 Section 1.4, items 1-6: How will the Silo 3 interfaces with other projects be managed? At one point, the Silos project had an interface procedure and a control board to manage project interfaces. Was the procedure approved and issued and is the board active? If not, the Silos project should consider reinstituting such a body to ensure that these interfaces are adequately managed. As a minimum, each interface should be assigned to a responsible individual.

---

* Indicates comments focused on the treatment operation which the CAT recognizes may be deleted.

*1.8 Table 2.1-3, Function ID 2.2.4 requires the sampling of untreated Silo 3 material. However, the design appears incapable of such sampling since the only sample point is downstream of the mixer. A product sampler is not required, however the design incorporates this function.

*1.9 Table 2.1-4, Function ID 3.2 allows for a maximum of 10 gallons per minute wastewater to AWWT. This allowance is for the entire silos project and is limited during times of rainfall.

*1.10 Table 2.1-5, Function ID 4.1 requires the facility to "collect radon." However, the facility has no provision for radon collection, radon is simply diluted and released to the atmosphere.

1.11 Table 2.1-5, Function ID 4.2 require noise levels for equipment to be below 85dB. The Conceptual Design does not currently include equipment specifications. Therefore compliance with this requirement cannot be verified. The specifications ultimately will have to include this requirement, if it is to be met.

1.1.2 Table 2.1-5, Function ID 4.2.1 requires a "negative pressure in the retrieval and treatment enclosures relative to atmosphere." Currently, the design does not provide sufficient information to determine compliance with this requirement.

1.13 Table 2.1-5, Function ID 4.3 refers to "modeling data" supporting the release of radon. The modeling approach and data should be referenced or provided.

*1.14 Table 2.1-5, Function ID 4.5 requires particulate and radon sampling at the stack "as necessary." Reference for determining when such sampling is "necessary" should be cited. Also, the conceptual design documentation is inconsistent in the use of the terms "sampling" and "monitoring." Improved process descriptions would help clarify the actual sampling and monitoring approach in the design.

*1.15 Table 2.1-6, Function ID 5.1 requires minimizing the "potential for contamination of the external surface of the disposal container..." How is this accomplished so that the container will meet surface contamination release limits?

1.16 Section 2.2.1, item 3: The OU4 ROD and ESD requirements applicable to Silo 3 should be referenced (and possibly summarized) here. This would provide all reviewers the same basis for review.

*1.17 Section 2.2.3 refers to RMRS documents. These documents should be referenced.

*1.18 Section 2.2.3 should outline the requirements of the isokinetic monitoring system (at the very least, the requirements should be referenced). Also, the precise method of radon monitoring should be outlined. This section requires the best

available technology for gaseous effluents. What is the best available technology for radon and how is it being applied for this design?

1.19 Section 2.2.3 refers to the "controlled" release or radon and the "collection and treatment" of radon. The current design does not control, collect or treat radon.

*1.20 Section 2.2.4 should reference a Fluor controlled civil plot plan drawing of the Silos area.

1.21 Section 2.2.4.2 requires areas to don and doff protective clothing and place radiological survey equipment. The current design is lacking adequate information to validate these requirements.

1.22 Section 2.2.4.2 requires radiological areas to be segregated from 'clean' areas. The CAT cannot determine if this requirement is being met, especially since 'clean area' is undefined. The current design lacks information pertaining to segregation, radiation monitoring/control equipment and placement, etc.

*1.23 Section 2.2.4.2.1 assumes that the facility could be built on the ISA pad. Analysis and documentation to confirm this assumption is needed especially since, (a) the ISA pad will be utilized as foundation for the new facility and (b) the ISA pad already contains cracks. Also, the drawings and specifications for the ISA pad should be referenced here.

*1.24 Section 2.2.4.2.2, second paragraph states that electrical equipment can be housed either in a portable trailer or the treatment facility. This decision should be made by the end of conceptual design.

1.25 Section 2.2.4.2.3: Silo 3 project may want to consider installing microphones in remote areas near critical equipment that can be monitored in the control room. Sound helps operators determine equipment performance.

1.26 Section 2.2.4.2.4 refers to the "staging" area being different from a "storage" area. What constitutes this difference? Also, how many trucks/containers can be staged in the staging area?

1.27 Section 2.2.4.2.6, last three words on p. 2-10 are "to be determined." When will the location for subcontractor trailers be determined?

1.28 Section 2.2.4.2.7 states that facilities for changing clothing "may" be provided. These facilities will be necessary and provisions for them should be made.

*1.29 Section 2.2.4.5 It is not clear where the isokinetic sampling will take place. Depending on location, the instrument and lines may have to be heat traced.

1.30 Section 2.2.4.5 refers to extreme winds as 21 mph. Winds at Fernald are likely to be routinely higher than 21 mph.

1.31 Section 2.2.4.7 must be supported by information outlining the conversion of the VIT PP into a centralized maintenance facility. How will this be done? When will it be done? What provisions for contamination control will be added to the VIT PP? Are necessary modifications to be completed by this project? In addition, It using the VIT PP for maintenance may be troublesome since it was not designed for this purpose.

1.32 Section 2.2.5.2 states the safety strategy and level of documentation will be outlined in the Safety Basis Implementation Plan. What is the status this plan?

1.33 Section 2.2.5.2 refers to Fluor Fernald effort to recategorize Silo 3 as a radiological facility. Will recategorization impact the design? What category is the current basis of design?

