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REMOVAL ACTION NO. 20: URANYL NITRATE NEUTRALIZATION PROJECT FINAL REPORT RESPONSE TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS

03/05/97

DOE-0616-97
DOE-FEMP OEPA
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RESPONSES

7997

Department of Energy

Ohio Field Office
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

MAR 5 1997

DOE-0616-97

Mr. Phillip Harris
Division of Hazardous Waste Management
Southwest District Office
401 East Fifth Street
Dayton, Ohio 45402-2911

Dear Mr. Harris:

REMOVAL ACTION NO. 20: URANYL NITRATE NEUTRALIZATION PROJECT FINAL REPORT RESPONSE TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS

Reference:

1) Letter from Phillip Harris to Johnny Reising, "Ohio EPA's Response to Removal Action No. 20: Uranyl Nitrate Neutralization (UNH) Project Final Report," dated January 24, 1997.

2) Removal Action No. 20: Uranyl Nitrate Neutralization (UNH) Project Final Report, submitted by U.S. Department of Energy, November 22, 1996.

Enclosed is the response to comments in your letter approving the Removal Action No. 20: Uranyl Nitrate Neutralization (UNH) Project Final Report.

If you have any questions, please contact Robert Danner at extension (513) 648-3167.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Danner

Enclosure: As Stated

cc w/enc:
S. Fauver, EM-42/GTN
AR Coordinator/78
RCRA Operating Record/30

Recycled and Recyclable

cc w/o enc:

J. Trygier, DOE-FEMP
T. Schneider, OEPA
J. Saric, U.S. EPA
T. Clark, FDF/52-3
K. Kolthoff, FDF/52-3

1) **Commenting Organization: Ohio EPA** **Commentor: OFFO**
Section #: Pg#: Line #: **Code: M**
Original Comment #: 1

Comment: The document appears to skim over the number of difficulties and problems encountered during the implementation of this removal action. More importantly it does not document the lessons learned during the project. For this document to be truly useful and aid future activities, it should include an accounting of difficulties, solutions and knowledge gained. Such information is important to not only activities at Fernald but for other sites that may want information conducting similar actions. Documenting such lessons learned will prevent the loss of institutional knowledge through personnel changes.

Response: Agree.

Action: Lessons learned for the UNH Removal Action were prepared September 12, 1995, a copy has been attached with this submittal. See also Responses to comments 2 and 3.

2) **Commenting Organization: Ohio EPA** **Commentor: OFFO**
Section #: Pg#: Line #: **Code: C**
Original Comment #: 2

Comment: Final reports are supposed to include a history of the project and any changes in approved work plans. The document should be revised to include a discussion of the origination of the Removal Action as an Emergency Removal Action and why it was changed. In addition, changes to approved work plans should be discussed.

Response: Agree.

Action:The following information is provided as background for the origination of the Removal Action:

In September 1991, DOE committed to initiating the UNH Neutralization Project as an Emergency Removal Action due to leakage from existing lines and valves. An 'Information Package', consisting of procedures, Health and Safety plans, and ARAR compliance documentation, was submitted to OEPA April 28, 1992. Due to the status of the project as an Emergency Removal Action, no formal Removal Action Workplan, nor request for USEPA / OEPA approval was submitted. Although a limited amount of UNH solution was neutralized during a 1993 test run, full scale implementation of the project was delayed by operational, design, and safety issues due to additional leaks found in the existing piping and valves.

In order to resolve the difficulties in implementing UNH processing, a redesigned processing system, and modified operational approach was developed. In late 1993, a decision was made document the new approach in a workplan, and further to formally submit the workplan for USEPA and OEPA approval rather than to continue with implementation as an Emergency Removal Action. The chronology of workplan submittal, approval, and modification is summarized below.

Submittal of Removal Action Workplan to OEPA / U.S. EPA	6/21/94
Conditional Approval by U.S. EPA	8/9/94
Workplan revised in accordance with U.S. EPA and OEPA comments and resubmitted	9/2/94
Approved by OEPA	10/6/94
Additional comments received from U.S. EPA	11/28/94
Final response to U.S. EPA comments submitted - resolving remaining conditions for approval	1/12/95
In-situ Neutralization Workplan submitted to OEPA and U.S. EPA	3/17/95
Approval received to initiate In-situ Neutralization from U.S. EPA	3/24/95
Workplan Amended to reflect post-approval design modifications, and changes in tank inventories due to transfers and In-situ Neutralization	5/31/95

Per agreement with OEPA subsequent modifications required due to changes in processing sequence were documented and submitted as they occurred.

3) Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.3 Pg#: 1-5 Line #: Code: C
Original Comment #: 3

Comment: The document should include a brief discussion of activities occurring between 4/93 and 12/94. Currently the document suggests nothing was done until Ohio EPA issue(d) the DF&O.

Response: Agree.

Action: A summary of the activities that occurred between April 1993 and December 1994 is attached for your information.

4) Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.0 Pg#: 3-1 Line #: 2nd paragraph Code: C
Original Comment #: 4

Comment: The paragraph should be revised to use similar units for waste generated and waste shipped to NTS. In addition, since the paragraph needs revision an update of the amount shipped to NTS is appropriate.

Response: A 55-gallon drum contains 7.4 cubic feet. The 2,100 55-gallon drums are a total of 15, 022 cubic feet (cu. ft.). The actual volume of the waste shipped to NTS was 23,264 cu.ft. In addition to over packing six drums to a small white metal box this volume includes:

1) the Nitric Acid/Residual Waste, Tanks D7 and D11, (105 cu. ft.) which was included in Removal Action No. 20;
2) filling the void space between drums, in the six pack, with bagged trash and non-recyclable PPE (2,507 cu. ft.); and,
3) approximately 5,630 cu.ft. of void space remained in the over packing.

Waste Source	Waste Volume (cu. ft.)
2,100 55-gallon drums	15,022
Nitric Acid/Residual Waste (Tanks D7 and D11)	105
non-recyclable PPE	2,507
void space	5,630
Total	23,264 cu. ft.

Action: None required.

Activities that occurred between April 1993 and December 1994

April 27-28, 1993	There was a spill of Uranyl Nitrate Hexahydrate which resulted in a Type B Investigation that ultimately led to the DOE Office of the Assistant Secretary for the Environmental Management committing to the Defense Facility Nuclear Safety Board (DFNSB) to be the start-up authority and to conduct an Operational Readiness Review (ORR) prior to processing.
December 1993 to April 1994	New process design performed. The new design was accepted and included new dedicated piping, new valves, and new pumps.
May 1994	Construction of the newly designed process system began.
August 1994	URANYL HEXAHYDRATE NEUTRALIZATION PROJECT REMOVAL ACTION WORK PLAN: REMOVAL ACTION NO.20 submitted.
October 1994	After it was determined that the new progressive cavity pumps had leaked they were replaced with double diaphragm pumps.
November 4, 1994	Letter: Chris White, DOE, to James Saric and Tom Schneider URANYL HEXAHYDRATE NEUTRALIZATION PROJECT - ITEMS TO BE DISCUSSED AT THE NOVEMBER 7, 1994 MEETING, DOE -0157-95. This included both a project schedule and a discussion on "Weather Restrictions on Processing Uranium Solutions", the start-up date of January 16, 1995 is suggested as feasible.
December 1994 initially	Construction of the newly designed process system was completed.
December 1994 to January 1995	The System Operability Testing (SOT) was performed to verify that all valves, pumps, instrumentation, interlocks, and other equipment met operation requirements. The SOT verification and resolution extended beyond the January 17, 1995, start-up date specified in the December 27, 1994, Director's Final Findings and Orders.

The UNH Project LESSONS LEARNED

Abbreviations, Acronyms and Initials

CONOPS	Conduct of Operations
DOE	Department of Energy
FERMCO	Fernald Environmental Restoration Management Corporation
FSAR	Final Safety Analysis Requirements
HC3	Hazard Category 3
ISRC	Independent Site Review Committee
P&ID(s)	Piping and instrumentation Drawing(s)
PG3	Performance Grade 3
PEP	Project Execution Plan
POA	Plan of Action
PSAR	Preliminary Safety Analysis Requirements
PTMs	Project Team Meetings
OEPA	Ohio Environmental Protection Agency
ORR	Operational Readiness Review
RA	Readiness Assessment
RSO	Remedial Support Operations
SAR	Safety Assessment Report
SMEs	Subject Matter Experts
TIP	Technical Information Plan
TRB	Technical Review Board
TSR	Technical Safety Requirements
UNH	Uranyl Nitrate Hexahydrate
USQ	Unreviewed Safety Questions
USQD	Unreviewed Safety Questions Determination

UNH Neutralization Project LESSONS LEARNED

These lessons learned are a compilation of areas of concern noted during the UNH Neutralization Project.

