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PROPOSED ENHANCEMENTS TO THE PLANT 7 DISMANTLING REMOVAL ACTION WORK PLAN

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LETTER

Department of Energy
Fernald Environmental Management Project
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JUL 12 1994
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Mr. James A. Saric, Remedial Project Director
U. S. Environmental Protection Agency
Region V - 5HRE-BJ
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

PROPOSED ENHANCEMENTS TO THE PLANT 7 DISMANTLING REMOVAL ACTION WORK PLAN

The Department of Energy (DOE) requests concurrence to proceed with modification to the dismantling procedures designed for Removal Action 19, "Plant 7 Dismantling." These changes will result in three major improvements:

1) Enhanced worker safety and environmental protection.
2) Enhanced structural steel demolition procedure for Plant 7.
3) Early removal of Building 4C.

Enhancement 2 is a change in the Plant 7 dismantling design and is not a change to the Removal Action Work Plan (RAWP) document. The RAWP states that the "... structural steel will be removed down to the base slab." (Section 6.3, pg. 6-5). The RAWP does not specify the dismantlement technique.

The modifications to the design will increase safety, improve cost effectiveness, and allow us to complete the project earlier. This proposal was presented June 23, 1994, at the Fernald Residents for Environmental Safety and Health (FRESH) meeting where DOE and the Ohio Environmental Protection Agency (OEPA) representatives were in attendance. The proposal has also been discussed with the United States Environmental Protection Agency (USEPA). Favorable responses were received from all four organizations.

The current Plant 7 design specifies torch cutting the structural steel and lowering it, in approximately 80 modular lifts, to grade level. When torch cutting the structural steel, a point source vacuum would collect airborne particulates. After the structural steel is lowered to the ground, it would be monitored for radiological contamination, size-reduced, and packaged.

Recycled and Recyclable

It is proposed that Plant 7 structural support columns be cut using controlled detonation. By using a specialized steel-cutting method of linear-shaped charges with sequential charge detonation, the weight and shape of the building will fold within seven seconds. Plywood boxes and conveyor belting would be placed around the charges to prevent dispersion of material upon detonation; no toxic dust or fumes are anticipated from the detonation. Plant 7 would lean in a northwest direction and fall into the open area where Building 4C is now located. The steel will be size-reduced, monitored for radiological contamination, and packaged once on the ground. Adjacent structures will be protected in accordance with Fernald Environmental Management Project (FEMP) Safety Assessment 93-0033.

To provide sufficient open area for Plant 7 to fall, Building 4C, a one-story building consisting of structural steel and transite, will be removed to grade in accordance with the procedures described in the currently approved RAWP for Plant 7. No new waste streams will be generated in the removal of Building 4C. Materials from Building 4C will be added to the Plant 7 materials and managed accordingly. This is a less than 10% increase in the Plant 7 waste volume.

Prior to controlled detonation cutting of Plant 7, the interior and exterior walls, asbestos-containing and asbestos-contaminated materials, piping, equipment, west canopy, south shed, and elevator (shaft, cab, and counterweight) will be removed and packaged. Plant 7 will be reduced to a simple structural steel skeleton and floor decking. The floor decking is comprised mainly of diamond plate steel and two concrete slabs (10' x 12' and 20' x 40'). The concrete slabs will be used to experiment with two methods (i.e., encapsulation and misting) to mitigate potential releases of concrete dust.

The surface soil and Plant 7 structure will be wetted down with water to mitigate release of contamination from the soil and structure upon impact. Run-off will be controlled with diking and pooling of water will be minimized. In accordance with the *Operable Unit 5 Remedial Investigation Draft Report (FEMP-OU5-RI-June 24, 1994)*, the survey of the Plant 7 area indicates that surface soils contain uranium contamination at or below 100 mg/kg. This level of radiological contamination does not present a significant airborne risk to human health or the environment.

The safety, environmental, and schedule enhancements gained from this dismantlement method are explained in the enclosure and summarized below:

<u>Safety enhancements:</u>

1) Reduce site worker exposure to additional torch cuts.
2) Reduce time workers are exposed to possible lead-based paint fumes.
3) Reduce worker time at high altitudes.
4) Perform controlled fall of Plant 7 on a weekend to reduce the number of workers in the area.
5) Reduce heavy lifts.

Environmental enhancements:

1) Reduce environmental element exposure time (i.e., wind and rain).
2) Building 4C, a potential source of contamination, will be removed earlier than anticipated.
3) Reduce potential lead and radiological releases.