1.34 Section 2.2.5.3.1 states that maintenance and operations personnel need access to equipment in radiological areas. What are the requirements for access? Self monitors? Step off pads? Respiratory equipment? Are there applicable site procedures that?

*1.35 Section 2.2.5.3 states that there may be locations in the facility where Silo 3 material and contaminated equipment will not be handled remotely. There is no discussion of these locations or what remote activities may/may not be required.

*1.36 Section 2.2.5.3.2 states"Health physics monitors shall be provided within the facility..." There is no indication in the design documentation as to location, type or numbers of these monitors.

*1.37 Section 2.2.5.3.3 states that personnel radiation exposure will be limited to 800 mrem/year. However, Table 2.2-1 permits 832 mrem/year.

1.38 Section 2.2.5.3.5 states that Silo 3 must maintain radon concentrations at the fence less than 0.5 pCi/L. Is 0.5 pCi/L the Silo 3 allocation of overall site radon limit, or is it the Silos project contribution?

1.39 Section 2.2.7 seems to be a general DOE natural phenomena criteria. Are there specific Fernald criteria that mitigate these requirments. (e.g. the need to design for flood)?

*1.40 Section 2.2.8 refers to Table 2.2-2. There is no Table 2.2-2, it's 2.2-3. In addition, is the conceptual design this numbering system based on, or linked to, the Silos Project WBS?

1.41 Section 2.2.9.1 should contain references to requirements for Construction Acceptance Testing. Conceptual Design must consider and include provisions to support Construction Acceptance Testing.

*1.42 Table 3.1-1, TMRS-004: What is the pneumatic conveying system and how does it work? Who is the vendor? How is it moved? How is it adjusted? The design documentation does not provide adequate detail concerning the vacuum device despite its being the basis for initial retrieval of Silo 3 material.

*1.43 Table 3.1-1, TMRS-004 states "provide the ability to unclog mechanical and pneumatic conveying systems." The design does not appear to be compliant with this requirement.

*1.44 Table 3.1-1, TMRS-005: This requirement should ensure the excavator is designed so that it doesn't have enough mass, speed, or traction, to structurally damage the silo. The design package provides no evidence that this requirement has been met.

1.45 Table 3.2-1 MTS-004: Refers to a 'Homogeneous product.' The product will also have to be 'flowable' to be discharged from the mixer.

1.46 Table 3.3-1, CHS-001: This requirement should reference site standards, or identify RM-0045 as a site standard.

1.47 Table 3.3-1, CHS-006: The design appears compliant with this requirement although the requirement is inadequate. The design currently holds that the absorbent is placed in the bottom of the container—where free liquids are not likely to accumulate. Also, the type and quantity of absorbent is not identified.

1.48 Table 3.3-1, CHS-008:The design is not compliant with this requirement—it does not ensure that filled containers of off-specification material are "staged in a controlled manner."

*1.49 Table 3.3-1, CHS-009: The design does not define a container/liner receipt and inspection regimen to ensure container integrity prior to filling.

1.50 Table 3.4-1: Does solid waste include HEPA filters and the removed sections of the silo wall?

*1.51 Section 3.5 refers to the Process Vessel Vent System as maintaining "the necessary negative pressure." However, the necessary negative pressures are not identified in the design documentation.

1.52 Table 3.6-1, WWS-005 requires that "no listed or characteristic hazardous waste" is discharged to the AWWT. The design does not appear to be compliant with this

requirement. This requirement may be overly restrictive (and nearly impossible to meet).

*1.53 Table 4.1-1, CSL-001 requires egress routes for personnel. The current design shows no egress routes on the drawings. CSL-002 requires change facilities for both male and female workers. How many workers do these facilities need to accommodate?

*1.54 Table 4.1-1, CSL-006 requires equipment to be located for ease of operation and maintenance. Filters (FLT-71-5770 A, B and C) are located on the third floor roof and require personnel access via a cage ladder. Replacing the filters will require crane support. The location of these filters is an example of non-compliance with this requirement.

1.55 Table 4.1-1, CSL-006 requires the design to address ergonomic issues. However, there is no discussion of ergonomic issues in the design.

*1.56 Table 4.1-1, CSL-007 requires an identification of methods for major equipment repair and space/egress routes for major repairs. The design does not demonstrate compliance with this requirement.

1.57 Table 4.1-1, CSL-009 requires facilities to be capable of receiving and appropriately storing chemicals. The design does not demonstrate compliance with this requirement.

1.58 Table 4.1-1, CSL-010 requires meeting ALARA principles for personnel exposure. The design does not demonstrate compliance with this requirement.

*1.59 Table 4.1-1, CSL-012 requires stairways for personnel access. Design provides a cage ladder for access to HEPA filters on the roof. Personnel should have stair access to roof for compliance with this requirement.

*1.60 Table 4.1-1, CSL-013 requires space allocations be defined for support equipment and services. The design does not demonstrate compliance with this requirement.

1.61 Table 4.1-1, CSL-021 Does the ISA pad meet the standards outlined in this requirement (i.e ACI-318 and ACI-301)?

*1.62 Table 4.1-1, CSL-024 requires adequate lighting, noise reduction and identification of high noise areas. No discussion of lighting, noise reduction or identifying high noise areas is found in the design.