SAR Area [SAR = SAR/TSR/USQD]

1. SAR Detail. For systems that are not designated as being safety significant, only process flow diagrams should be included. P&IDs should only be included for items that are safety-significant or safety-class. Even then, a P&ID should only be included if there is a complex system. A P&ID should not be included for a safety-significant pressure relief, it is a common component, and only the performance criteria is required Including P&IDs will result in numerous USQD efforts when drawings are changed.

2. SAR Content. Only information specifically required by DOE Orders and Standards should be included in the SAR. All information should be referenced to other source documents as much as possible and not included or reiterated in the SAR.

3. Proper SAR Review. The SAR should be reviewed against defined requirements only and determining the adequacy of the SAR solely based upon meeting these requirements.

4. SAR Ownership. Preparing the SAR is the responsibility of the performing organization. The performing organization must take ownership of the SAR and ensure that it allows enough flexibility to permit smooth operations. Operations and project management must take an active role in preparing the SAR since they are the groups primarily impacted by the SAR. The SAR preparation process must be a team process to ensure success. Minimize details and operational limits in the SAR that have no relevance to safety.

5. SAR Guidance. Because of the "graded approach" which is authorized, the requirements and guidance for preparing a SAR/TSR may be subject to some degree of interpretation. This can lead to lack of focus in the review and approval stage as a result of the interpretations of grading.

6. SAR Review. The SAR must receive an adequate review by appropriate project participants and all Functional Areas. Realistic review durations should be scheduled. Internal review of the draft SAR must include a knowledgeable and thorough evaluation by technical and functional area managers of the project. This will ensure that the SAR does not include unrealistic or unnecessary commitments. Reviewers need to be trained to understand the impact that SAR commitments will have on project procedures, design, and training.

   The SAR may require commitments in design, procedures, surveillances, training, safety, and other functional areas. The author of the document may not have the knowledge base to make commitments in many of the functional areas addressed by the SAR. As a result, without adequate review, hardware, personnel, or programmatic commitments may be made that would create difficulties to implement. Even though these sections of the SAR may be written by experts in the area and also reviewed internally prior to

submittal, a full understanding of what should be in the SAR may not be communicated to those reviewers.

The SAR author should brief the contributing authors and reviewers and describe what a SAR means in the DOE system, provide a thorough review of the contributing authors submittals, and the removal or rewriting of commitments. The SAR is a commitment document and should include a description of the facility and activity with only the systems important to safety being described in detail. The SAR should meet the requirements of the DOE orders without making specific commitments not needed as part of the safety basis of the project or that do not materially add to the understanding of the project by the reader.

7. SAR Training. Operations, project and division management need to understand what a SAR/TSR does for an activity or facility. It is desirable to train all project participants in the significance and importance of a SAR/TSR.

8. SAR/TSR Approval Process. The process is not formally developed. It is difficult to provide any schedule-related information.

9. Premature Initiation of the SAR. Fast track scheduling, resulting from commitments made to the OEPA and DOE to expedite effort on this project as part of the emergency removal action, caused the SAR to be initiated prior to settling all major design issues. This decision appeared logical when it was made because project management believed the design would not change significantly between initiation of the SAR and design completion. It was difficult to ensure that the SAR analysis correctly reflected the design. A series of ongoing design changes impacted SAR completion. Once the DOE SAR review begins, changes cannot be made without submitting a revised SAR which restarts the review cycle.

10. USQD Process. The USQD process is too cumbersome. Project functional managers should have a good understanding of the USQ process. The USQD process needs to be changed to delete the requirement of Part II for review by the Independent Site Review Committee (ISRC). This is very costly and requires to much time.