Schedule enhancement:

1) Two weeks versus eight weeks to dismantle.

The innovative technology/treatability studies to be gained from the modification include:

1) Evaluation of water misting and encapsulation techniques on concrete flooring to mitigate potential emissions.
2) Evaluation of controlled detonation cutting as a dismantling technique resulting in potential acceleration of OU3 remediation.

The modifications are expected to increase worker safety, be protective of the environment, reduce dismantling time, improve cost effectiveness, and provide useful information for future decontamination and dismantlement activities at the FEMP. We are also in the process of formulating a public notification plan and will provide you with a copy when completed.

In order to prevent adverse impacts to the schedule, cost and work force availability for this removal action, DOE-FN requests your expedited review of the modifications described in this correspondence. If you have any questions, please contact Mr. Arthur Murphy at (513) 648-3132.

Sincerely,

Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Reising

Enclosure: As Stated

cc:

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CONTROLLED DETONATION CUTTING OF PLANT 7 STEEL FRAME PROPOSED

The use of controlled detonation cutting on Plant 7's key structural supporting columns has been proposed as a viable method of taking down the building in a manner that is -- most importantly -- safer, and also faster and more cost efficient than the previous floor-by-floor dismantling plan.

If this procedure is approved by the U.S. and Ohio EPAs -- and supported by Fernald Residents for Environmental Safety and Health, the Fernald Citizens Task Force and other stakeholders -- the controlled detonation cutting tentatively would take place in mid-August.

Under this method proposed by Project Development Group Incorporated and Best Group Incorporated (FERMCO subcontractors on the Plant 7 dismantling project), linear shaped charges would be placed strategically at key structural supporting columns. The specialized steel cutting charges would be detonated sequentially to cut columns and to utilize the weight and configuration of the building, allowing it to lean in a northwest direction and fall into a pre-determined open area. After the shaped charges are detonated, the structure would fold within seven seconds.

Upon detonation, there would be a minimal amount of black smoke and dust. There would be no toxic dust or fumes, only black smoke from the charge itself. The area surrounding the building is covered in clean gravel and would be pre-wet as a dust control measure. This procedure would be performed on a weekend, when there are few workers and little activity at the site.

Before the detonation would be performed, all interior and exterior walls, piping, equipment, the penthouse, the elevator (shaft, cab and counterweight), will have been packaged and removed from the Plant 7 structure. Only the building's main structural steel would be involved in the fall -- everything else will have been removed beforehand.

Air monitors would be put in place around the perimeter of the work site to detect any possible airborne activity, which is unlikely since any loose contamination will have been removed from the building prior to the controlled detonation.

CONTROLLED DETONATION CUTTING OF PLANT 7 STEEL FRAME PROPOSE (Cont'.d)

This method would: 1) minimize worker exposure to lead-based paint; 2) reduce the amount of time working at high altitudes; 3) reduce radiological contamination exposure; 4) reduce the number of lifts by the crane by 75 percent; 5) shorten the schedule and reduce FERMCO's support staff costs; and 6) a nearby maintenance building would be removed at no cost by the subcontractor prior to the Plant 7 controlled detonation cutting.

The entire structure would collapse, leaving the highest structural member less than 35 feet off the ground and well within the reach of shears mounted on excavators to downsize the steel. The charges would be fashioned to burn the steel in a manner that is many times faster and hotter than a torch. When the structure is weakened from the burning at critical points, gravity will cause the building to fold upon itself.

A comparison of this proposal against the current floor-by-floor dismantling plan has led DOE and FERMCO to conclude that controlled detonation cutting would be safer, faster, environmentally sound and cost efficient.

The overriding advantage of this alternative is the increased level of workers' safety. There is a high degree of risk due to the height of Plant 7 and because the workers would have to cut steel which contains lead. Due to the presence of lead, workers would be required to wear protective clothing, respirators and use air filtration devices while the steel was being cut. The current work plan safely addresses these issues, although this new proposal is safer and more cost efficient.

Protection of adjacent buildings would be accomplished by having columns along the east face of Plant 7 pulled in a northwest direction by cables tied to interior columns.

The subcontractor of choice to perform this work is Controlled Demolition Incorporated (CDI), which would be procured through PDG/Best Group.

Laura Hegge, Ohio EPA, asked Gary how the public would be notified if shaped charges are used to take down Plant 7; Gary assured her neighbors in the immediate vicinity would be informed.