*1.63 Table 4.2-1, HVAC-001 requires controls and containment of contamination as well as maintenance of negative pressure. The design does not demonstrate compliance with this requirement. It is lacking in information on maintenance of a

negative pressure when the silo wall is breached and how air will flow through the facility.

*1.64 Table 4.2-1, HVAC-004 requires filters to be placed in "easily accessible areas." The design is not compliant with this requirement.

*1.65 Table 4.2-1, HVAC-005 requires analysis showing the adequacy of the filtration system. The design is not compliant with this requirement as no such analysis has been presented.

*1.66 Table 4.2, HVAC-008 requires maintenance of a minimum air velocity of 150 ft/min across openings. The grate area in the excavator room may not maintain a velocity of 150 ft/min. However, the data necessary to confirm this to was not provided with the design.

*1.67 Table 4.2-1, HVAC-009 requires filter testing. The following filters do not include testing capability: Supply HEPA Filter (FLT-11-5070), Makeup Air Filter (FLT-19-5212), Rooftop HVAC inlet (ACU-70-5700, 5710, 5720) and the HVAC outlet (FLT–71-5770-A, B, C). If credit is being taken for these filters removing particulate, then test capability must be provided.

*1.68 Table 4.2-1, HVAC-011 requires pressure differentials to assure air flow from least contaminated to most contaminated areas. The design does not demonstrate compliance with this requirement. If the requirement is met, some doors may require 100 lbs pressure to open. The project may need to add levers to initiate door opening.

1.69 Table 4.2-1, HVAC-012: Is this requirement applicable to any equipment or area other than hoods? The CAT cannot determine whether the design complies with this requirement.

1.70 Table 4.2-1, HVAC-017 requires an estimation of radon release through modeling. The design does not demonstrate compliance with this requirement.

1.71 Table 4.2-1, HVAC-018 requires continuous radon monitoring. Design narrative is not clear that this requirement has been met. Also, the requirement states data will be recorded "as required." A definition of 'as required' is needed.

*1.72 Table 4.3-1, UTIL-003 requires cathodic protection. The design does not refer to cathodic protection or identify any such requirements.

1.73 Section 4.3.2.3 states that the length of breathing air hose 'shall be minimized.' The CAT cannot assess compliance with this requirement without more information on acceptable hose lengths.

1.74 Section 4.3.4 shows firewater supplied by one hydrant. Is this sufficient?

1.75 Table 4.4-1, MECH-001: Modularization presents many benefits. However, modules must be closely coordinated with other modules as well as with facility equipment (e.g flanges, bolt size, bolt patterns, rebar needs, etc.). Also, modules need to include vendor data (spare parts, manuals, specifications, etc.)

*1.76 Table 4.4-1, MECH-003: This is a poor requirement. Sound engineering requires derating equipment, which ensure non-compliance with this requirement. Suggest deleting this requirement.

1.77 Table 4.4-1, MECH-006: Currently it is difficult to tell where piping is and what credit is being taken for secondary containment. Therefore, it is difficult to determine compliance with this requirement.

1.78 Table 4.5-1, ELECT-010: Does providing a red pilot light to indicate operating equipment meet Fernald site standards? Generally, green indicates running, red indicates stopped.

1.79 Table 4.5-1, ELECT-015: This requirement should also ensure bulb replacement is considered.

1.80 Table 5.2-1: This table does not define sample size. What is the sample size required for this project?

1.81 Table 5.2-1, SAM-001 requirement states 'integrate the sampling system." What does this mean?

1.82 Table 5.3-1, GEN-002 states "Select only commercially available equipment/ material." Because the design has not matured to the point of equipment selection, compliance with this requirement cannot be determined. The CAT recommends commercially available equipment be selected when appropriate.

*1.83 Table 5.3-1, GEN-003: Cannot assess compliance with this requirement since this document has not been submitted for review. The safety basis should be referenced in this requirement.

*1.84 Table 5.3-1, GEN-007 requires remote and/or local viewing capability of key processes. The design does not demonstrate compliance with this requirement.

1.85 Table 5.4-1, SD-010, The first statement in this requirement is confusing and not a complete sentence.

1.86 Table 5.4-1, SD-012, Has the required vibration test been performed? Also, are the single sacks vibrated or the entire Gondola car? What are the results intended to prove?

*1.87 Table 5.5-1 lacks information on the control system software and does not identify configuration control requirements for the software.

*1.88 Table 5.5-1, CS-004: This requirement should also ensure that the computer retains a certain minimum amount of storage space for data.

*1.89 Table 5.5-1, CS-005: These requirements should ensure that the process display complies with Fluor Fernald site standards.

*1.90 Table 5.5-1, CS-016 requires control operator monitoring capability of HVAC damper lineup. Current design does not demonstrate compliance with this requirement.

1.91 Table 5.5-1, CS-018: This requirement is poorly written and should be re-written.

1.92 Table 5.5-1, CS-022: Term "appropriate enclosures" should be defined or a reference should be given to determine requirements (waterproof? weather proof? explosion proof?)

*1.93 Section 5.6.3 refers to Appendix B. There is no Appendix B, the ARAR's list is Appendix A.

*1.94 Table 5.7-1, RnC-002: There are two Tables 5.7-1. Also, 0.2 working level is the hourly average in one table 5.7-1 and the instantaneous value in the other Table 5.7-1. This must be clarified.