11. Design and Analysis Must Remain Separate from the SAR. Adequate design and project description documents must be prepared. Without adequate project definition, inaccuracy or excessive detail may be forced into a SAR, reducing flexibility.

12. Initiating the SAR. The SAR (PSAR/FSAR) should be one of the first project documents generated. The decision to combine the PSAR and FSAR, coupled with problems in the design area, resulted in ongoing delays in finalizing the SAR.

13. Finalization of Engineering Design Prior to Initiating the SAR Review by DOE. The initiation of the SAR review by DOE should be done after the preliminary design of the process has been set. Time for an orderly sequence of events must be allowed. The original project schedules did not realistically recognize or predict the amount of time required for this process with the result that commitments to the DOE and OEPA were missed.

14. SAR Tracking and Formal Comment Resolution Procedures. A formal process for submission of the SAR, comment tracking, and comment resolution needs to be agreed upon by FERMCO and the DOE. This process should include identification of contact points, approval authorities and times for each segment of the process. The DOE must be involved early and frequently in the SAR preparation and review process.

    When the comments were received by the SAR author, he coordinated their resolution with the DOE SAR review team. The dissemination of information relative to the comments was not publicized to other interested DOE parties. This resulted in misunderstandings as to whether the reviews were conducted properly and whether DOE comment resolution had been reviewed by the DOE. Although the author executed his responsibilities properly, the lack of an agreed to process raised concerns in the DOE. They believed FERMCO had taken liberties with the SAR review process by making independent changes which were not approved by the DOE.

PROJECT ORGANIZATION

15. Need for a Project Execution Plan (PEP). The need for developing a Project Execution Plan was not recognized early in the project. [The PEP covers the responsibilities and processes to be followed for a project.] This was attributed to a lack of appreciation of the complexity of this project relative to other similar FERMCO activities. This management document, the PEP, needs to be published early in the project life.

16. Need for Project Management Training. FERMCO needs to develop a training program for its key project personnel on the subject of initiating and controlling a project. There are procedures for everything else on site, but none of them document how to set up and execute a project.

Conduct Of Operations (CONOPS) issues

17. Conduct of Operations Implementation. The implementation of CONOPS in the project is facilitated by the assignment of dedicated Operations Support Personnel from the RSO Management Programs to the project. These individuals provide assistance in three key areas: (1) direct support to the Operations Manager and Facility Owner, (2) development of operating procedures, and (3) on-the-scene monitoring/assistance in the field.

18. CONOPS Direct Support Issues. Direct support efforts in CONOPS implementation included (1) the development of the CONOPS Applicability Matrix, (2) development of Standing Orders, (3) performing self assessments across Functional Area lines, (4) developing operational drills and evolutions, (5) assisting in training development and implementation, and (6) possibly performing a myriad of other tasks from briefing the DNFSB to assisting in developing ORR preparation plans. The operation experience of the individuals provided the Project Manager, Operations Manager, and the Facility Owner with immediate resources to enhance operational capabilities and performance.

19. CONOPS Assistance in Procedure Development. Procedures should be developed that are "operator friendly" and technically correct. The Team assigned to develop the procedures should have technical knowledge, operations experience, and a good engineering background. The development schedule needs to provide ample time for a draft product to be reviewed, walked-down in the field by the developer, and table-

topped with operations supervisors and operators. After comments have been incorporated into the draft procedure, it should be used for simulation and/or walked-down by shift personnel. After enhancements have been included, the procedure is now ready for providing a reliable vehicle for safe and efficient operation.

20. CONOPS Assistance to Project Operations Personnel. Operations Support Personnel provide on-the-scene monitoring/assistance in Plant 2/3 on a near full-time basis and in Plant 8 on a reduced schedule. These personnel provide counsel and advice to the Facility Owner, supervisors, and operators, noting and effecting on-the-spot correction of conduct of operations difficulties. They provide technical evaluation of instrument and equipment problems and timely feedback to management on deficiencies observed and corrective actions taken or recommended. Further, these personnel also direct the training for operational and emergency drills through classroom table-top efforts, walk-down assistance in the field, and actual drill performance for training and ORR. Additionally, the near every day presence of a mentor is fundamental to building supervisor and operator level of knowledge and performance by reinforcement of CONOPS principles, procedural and administrative compliance, and proper communications.