Other FRESH members asked if they could videotape the event, and Gary said they could. He suggested that an area near State Route 126 would be a good vantage point. Gary also promised the event would be videotaped by Fernald personnel, and he said the video would be available in the PEIC.

Vicky said she wanted DOE to definitely invite the media and Congressionals so they would be aware of this visible progress at Fernald and remember events such as this when considering funding for Fernald.

DISMANTLEMENT OF PLANT #7
STRUCTURAL STEEL DISMANTLEMENT
COMPARISON OF METHODS

ITEM #	APPROVED METHOD	ITEM DESCRIPTION	ALTERNATE METHOD
1.		NUMBER OF TORCH CUTS	
	420 LF. Full Cuts	Columns	90 LF Flange Cuts
	3000 LF. Decking	Floor Decking	0 LF.
2.	80	Number of Heavy Lifts	0
3.	8 Weeks	Duration	2 Weeks
4.	640 Man Hours	Possible Lead Fume Exposure	25 Man Hours
5.	8 Weeks	Possible Rad Exposure	2 Weeks
6.		SAFETY	
	Yes	High Altitude Work	No
	Yes	Perform Work Around Open Floor Areas	No
	Yes	Heavy Lifts	No
	Yes	Full Cuts On Columns	No
7.		ENVIRONMENTAL	
	3420 LF. of Torch Cutting	Possible Rad and Lead Fumes	90 LF. of Torch Cutting

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STRUCTURAL STEEL CONCRETE REMOVAL PLAN
(REV. #4)

1.0 INTRODUCTION

a. This narrative has been prepared by Project Development Group (PDG) in accordance with # 02060, 1.5 of FERMCO Specification for the Plant 7 Building Dismantlement and Demolition. This Structural Steel Concrete Removal Plan will discuss those issues associated with the disassembly of the Plant 7 steel structure, the bridge crane structure, the concrete piers adjacent to Plant 7, the pipe racks and supports, elevated concrete slabs, within Plant 7, above grade concrete structures within the construction zone boundary, and establishment of laydown and size reduction areas.

2.0 EQUIPMENT

a. Equipment to be utilized for the structural disassembly operations include a 60 ton crane, two 100,000 pound excavators with shear, grapple, and/or breaker, cutting torches, cutoff saws, electric jackhammers, and small tools. The Scanclimber utilized during the Exterior Transite Removal operations will have been removed by the onset of the Structural Steel Removal.

3.0 SITE LAYOUT

3.1 Laydown and Size Reduction Areas

a. The Structural Laydown Area, the Satellite Accumulation Area, and the Rigging Storage Area shall be marked using yellow chain attached to and supported by either posts driven into the ground or temporary posts-and-stanchions on concrete. These chains shall be in place prior to start of work. These areas, the crane base areas, and the oxygen/propane storage area will be located as shown in Sketch #2 submitted with the Mobilization Plan. The staging areas shall be cleaned of miscellaneous, loose materials prior to use.

b. All removed materials (structural steel, bridge crane, etc.) that are to be placed in the Structural Laydown Area will be elevated off the ground by placing them on pallets or timbers. Throughout this narrative, the phrase "placed on the ground" shall mean placed on the pallets or timbers on the ground, unless otherwise noted.

c. In most cases the structural steel units will be lowered to the ground and landed on the concrete in Northwest corner of Plant #7, where it will be size reduced. This is to reduce the possibility of the lead-based paint chips contaminating the ground. Lead-based paint chips will be controlled on the concrete by using a HEPA vac to collect them at the end of the shift. After size reduction, the structural steel will be loaded directly into containers designated for structural steel or placed in the Structural Steel Laydown area.

3.2 Container Storage Area

a. On the West side along B Street, the fencing shall be recessed approximately 30' for a length of approximately 160'. This recessed area shall be utilized as the Container Storage Area. Yellow chain

shall be used on the West side along B Street to mark off and separate this area from the nonwork site areas. (Refer to Sketch #1 submitted with the Mobilization Plan.)

3.3 **Crane and Scale Locations**

a. The 60 ton crane shall be located to the West of Plant 7 for the waste container movement operations. (Refer to Sketch #1.) Manufacturer's data and maintenance records will be provided before equipment arrives on site. The scale on the 60 ton crane will also be used to weigh the waste containers.