*1.95 Table 5.7-1, RnC-003 requires 'immediate action' in the event radon limits are exceeded. While 'immediate action' is not defined, the current design does not provide for any obvious options that might constitute 'immediate action.'

*1.96 Table 5.7-3, IRE-001: There isn't an Appendix B.

*1.97 Table 5.7-3, IRE-003 requires air sampling equipment be placed in strategic locations to detect airborne contaminants. The design is not in compliance with this requirement.

*1.98 Table 5.7-4, RC-002 requires secondary containment for 100% of stored material. Current design provides curbed areas, but doesn't provide enough information to determine if they are appropriately sized.

1.99 Table 5.7-5, RDC-002 requires consideration of stainless steel cell lining for potentially contaminated areas. Excavator Room could require a stainless steel liner.

1.100 Table 5.7-4, RDC-004 requires access to tanks and vessels for inspection and cleanouts. In addition, mechanical devices will be necessary to help lift and move access manways.

1.101 Appendix A, ARAR's list, Pg. 8 refers to empty container regulation. The Compliance Strategy states that containers are "not planned to be emptied." If off-specification material is produced, this item could present a compliance difficulty.

2.0 Silo 3 Project Access and Retrieval Strategy

2.1 Section 1.1, This section needs the proper title and document number for Silo 3 Process Description.

2.2 Section1.1.2, Why is the opening in the silo so large (15ftx20ft)? What are the basis and logic for opening size?

*2.3 The excavator's bearings, rotating surfaces, and sliding surfaces need to be protected against the abrasive Silo 3 oxide. Sealed bearings, sealed shafts, etc. will be required.

2.4 Section 1.2: What is the definition of "cold" metal oxide?

2.5 Section 1.2: The discussion on RCRA applicability is confusing, a clearer discussion would be helpful.

*2.6 Section 1.2, page 2, third bullet refers to "Miscellaneous debris such as simple hand tools..." If large amounts of silo material are being removed by excavator, the most obvious point to observe debris is at the bin grating. The design shows no ability for the excavator, bin or conveyor to to deal with significant debris (e.g. handtools). Should foreign material enter the steep incline conveyor, what is the corrective action? Provisions should be made to mitigate the risk of debris passing the grating and entering the conveyor. In addition, a recovery action and recovery plan should also be prepared. How is debris collected and disposed?

2.7 Section 1.2, page 2 refers to the Silo 3 material being "compacted at the perimeter." What is the definition of the "compacted perimeter"?

*2.8 Section 1.2, page 2, last paragraph refers to "recent particle size analysis." Where is the reference for the analysis, who performed this analysis, and what were the results?

2.9 Section 1.2, top of page 3 indicates the moisture content ranges from 3.7-10.2%. However, the PFD uses a moisture content of 3.2%. Why the difference?

*2.10 Section1.3: This section should include a sketch of the silo and the manways.

2.11 Section 1.3.1: This section should reference the Safety Basis Requirements.

*2.12 Section 1.3.2: Is there a Fernald definition of critical lifts? If so, it should be referenced.

*2.13 Section 2.0, First bullet refers to a weather enclosure over Silo 3. The design is incomplete in outlining the personnel access, design features and ventilation requirements of the enclosure. What are the utility needs in the enclosure?

*2.14 Section 2.0, second and third bullet do not adequately describe how the cameras, lights and ventilation are installed, operated and maintained.

*2.15 Section 2.0, fourth bullet does not contain sufficient detail in its description of the insertion of the pneumatic hose into the manway or its manipulation. A more detailed description and drawing are necessary.

*2.16 Section 2.0, fifth bullet does not contain sufficient detail in its description of cutting the opening in the silo wall. It is unclear how the size of the initial hole will be determined. The CAT is also concerned about the ability to precisely cut the silo wall using the mechanical excavator and handle silo wall sections (e.g. grappling, moving, etc). Is the excavator a rigid enough support for the saw? Will the saw bind? Can the saw be adequately controlled? When the cut takes place, the saw cooling water may not drain to the sump (which is in the corner) but drain into the grate. The CAT suggests mocking-up and demonstrating the wall cutting and segment removal on Silo 4 to ensure the remote/operability concerns are understood.

*2.17 Section 2.0, sixth bullet is not sufficiently detailed in describing the following operation, the pneumatic hose is "perhaps manipulated by attachment to excavator arm...until the opening is large enough to deploy excavator."

2.18 Section 2.0, last bullet refers to material retrieval continuing until "all" material is retrieved. The definition of 'all' should be included or referenced in the text.

2.19 Section 2.0 seems the appropriate place for a description of the process for installing platforms on the top of the silo.

*2.20 General comment: How are segments added to the pneumatic wand system. How is it manipulated? How heavy is it? Is the hose flexible? Is it stiff? What are the systems dimensions? How is it maintained? How many operators are needed? What is its capacity for transporting solids? How will it be moved from manway to manway? This information is necessary at the conceptual design stage to demonstrate the feasibility of the concept.

*2.21 General comment: It is unlikely that the CCTV will be useful in monitoring activities in the silo (cameras will be fogged and clouded). Fluor should consider a back-up system should the CCTV not prove suitable (e.g. a concept similar to GPS?)

*2.22 Figure 4: "Stop and Caucus" is not an acceptable action for recovery. For each 'Stop and Caucus" step, the project should instead develop a recovery plan/backup plan as part of the safety analysis.