Operations Issues

21. Regular Project Meetings. Holding regular Project Team Meetings (PTMs) is desirable to ensure that all project personnel are aware of forthcoming activities. The information promulgated in the PTM should include the following type information:

- Pending operations,
- Maintenance issues requiring operations personnel support,
- Overtime requirements,
- Commitments (operations, administrative, and personnel),
- Training requirements,
- Lessons Learned, and
- Requests for assistance (engineering, construction, maintenance, etc.).

The PTMs have one other important focus -- **ACCOUNTABILITY**. For the success of the meetings, it is mandatory that principal decision makers, or a suitable alternate, not only be present but also be knowledgeable of current status of their respective area of responsibility. When the above ingredients are present, timely and useful information is transferred and timely corrective action can be implemented as needed.

22. Scheduling Issues. There must be adequate and dedicated time provided in the project schedule to ensure that the required classroom training, field simulation, on-the-job training/qualification, and operational drills and evolutions can be accomplished to provide adequate assurance that planned operations can be conducted safety and efficiently. This training further ensures operator confidence and proficiency. The block of time for training must include sufficient time for the Training Manager's Subject Matter Experts (SMEs). They should spend adequate time in the field with the operators to satisfy on-the-job training and qualification requirements. This approach encompasses both equipment-based and process-based training techniques.

23. Project Planning and Strategies. Project Planning and Strategies should be initiated early and should include items such as:

- Project organization,
- Organizational responsibilities and relationships,
- Interfaces with other site groups,
- Project requirements, references and the justification of the graded approach application in requirements identification, and
- Organizational responsibilities for each requirement.

Initially, the UNH Project was generally perceived to be a simple project. A project plan was not formally developed until the Technical Information Plan (TIP) was published late in the project. The delay in publishing this document resulted in significant UNH work not being done to DOE requirements, delays in accomplishing work due to unclear lines of responsibility, and a lack of full understanding by the project managers as to project obligations.

Procedures must incorporate the Safety Envelope as described by the Safety Analysis Report (SAR) and Technical Safety Requirements (TSR).

Procedures must be used in the field during simulation training so that operators will be familiar with them.

PROCEDURES

24. Proper Procedure Preparation. This is an area where the philosophy for operations is critical. Areas such as prerequisites, off normal conditions, etc., must be discussed with Engineering, Operations, Industrial Hygiene, Radiological Control, and Quality Assurance. It is critical that the operator and operations supervisor have time to tabletop and walk down the procedures to obtain input for the drafts of these documents.

25. Changes to Procedures. Having the ability to use technical change notices and operational work instructions allows flexibility. However, the involvement of the Technical Review Board (TRB), Engineering, and Quality Assurance for changes to the procedures under a Performance Grade 3 (PG3) operating component must be well understood. Much time could be lost if this area is not well coordinated.

Readiness Preparation for the UNH Neutralization Project

26. Early Identification of DOE and Regulatory Requirements. The DOE and regulatory (US EPA and Ohio EPA) requirements for the project need to be identified early in the project and communicated to project management personnel.

27. Plan of Action (POA) Difficulties. Do not plan on conducting an Operational Readiness Review (ORR) utilizing the process of sequentially releasing Core Requirements. The POA was originally published with a schedule for sequentially releasing the core requirements as they were completed. This process was intended to help speed up the ORR process. Unfortunately, this sequential process has problems because the core requirements are so very interdependent that it is difficult to be ready for one requirement without being ready for others.

DOCUMENT CONTROL

28. Hazard Category 3 Activities. Control of changes to configured documentation during installation, maintenance, and operations is a demanding requirement. The activities around a Hazard Category 3 (HC3) are particularly demanding because changes for Performance Grade 3 components may require review and approval via the Technical Review Board (TRB) before action can be taken. While the components on this job were not HC3, this is a "heads up" for other projects.

    Careful thought as to how to coordinate this activity is required early on in the project.

29. Document Control Centralization. Having multiple areas for document control, while convenient, are difficult to manage.

