

# Critical Analysis Team Report

## CAT Report #23

15 September 2001

The Critical Analysis Team (CAT) has reviewed the Silos Project Engineering Execution Plan (EEP), the Silos 1 and 2 Conceptual Design Package, and Jacobs Engineering Silos Project organization. This report outlines CAT comments and concerns identified during these reviews.

### Review of Jacobs Engineering

1. Jacobs appears to have a reasonably sound design team, accepted management mechanisms, structured document control systems and seasoned safety support, particularly in regards to thorium and radon control. Project controls appears to understand the importance of EVMS reporting but has not yet fully implemented this concept. Successful implementation of EVMS reporting requires management interest and support.
2. Currently, the Silos 1 and 2 schedule is not a useful document. It does not contain a critical path, interim milestones or sequential logic. Personnel responsible for each task should identify work logic and then estimate schedules with interim milestones and resource requirements. These estimates are then rolled-up to the project master schedule and cost estimate. It currently appears that the schedules and cost estimate are not being created in this bottoms-up approach but are rather created from the top-down.
3. The importance of remote systems mock-up, demonstration and testing before completing final design and initiating procurement cannot be overemphasized. This activity is fundamental to the ultimate success of this project. Mock-ups and demonstrations must simulate actual work conditions including operations and maintenance, protective clothing, breathing air, etc.
4. The Jacobs team appears to have an appropriate engineering skill mix. However, it is very difficult to find personnel experienced in remote operations and maintenance. Such talent will be critical to project success. Jacobs should make efforts to augment the design team with specialized remote experts.
5. The TTA volume issue has still not been resolved. It should be resolved as soon as possible.

6. The project Work Breakdown Structure (WBS) needs to include a WBS dictionary. Both the WBS and the dictionary need to extend to the task level to provide the necessary information to manage, track and report the work.
7. For the Silos Project, the Fluor teaming partners should be managed as subcontractors. Fluor is ultimately responsible for this project and should be managing accordingly.
8. Currently, Jacobs is not providing performance reports as required by the EEP. Furthermore, Fluor is not been requesting these reports. The EEP however, does not require reporting beyond actual costs. Proper project management should require EVMS type reports.
9. The CAT performed a brief overview of Jacobs Silos Project Document Control Center. Document control activity appeared to be well organized and managed.

### **Comments on Silos 1 and 2 Conceptual Design Package, Rev.A**

The CAT does not consider the package provided a conceptual design for Silos 1 and 2. It is essentially a very preliminary conceptual draft that is not suitable for formal review. The relative immaturity of the design is understandable as Jacobs had been actively designing for little more than six weeks at the issuance of this package. However, the discussions the CAT has had with Jacobs on this draft material have been fruitful and productive.

Because of the early stage of design, the CAT will not offer formal comments on the design documentation but will highlight areas of concern (below) for Jacobs consideration for incorporation in Rev. 0. The CAT's expectation is that the Rev. 0 design scheduled to be released in April, 2002 will be of sufficient quality and detail to support meaningful cost and schedule estimates. The meetings with Jacobs reassured the CAT of Jacobs technical and management capability to complete a sound design for Silos 1 and 2.

1. Numerous errors and inconsistencies were identified in the documents. Better checking is necessary to correct this problem.
2. The exhaust stack location is near the breathing air, building air, and instrument air intakes. During inversions, this could create the potential for contamination difficulties in the systems and the facility.
3. The remediation building has been sized without a complete understanding of the remote equipment or its operation, maintenance, or access requirements. This could result in costly redesign in the future.

4. As part of the Rev. 0 effort, a preliminary time and motion study should be performed on all remote operations to ensure they do not reduce plant throughput. In addition, a preliminary "hands on" RAM analysis should be performed (this does not mean a computer probabilistic analysis, but an understanding of the physical constraints the facility imposes).
5. The Rev. 0 effort should consider life-cycle requirements: (1) decontamination for maintenance activities; (2) decontamination for final shut-down; (3) Health Physics needs (i.e. self surveys, step off areas, donning, doffing areas, etc.). In particular, the Health Physics needs may impact space, instrument, doorway, and airflows considerations.
6. A slurry pump test loop is again recommended using surrogate to determine minimum flow velocities, piping erosion rates, and evaluate performance of pumps, valves and flow measuring devices as specified by the design.
7. The design description defines slurry velocities between 5 and 15 feet/second. The P&ID shows one line between the slurry tank and pump sections that will have a velocity of slightly over 2 feet/second. This line will likely plug quickly at this low velocity. However, velocities in the 8-15 feet/second range will cause severe erosion of piping and failure of piping in a matter of weeks. Velocities should be maintained comfortably above a minimum flow to avoid plugging, but low enough to minimize erosion.