2.23 Figure 4: Last diamond states, 'Exceed material criteria during removal" What are these criteria?

*2.24 The design does not provide adequate description of the CCTV and lights installation and operation. CCTV and lights in the silos should be attached to reach rods to permit raising and lowering.

*2.25 Section 3.2: Training for the mechanical retrieval will be critical. Hose management (with multiple hoses running to the excavator) will be very difficult from an operator standpoint. The most probably maintenance activities should be mocked up; procedures prepared, demonstrated and approved; and personnel trained to the procedures to minimize excavator entry and residence time.

2.26 Section 3.2, last paragraph: The excavator should have been selected by now. When will it be selected? The assumed size seems larger than the CAT expected. Why has such a large excavator (verses a smaller bobcat type) assumed?

2.27 Section 4.1: Is the silo enclosure material porous or absorbent? If it is contaminated, can it be decontaminated?

3.0 CAT Comments on the Process Description for the Silo 3 Project, Document No. 40430-RP-0003, January 11, 2002, Revision A

Equipment and instrument titles and designations obviously have not been checked. In the following comments we identify many inconsistencies and errors to illustrate the magnitude of the problem.

*3.1 Section 1.0 states that "Most systems...are intended to be operated remotely (as much as possible)." The operating and maintenance philosophy of the project is very confusing. This unclear statement of "as much as possible" only contributes to this confusion. Presently the material excavator appears to be the only remotely operated equipment.

3.2 Table 1-1, System 44 is the Additive System. In the Design Basis (2.2-2) it is the Product Additive System.

*3.3 Table 1-1, System 70 is the Treatment Building Supply Air System. In the Design Basis (2.2-2) it is the Building Supply Air System.

*3.4 Table 1-1, System 71 is the Treatment Building Exhaust Air System. In the Design Basis (2.2-2) it is the Building Air System.

*3.5 Table 1-1: the Design Basis includes 15 systems not identified in the Process Description document (e.g. radon control system, container decontamination system, maintenance equipment system, etc).

*3.6 Section 2.0, second paragraph claims several pieces of equipment listed are discussed in the A&RPD. However, they are not found in the A&RPD and are therefore not addressed in any detail in the design documentation.

*3.7 Section 2.1: Description of the pneumatic transfer system is inadequate.

*3.8 Section 2.2, fifth bullet identifies pump PMP-11-5058 as the Vestibule Sump Pump. In the Equipment List it is identified as the Excavator Room Sump Pump.

3.9 Section 2.2.4: This discussion is out of place in this section. System 11 should be discussed as part of the silo ventilation section.

3.10 Section 3.0 should include discussion of the specific remediation goals of the stabilization process.

3.11 Section 3.0 states that the formulation "has not yet been identified." It is very late in the design process to not have a developed formulation. When will it be decided upon.

3.12 Page 3-1, footnote 4: Is the study cited in this footnote complete? If so, are the results available?

3.13 Section 3.2.2: Dust control provisions should be considered for the Additive System Operation.

3.14 Section 3.2.3: The Safety Analysis Report will have to address human factors and chemical safety issues pertaining to the Additive System Operation (particularly in regards to the reductants).

3.15 Overall, the process systems would be better described if references to the process flow diagrams or a simple block diagram were included.

3.16 Section 3.2.3, page 3-4, point 2: Does this (or any other) solution that might be used need to be heated, cooled, sampled, or agitated?

3.17 Section 3.2.3, page 3-4, point 3 refers to the use of a mass flow meter. A turbine meter would be simpler, cheaper and more robust than a mass flow meter for this application.

*3.18 Section 3.2.4 assumes a maximum of 2% fines. What is the basis for this assumption and how will it be validated?

3.19 Section 3.3.1, last bullet: A V-belt drive motor is planned to be used. V-belts need adjustment which may not be wise in this application. A gear drive would likely be more appropriate.

3.20 Section 3.3.2: This section is lacking in its description of the mixer.

3.21 Section 3.4.2: Again, the use of a mass flow meter is overly complicated. A turbine meter would work better.

3.22 Section 3.6, top of page 3-8, "After a suitable mixing period..." the tanks contents are sampled and analyzed. How is suitable defined?

*3.23 Section 3.6, page 3-8, last sentence: If waste water doesn't meet AWWT WAC it "will be treated physically and/or chemically to meet the WAC." What is the plan for physical and/or chemical treatment? And where will the treatment occur? Also, it may be appropriate to reproduce the AWWT WAC table here.

*3.24 Section 4.2 does not outline a process for inspecting and accepting sacks or liners upon receipt.

3.25 Section 4.2, page 4-1, item 4 refers to the manual addition of absorbent prior to waste filling. How is absorbent added after sack is hooked up and inflated? How

much absorbent is added? How does the absorbent work on the bottom of the bag when free liquids will likely be at the top of the liner.

*3.26 Section 4.3, third paragraph: It is likely the filling area will be contaminated shortly into operations.

*3.27 Section 4.3: How is the fill spout prevented from dripping? What happens if waste is spilled on the floor? Again, draft specifications for this equipment would be helpful.

3.28 Section 4.4: Are samples collected manually? How large are the samples?

*3.29 Section 4.6: Refers to sacks that don't pass smear to "await further processing and/or decontamination" What plans exist for processing and/or decontamination? The CAT suggests consideration of overpacking as a potential solution.