    There should be a single point for document retention and control. Document control procedures should be clearly promulgated. This should be discussed at the beginning of the job. Who will control the documents; where the central files for engineering, construction, procurement, and general project documents will be located; and what formal transmission documents are required need to be resolved.

    Configured documents required more attention, but all documents with revisions will require redistribution. The determination of who should receive updated, controlled copies, as well as who should get uncontrolled documents, is an important decision.

Training and Qualification Issues

30. Training Requirements. The training requirements for a project are expected to be demanding for a project and must be planned early using a training matrix. This training matrix must be preceded by the preparation of job task analyses which need to be prepared for both operators, supervisors, and management. All training should be identified for each person so records will be maintained accurate and current. Because the vendor documentation arrived late from construction, the training department had to "jump to" to create proper documentation for the key pieces of equipment. This effort required good coordination be maintained between the construction, engineering and training departments.

31. Training of Operations Personnel. Project personnel need adequate training prior to and during their assignment to a project. Much of the Training given to project personnel as to how the project is to be run, how it is to be set up, etc. was given late in the project preparation. As a result, some processes/procedures were set up incorrectly. Some of the items that experienced difficulty are as follows:

    - An adequate document control and processing system was established late in the project, and
    - Definition of quality requirements was established late in the project.

SCHEDULING

32. Logic Ties. The early schedules developed for the project were complete and had logic ties which enabled a critical path to be depicted. During the conduct of the project, the

logic ties were broken for a variety of reasons. The result was that in the end, the schedule did not have a fully developed critical path through all phases including: engineering, procurement, construction and construction testing, startup and turnover, training, operation, and maintenance.

33. Critical Path Schedules. Critical path schedules should be developed and formally approved by project management as a firm project commitment. These critical path schedules should be supported by **lower tier schedules with the details**, detailed action lists, manpower loading, and assumptions needed to meet the required internal and client milestones. Each functional manager must supply input for their area and formally agree with the schedule. It is absolutely essential that the critical path capture all of the prerequisites for each step. If this is done, adverse schedule shifts will be recognized quickly and the necessary corrective actions can be taken at the appropriate times.

34. Need for a Full-Time Planner. A project should not rely on the services of the Project Manager or Project Engineer to create and track the schedules. A qualified Planner should be assigned full time to the project to coordinate and control the schedule and reduce the work load of the Project Manager/ Project Engineer.

35. Formal Readiness Preparation Anticipation. The team had a continuing expectation that a Readiness Assessment (RA) would be adequate. The denial of the need for an Operational Readiness Review (ORR) caused many significant actions not to be planned in detail. This approach caused many activities not to be planned well in advance; such as required reading, lessons learned, level of ORR review, and equipment training.

36. Operational Readiness Planning. Project management should be trained in the Operational Readiness Plan, SM-0005, so that they understand the formal requirements that need to be met.

Engineering Issues

37. Early Site Engineering Involvement. Site Engineering needs to be intimately involved with the project early in the project development. Adequate time needs to be allowed for "up front" design work to be completed.

38. Project Scheduling Issues. Critical Path schedules need to be generated and should be supported by lower tier schedules with the detail, resource requirements, and assumptions needed to meet both internal and DOE-driven project milestones. Each Functional Area Manager should supply the input for his area and formally agree with the resulting schedule. The Critical Path should capture all project prerequisites, thus allowing for schedule slippage to be recognized and necessary corrective actions to be taken.

39. System Quality and Performance Level. Determine the System Quality and Performance level for all portions prior to developing and issuing the Project design specifications.

40. Material Procurement. Material procurement should not begin until appropriate drawings and specifications are issued as "Approved for Construction."

41. Equipment List. A complete equipment list should be prepared as the project design progresses.

42. Critical Component Location. Design and locate system "critical components" for ease of installation and maintenance. Do not field route these important items.

43. Systems of Quality Level 3 and Above. For Systems of Quality Level 3 and above, install systems and components using process work control sheets, such as independent inspectable "Hold Points" for QA checks.

44. ASME Codes. ASME Code requirements should not be restated in specifications unless the designer is adding or deleting requirements.

45. Engineering Design Lessons. The engineering activities yielded the following lessons learned.

    * Piping design for steam traced pipe should consider the impact of field routing.