### Engineering Execution Plan Comments

1. The Scope of the Engineering Execution Plan (EEP) is incomplete. The EEP does not outline roles, responsibilities or authorities for OU4 engineering (e.g. life-cycle issues such as construction, operation, and decontamination and decommissioning as well as teaming partner work being performed by Duratek). All teaming partners need to be committed to support the project deliverables, interfaces, schedules, and communications. To resolve this, the EEP should be expanded to include all OU4 engineering efforts. In addition, the EEP is only one portion of a comprehensive Project Execution Plan. As the PEP is being developed, the EEP (scope and content) should be incorporated into the PEP.
2. In the EEP, the roles and responsibilities assigned to the Fluor Engineering Manager are traditionally those of the Project Manager. As the project progresses, this approach will lead to confusion, diffusion of accountability, lack of life-cycle responsibility, and shifting of roles and responsibilities. Because of this, it also appears that the Fluor Project Manager carries little authority or accountability. The Project Manager should retain overall authority, responsibility and accountability for the life-cycle of the project as is outlined in the EEP for the Jacob's Project Manager role, "The project manager is ultimately responsible for all aspects of accomplishing a project." (p. 33 of EEP).

3. The scopes of work are inconsistent between projects (Silo 1 and 2, Silo 3 and AWR). These inconsistencies should be corrected or justified. For example: (1) The Conceptual Design package for Silos 1 and 2 does not require Jacobs to prepare a schedule. For Silo 3, Jacobs is required to complete a schedule and a cost estimate; (2) Under Technical Baseline, Jacobs is required to produce Site Plot Plans and Safety Basis documentation for Silo 1 and 2, but not for Silo 3.
4. The EEP establishes Jacobs as having vendor data approval authority. While Jacobs should serve as a reviewer of vendor data, approval is a project responsibility and should remain with Fluor.
5. According to the EEP, all three silos projects will complete a conceptual design, preliminary design, and final design. However, the EEP does not contain sufficient definition of deliverables to provide a common definition of each of those phases of design. Further, the Jacobs schedule for Silos 1 and 2 conceptual and preliminary design deliverables are only separated by six weeks. The CAT questions the value of issuing two design versions so closely together. The scope of Silos 1 and 2 Preliminary Design Rev 0 as identified in the EEP is, in the CAT's opinion, the next appropriate point for formal issuance and review.
6. The EEP does not assign responsibilities for long-lead procurement. Because of the schedule pressure, it is likely that long lead procurements should be initiated by the first quarter of calendar year 2002. Therefore, it is important that the EEP establish long lead procurement responsibilities.
7. The CAT is confused as to how the 'design-to-cost' concept is being applied to OU4. Design-to-cost as defined in the EEP appears to be little more than simply reporting and tracking actual costs. If the EEP definition is accurate, this approach is woefully inadequate for a project of this complexity and magnitude.

To adequately support a design-to-cost effort, both teaming partners need to develop a baseline cost (existing cost estimates are extremely rough and premature) with sufficient technical basis to adequately understand the effort. The April, 2002 release by Jacobs is likely the first document with sufficient technical content to establish the basis for cost and schedule. However, Jacobs seems to have a system by which they could support a true design-to-cost effort.

Lastly, this design-to-cost effort may violate the Federal Acquisition Regulations (FAR) requirement for a government subcontract estimate (FAR Subpart 36.203, and Subpart 36.605). Design-to-cost and the teaming approach seems to circumvent this FAR requirement.

8. Section 2.2.3.6 states that specifications are to be reviewed by Fluor, DOE, CAT and Jacobs prior to issuance for bid. They are to be reviewed "as they are completed and not as a single package." To perform adequate reviews, specifications must be

- accompanied by appropriate explanatory and supporting information (e.g. drawings, design descriptions, etc).
9. The EEP is not clear on approval and release authority for design documentation. The EEP outlines lead and support responsibilities but does not clearly state the approval authority on the Engineering Deliverable charts or in Section 3 (EEP, p. 13).
  10. The EEP doesn't appear to require a project level change control board. Instead, only the Engineering Manager's approval is required.
  11. Figure 6-1 indicates that the CAT will review and approve DCN's. While the CAT may be interested in reviewing specific DCN's, the CAT should not be identified as an approval authority in the review process.
  12. Page 51 identifies work packages. However, these work packages are not at a sufficiently low project level to provide sufficient detail to adequately track performance. To resolve this, the WBS and WBS dictionary should be included as an attachment to the EEP.
  13. Attachment 3 lists codes and standards. This EEP is not a design basis document, it is a management plan. Codes and Standards are more appropriately identified in a design basis document. Further, the usefulness of such information is minimized if codes and standards are not specifically defined and referenced (i.e. section and paragraph).
  14. The EEP only requires Jacobs to report ACWP and schedule status on a monthly basis. However, Jacobs is not currently providing this information nor has Fluor yet requested such reports. Sound project management requires EVMS reporting

## Recommendations

**Recommendation 23-1:** Silo 1 and 2 Rev. 0 design should reflect adequate technical definition to support a meaningful baseline cost and schedule estimate, and the project's life-cycle. In particular, the Silos Project should develop a plan to ensure the significant difficulties associated with designing, testing, re-designing, procuring, operating and maintaining remote systems are addressed.

**Recommendation 23-2:** The Silos Project should implement management systems as outlined in DOE Order 413.3, and periodic auditing should be performed to assure compliance with the order.

**Recommendation 23-3:** The Engineering Execution Plan (EEP) should not be revised and reissued as a stand-alone document. Rather, a Project Execution Plan (PEP) should be developed with the EEP as a section of this overall management document. The PEP

should include life-cycle silos project efforts (e.g. all teaming partners, decontamination and decommissioning, etc.).

**Recommendation 23-4:** The individual having the overall authority for each silos project should be identified.