3.30 Section 4.7: How many sacks are placed on each truck?

*3.31 Section 5.0 has an inadequate discussion of controlling a negative pressure on process vessels.

*3.32 Section 5.1 refers to the ultra low penetration air units. What is the expected performance of these units? What particle sizes are removed and to what efficiency?

*3.33 Section 5.2.2: How is a negative pressure maintained when adding wand sections?

*3.34 Section 5.2.5: Bins A and B are vented through 'rigid' connections. Load cells won't provide accurate measurements if connections are rigid. Also, vacuum relief devices are not needed here because the vessels are vented.

*3.35 Section 5.4.2 Dust collector remove the "larger particles." How is larger defined?

*3.36 Section 5.4.3 says ASHRAE filters are rated at 30% and 95%. The process system drawings say they are rated at 35% and 65%. And the HVAC drawings indicate 35% and 90%. The ratings of the ASHRAE's should be clarified and presented consistently.

*3.37 Section 5.4.4: The process exhaust fans are rated at 4,500 CFM and, according to the process flow diagrams, are planning to operate at 4,499 CFM. Design point for vessel vent systems are always inadequate or marginal. There should be at least a 50% excess capacity.

*3.38 Section 5.4.5: More definition of the sampling system is necessary. What is sampled? What is monitored? How frequently does a person have to take a manual sample from the stack?

3.39 Section 6.0: The filter banks should have adequate filters to ensure flow per filter stays in the range of 1,000 CFM. The HEPA filters are more likely fail as the flow nears 1,500 CFM.

3.40 Section 6.1.2 refers to meeting "guidelines" in the design basis. Is the Design Basis "guidelines" or "requirements?" Also, all applicable guidelines should be referenced.

*3.41 Section 6.1.3: The description concerning the Silo 3 enclosure must be much more detailed. Especially in regards to ventilation issues. 6.1.3 states that the exhaust system joins the main HVAC duct. However, this stream is not shown on the drawings. The Silo 3 enclosure ventilation must be included, otherwise the existing system is vastly undersized (HEPAs, fans, etc).

3.42 Section 6.1.5 states that each HEPA bank includes an ASHRAE prefilter. To increase the life of the HEPA filters, two ASHRAE's in series should be included per bank.

*3.43 Section 6.3.2 states that breathing air connections will be in contaminated areas. Later, the document states that they will be outside of contaminated areas. Breathing air connections should always be outside contaminated areas. Also, the breathing air system should provide an audible alarm to alert the user of a low pressure condition.

4.0 CAT Comments on Equipment List for the Silo 3 Project, Document No. 40430-LST-0001, January 11, 2002, Revision A.

4.1 The Equipment List contains neither the breadth or depth of information necessary or expected for conceptual design.

5.0 CAT Comments on Process Control Plan for the Silo 3 Project, Document No. 40430-PL-0003, January, 2002.

5.1 This document is stamped "Information Only, Uncontrolled." For Conceptual Design, this document should be reviewed, issued and placed under change control.

*5.2 It appears that this entire section was copied and pasted from the RMRS documentation. As a result, the waste form is incorrect and the text is inconsistent with the design drawings. Lastly, it doesn't appear that the document was checked prior to its inclusion in the process control plan.

5.3 Section 2.1 states that the Envirobond "Reactions are not known." To utilize Envirobond, much more information is necessary. The bottom of page 2-2 notes a

85% waste loading in briquettes. How is this determined if the formulation is unknown?

5.4 Section 2.3.1 states "Laboratory results demonstrate the effectiveness of the treatment formula." How will the lab demonstrate such effectiveness? Also, why should it be assumed that a production facility will replicate lab results?

5.5 The numbering of sections skips Section 2.2.

5.6 Section 2 should include data on heats of reaction. Also, there should be a more detailed discussion of the formula, addition sequence, batching accuracy, and function of reductants.

*5.7 Section 3.0: P&IDs should be referenced in the text of this section.

*5.8 Section 3.1.1 refers to the Baghouse Inlet Valve (AOV-10-5010). It is numbered DMP-10-5010 in the drawings.

*5.9 Section 3.1.1 refers to the Cyclonic Baghouse. In all other design documents it is referred to as the Dust Collectors.

*5.10 Section 3.1.1 refers to the Baghouse Discharge Dump Gate Valves (AOV-10-5014A/B). They are numbered as VDD-10-5014A/B in design drawings.

*5.11 Section 3.1.1 refers to the Convey (sic) Blower Current Transmitter (IT-BLR-10-5006). It is numbered as II-BLR-10-5006 in design drawings.

*5.12 Section 3.1.1 refers to the Blower Discharge Valve (AOV-10-5028). It is numbered as HOV-10-5028 in design drawings.

*5.13 Section 3.1.1 refers to Pressure Control Valve (PCV-10-5033). It is numbered as PCV-40-5033 in design drawings.

*5.14 Section 3.1.2 states that the pneumatic retrieval system 'will be mechanically maneuvered through a local vendor control panel." What is mechanical maneuvering? What is the mechanical arm? The Process Description states that the arm is manually maneuvered.

*5.15 Section 3.1.2, top of page 3-2: These filters (FLT-10-5004) will require shutdown for filter replacement.