    * Piping design for field run pipe should be more detailed around the requirements for valve access by operators. This can be done by providing the design engineering oversight during installation.

    * Pipe hanger design for field run pipe should be more specific as to hanger types that are acceptable and give considerations to the installation needs by construction.

    * Engineering should provide a matrix of document submittals required for vendors. Using a single, general document list is not adequate. This can also be solved by having more involvement in the requisitioning review process for key design components. These requirements should be identified to construction procurement at the earliest time in the project so that the review and input from engineering can be planned. Document submission, review and turnover should be a specific item on the project milestone schedule.

Quality Assurance (QA)

46. Early Involvement of Quality Assurance. Be sure that the Quality Assurance Group is involved on the project at the earliest possible stage. Clearly define the scope of activities desired of the QA Group early in the project.

47. Quality Inspection Hold Points. With input from Engineering, Quality Assurance should establish, for FERMCO-procured engineered components, appropriate Quality Hold Points. Site QA Inspectors should be made aware of the importance of scheduling and conducting these checks well in advance of their being required. These hold points should be listed on the documents contained in the "Request for Quotation" for engineered components.

48. QA Plan (QAP) Development. The QA Project Manager (QAPM) needs the "full cooperation" of all Project Management when writing the QAP. The Plan is only as project-specific as Project Management makes it by supplying the requested information

to the QAPM. This was a problem encountered in the development of the QAP.

49. QA Involvement in Construction Procurement. QA involvement with and approval of Construction Purchase Requisitions for the project are needed.

Health, Safety, and Industrial Hygiene Concerns

50. Root Cause Analysis. In addition to Emergency Preparedness personnel, additional individuals need to be trained to the Site Root Cause Analysis procedure. This training will enable the Project Personnel to perform analyses of accidents, near misses, system equipment failures, and deduce the bottom line cause of a problem or incident.

51. Open H&S Communications with Operators. Open communication with the RSO Operators is important. When describing the elements of the Project-Specific Health and Safety (H&S) requirements matrix with the operators, be receptive to the operator's concerns and make appropriate changes to the procedure(s) when warranted. If operator suggestions make sense and allow them to perform their tasks more safely, incorporate the recommendations. The operators develop a sense of ownership for the task and promote a safety attitude in the area when they are involved in this process.

GENERAL ITEMS

52. Know and Utilize Your Resources. Make each individual project team member responsible for his Technical Information Plan (TIP) area.

53. Material Safety Data Sheets (MSDSs). Check the quality of all MSDSs to determine whether they will be of reproduction quality prior to being included in a Project-specific Health and Safety Plan. This applies similarly to all items to be reproduced for the project.

Construction

54. Adequate Time Allowance for Construction. Adequate time should be provided in the project schedule to properly construct a facility and perform necessary Construction Acceptance Testing (CAT). This is especially true when the design calls for significant field routing of piping.

55. Involvement of the Site Engineering Department. Keep the Site Engineering Department actively involved in field routing of equipment and field changes to design and installation.

56. QA Waiver of Witnessing of Inspection of Significant Items at the Vendor's Shop. Waiver of witnessing pump inspection at the vendor's plant by Construction ultimately caused additional project delays since the pumps needed to be dismantled and returned to the vendor for repairs. Poorly fabricated equipment had been produced and supplied to the site. Inspection requirements for each piece of critical equipment should be tracked and performed as specified.

57. Construction Acceptance Testing (CAT). During Construction Acceptance Testing of equipment, it is critical to designate a Start Up Engineer, who is in control of the

activities. The CAT should be well developed and reviewed prior to attempting the test. Adequate schedule time should be allowed, so that, (A) the testing plan can be reviewed and improvements to the test procedure can be incorporated and (B) equipment adjustments and vendor involvement can be properly planned.

58. Construction Lessons. The construction activities yielded the following lessons learned:

- Involvement of engineering in the field routing of pipe and pipe hanger design and installation is critical.
- Travelers for the work to be done with Quality Assurance (QA) sign off records were developed late. Previous records for inspection were not considered adequate. This was confirmed when one of the installed pipes broke.
- Welding rod control was not adequate. However, this area had little impact on the project with the inspection performed.

JSH 9/12/95