*5.16 Section 3.1.3: Baghouse Inlet Valve (ZIO-AOV-10-5010) and Blower Discharge Valve (ZIO-AOV-10-5028) could not be found on the drawings.

*5.17 Section 3.1.4, Control Device ZS-AOV-5010 is listed on the previous page as ZIO-AOV-10-5010 and on the design drawings as DMP-10-5010.

*5.18 Section 3.1.4, Control Device PDIT-FLT-10-5004 is numbered as PDI-FLT-10-5004 in the design drawings. Also there are three filter banks: 5004A, B and C.

*5.19 Section 3.1.4, Control Device ZS-AOV-5028 is numbered as ZIO-AOV-5028 on the previous page.

*5.20 Section 3.2.1: Vestibule Sump Pump (PMP-11-5058) is named and numbered as Excavator Room Sump Pump (PMP-55-5642) in the drawings and equipment list.

*5.21 Section 3.2.1: Vestibule Sump Pump Level Switch (LSL/H-11-5058) is named and numbered as Excavator Room Sump Pump (LSL-H-55-5642) in drawings and equipment list.

*5.22 Section 3.2.2, typo, "Step Incline Conveyor" should be "Steep Incline Conveyor."

*5.23 Section 3.2.2 states that the grate will allow particles of four inches to proceed to the Conveyor. According to the Process Control Plan (section 3.2.2 page 3-4), the grate will allow particles of 3 inches to pass. Which of these numbers is correct? Is there a delumper ahead of the conveyor to break up large chunks? Will a 3 or four inch lump stall the steep incline conveyor? If so, what is the recovery plan?

*5.24 Section 3.2.2, bottom of page 3-4: "The operator will be required to manually set the process ventilation routes from the various equipment using a series of manually actuated dampers." Controlling the HVAC system through manual dampers will be extremely difficult during facility operations. Further, it will require highly trained personnel.

*5.25 Section 3.2.2 states "Means will be provided to communicate Inclined Conveyor and other equipment status to the mining operator." What means?

*5.26 Section 3.2.3, Interlock Initiator LAHH-TNK-55-5600 does not appear to be on the drawings.

*5.27 Section 3.2.4, Alarms (PDIT-FLT-5070) do not appear to be on the drawings. Also, this alarm is a high high. The CAT questions the need for a high high when the high alarm causes shutdown.

*5.28 Section 3.2.4, DFC-11-5056 does not appear to be an alarm as stated here but rather is an interlock. If this shuts down on high current, what is the action/recovery plan?

*5.29 Section 3.3.1 refers to Feed Samplers (SSS-16-5130A/B). There are no such samplers on the drawings.

*5.30 Section 3.3.1 numbers Pneumatic Convey (sic) Material Feeder Current Transmitter as IT-FDR-16-5100. On the drawings it is numbered as IA-FDR-16-5100.

*5.31 Section 3.3.1 refers to Bin Weigh Transmitters WIT-BIN-16-5102A/B. These cannot be found on the drawings.

*5.32 Section 3.3.2, bottom of page 3-7 states that a Loss in Weight calculation will be performed to determine the speed of the screw feeder. The design documentation gives no indication that the screw feeder has a variable speed motor. In addition, it does not make sense to use batch weight to calculate speed.

*5.33 Section 3.3.2, top of page 3-8: Sampling system (SSS-16-5130A and B) do not exist on the drawings.

*5.34 Section 3.3.5 requires only total weight per bin batch. Initial weight and final weight should also be recorded.

5.35 Section 3.4.1.2: Stabilizing Agent Bulk Bag Hoist/Monorail is numbered as CRH-44-5410. It is numbered as CRH-44-5320 in the drawings.

5.36 Section 3.4.1.2: LIW Bulk Bag Unloader A and B Feeders are named Bulk Bag Unloader A and B on the drawings.

*5.37 Section 3.4.1.2: LIW Dust Collector Fines Feeder are Feeder for Dust Collector Fines on the drawings.

*5.38 Section 3.4.3, bottom page 3-11 names the Fines Holdup Bin Level Alarm High. In the equipment list it is named the Feeder for Dust Collector Fines.

*5.39 Section 3.5.1: Many of the numbers in this section are inconsistent. For example, System 17's are system 44 and 50's in the drawings.

5.40 Section 3.5.2, middle of page 3-14: This section should include discussion of the formulation, mixing time, and sequence of material addition. Also, the second paragraph on 3-14 refers to the product being a "suitable consistency." How is suitable consistency determined?

5.41 Section 3.5.2, top of page 3-14 refers to reducing agent addition based on analysis results. What analysis results are being referred to? More explanation is needed.

*5.42 Section 3.5.5, last paragraph refers to Appendices A and B. There are no appendices in this document.

5.43 Section 3.8.2, last sentence states, "If contents are not cleared for treatment by AWWT then..." When will this sentence be completed?

5.44 Section 3.9.2, page 3-26 outlines a great deal of apparently hands-on operations for the operators. Still, the design documentation has very little discussion of exposure issues and operating philosophy as it pertains to these operations. If treatment is eliminated many of these steps may be complicated by the presence of dry, airborne material during container filling operations.

*5.45 Section 3.9.2, page 3-27 refers to a Decontamination Staging Area. More discussion is necessary outlining the location and features of this area.

*5.46 Section 3.9.2, page 3-27: What is the assumed performance (e.g. turnaround time) of FEMP laboratory? Do laboratory requirements for turnaround time exist?

*5.47 Section 3.9.2, page 3-27: Crane CRH-25-5258 is listed as CRH-25-5280A and B on drawings.

5.48 Section 4.2 "To be supplied." When will it be supplied?

*5.49 Section 4.1.2, Makeup Air System: The control of this system is extremely complicated from an operator standpoint given the system of manual dampers.

5.50 Section 4.4.2: What is a "coalescent" filter?

*5.51 Section 4.4.5 states that "No plant controller interface will be provided with the skid units." What exactly does this mean?

6.0 CAT Comments on Drawings

The CAT found the following documentation suitable for conceptual design:

P&Ids
Electrical Design information
Civil Drawings
Architectural drawing (although lacking dimensions)
General Arrangement drawings
Structural drawings for framing the silo wall opening

Specific comments are as follows:

*6.1 Sheet G3104: The drawings do not provide adequate information on the silo enclosure. More details are needed to identify any potential impacts on design of major process systems.

*6.2 Sheet G3104, Note 5: Fluor should be responsible for providing necessary as-built drawings to all subcontractors.

*6.3 Sheet A0005: These drawings should include dimensions.

*6.4 Sheet A0006: This drawing shows the difficulty of accessing these HEPA filters for change out.

6.5 Sheet A0007: It appears that portions of the Additive Bin Area room are at least 75 feet from the stairs. Depending on the Life Safety Code, another exit may need to be provided.

*6.6 Sheet F0002: This drawing emphasizes CAT HVAC concerns. Note 2 states that Stream 9A is used only for vacuum retrieval. This appears to conflict with the mass balance table and text that includes flow for Phase II. The drawing should show the pressure drops across dust collector, HEPA filters, and pneumatic conveyor. Also, are the bins under a negative pressure?

*6.7 Sheet F0002: HEPA FLT-10-5004 does not have a redundant filter. Therefore, replacement will require shutdown. Because there is no redundancy for this filter bank, pressure differentials will be critical.

*6.8 Sheet F0002: Stream 12's bin hood velocity should be approximately 150 feet per minute. Is the hood velocity 150 feet per minute?

*6.9 Sheet F0002: FLT-10-11-5070 cannot be tested or replaced without shutdown.

*6.10 Sheet F0001 does not show a stream number between the dust collector and the HEPA filter. Solids can be expected downstream although the drawing shows no solids in any stream beyond 8 (except stream 28).

*6.11 Sheet F0001: Stream 15 shows 2500 SCFM (at 220 degress F, which is probably low) but there is only 1000 SCFM going into the blower. Where is the source 1500 SCFM come from?

*6.12 Sheet F0001: Stream 1A under Phase 2 indicates a density of 42.4 pounds per cubic foot. Silo 3 characterization data indicates a density of 29-58 pounds per cubic foot. Some fluffing will occur during retrieval and bagging.

*6.13 Sheet F0001 should include a note that outlines operating basis assumptions (number of operating days, number of hours per day, etc.)

*6.14 Alternating between CFM, ACFM, and SCFM is confusing for the reviewer. Presentation of air flows using consistent units (preferably SCFM) would be helpful.

*6.15 Why is there redundancy on the vessel vent system (two dust collectors) but only a single collector on the pneumatic retrieval. The pneumatic system is much more likely to plug more frequently than the vessel vent system.

*6.16 Sheet F0004: How is ambient air entering FLT-19-5212 controlled?

*6.17 Sheet N0100: The valve controlling water addition to the excavator (HOV-50-5098) is hand operated. The excavator operator will need to have the capability of controlling water misting.

*6.18 Sheet N0100, Note 1 includes a reference to "spool pieces." What are the spool pieces and what are they for?

*6.19 Sheet N0100: Lines and line designators are not identified.

*6.20 Sheet N0100: Pneumatic transfer line is 6 inch diameter and appears to transfer at a velocity of approximately 80 feet per second. This high velocity will cause severe erosion in the line.

*6.21 Sheet N0102: The bins have pressure relief valves. Given that the bins are vented, there doesn't appear to be a need for the valves.

*6.22 Sheet N0102: The bins inlet and outlet conveyors must be interlocked so that they cannot both operate simultaneously. Otherwise batch weight calculations will be erroneous.

*6.23 Sheet N0101 Interlock 17 provides for shutdown of blower upon low pressure. Why is this?

*6.24 Sheet N0103, Note 2 refers to inflatable valves. What are these? Are these maintenance-free or are there maintenance concerns? Do they fail? Is an air supply necessary for inflation (not currently shown on the drawings)?

6.25 Sheet N0103 states that mixer motors are 2 speed. Why is this?

*6.26 Sheet N0107 and N0108: Mass flow meters are included on the reductant addition lines. These are not necessary, turbine meters would be more appropriate.

6.27 Sheet N0107 and N0108: Are tanker trucks immediately available for this application?

6.28 Sheet N0111: What is the purpose of damper DMP-19-5219?

*6.29 Sheet N0111: Dampers DMP-11-5070 and DMP-19-5240 should be on automatic pressure control.

6.30 Sheet N0111 Interlocks 31 and 32 shut down blowers if high radon is detected. What is the advantage of shutting these blowers down if high radon is detected?

6.31 Sheet H0003: The HVAC system in the treatment facility is composed of five independent air streams. Balance and control of this system will be very difficult using manual dampers.