4.0 LIFT PROTECTION

4.1 HEAVY LIFTS

A. THE SUBCONTRACTOR ANTICIPATES NO LIFTS OVER 50,000 (FIFTY THOUSAND) POUNDS AT THIS TIME. IF ANY SUCH LIFTS DO BECOME NECESSARY AT A LATER DATE, THEY WILL BE CERTIFIED BY A LICENSED ENGINEER AND ANY NECESSARY RIGGING PLANS OR PROCEDURES WILL BE SUBMITTED TO FERMCO FOR REVIEW AND APPROVAL, PRIOR TO THE LIFT.

4.2 PROTECTION OF ADJACENT BUILDINGS

A. NO LIFTS WILL BE SWUNG OVER BUILDINGS 4B OR 4C, EITHER BY DESIGN OR ACCIDENT, IN ORDER TO PROTECT THESE STRUCTURES FROM FALLING MATERIALS, EQUIPMENT, OR STRUCTURAL STEEL.

b. **Structural steel removal will not be performed when lightning is present or winds exceed 20 mph, or lower per Subcontractor discretion, in the area for purposes of personnel safety.**

5.0 SEQUENCE OF MAIN ACTIVITIES

a. The basic sequence of disassembly activities will be as follows.

- Disassembly of the overhead bridge crane and support structure.
- Disassembly of the pipe rack.
- Disassembly and removal of the canopies and all structural steel South of Column line 4.
- Disassembly of outside storage tanks.
- Disassembly and removal of the penthouse.
- Disassembly of the elevator shaft and removal of the elevator.
- Controlled demolition of the structure utilizing linear shaped charges.
- Removal of above grade concrete structures within the construction zone boundaries.
- Completion of size reduction operations and loading of containers.

b. The substation will be removed during the Exterior Transite Removal Operations as described in the Exterior Transite Removal Plan, Sections 8.5 b and c, those sections repeated here. After removal of the transite panels, the Structural steel between Column lines 4 to 6 and Column lines E to A will be removed using a hydraulic shear. The shear will remove and down-size the Substation structure in place and will load the steel into the top-loading large metal boxes designated for structural steel. (This method of in-place removal by a hydraulic shear will cause no unsafe conditions to the remainder of the structure as a hydraulic shear can be used to cut steel without causing any jarring movement to the structure.) The shear will not be in contact with any connected portion of the

building while the transite siding is being removed from the other side. The equipment located in this Substation area will then be removed utilizing the 60 ton crane.

6.0 BRIDGE CRANE DISASSEMBLY

a. REMOVED

b. REMOVED

c. Refer to Addendum for Bridge Crane Disassembly Procedures.

7.0 PIPE RACK DISASSEMBLY

a. REMOVED

b. Refer to Addendum for Pipe Rack Disassembly Procedures.

8.0 CANOPY AND TANK REMOVAL

a. REMOVED

b. Outside storage tanks will be downsized in place using cutting torches and loaded into waste containers. (The mechanical shear will be utilized to initiate the first cut on the tanks.) Prior to removing and/or downsizing these tanks, PDG will verify that they have been emptied, isolated, and purged.

c. Refer to Addendum for Canopy Disassembly Procedures.

9.0 MOBILIZATION OF TOWER CRANE

a. REMOVED

b. REMOVED

c. REMOVED

10.0 ROOF REMOVAL

10.1 ELEVATOR SHAFT AND WALKWAY

a. REMOVED

b. A two point connection with chokers will be attached to the walkway from the penthouse to the elevator shaft. The walkway will be cut with torches at both ends by laborers standing in the penthouse and the elevator machine room. The walkway will be raised and lowered to the ground in the Structural Laydown area.

c. The elevator cab will be secured to the structure below the elevator machine room floor. A choker will be attached using a basket hitch to each side of the bottom of the cab. The chokers will go around the out side of the guiderails, which are attached to the structural steel. The counterweight will be attached to the structural steel. The cables will be cut and lowered to the bottom of the shaft.

d. CHANGE
The elevator machine room will be removed in the largest pieces possible using the 60 ton crane. The machinery will be removed before the concrete floor is removed. The concrete floor will be removed as a unit. Chokers will be attached to the elevator cab and the cab will be removed and lowered to the laydown area. The counterweight and the remainder of the shaft structure will be removed in sections by attaching the chokers to and cutting the columns.

10.2 ROOF SECTIONS C-D/1-4 & B-C/1-4

a. REMOVED

b. REMOVED

c. Refer to the Addendum for Roof and Structure Disassembly Procedures.

10.3 ROOF SECTION D-E/1-4

a. REMOVED

b. Refer to the Addendum for Roof and Structure Disassembly Procedures.

10.4 C LINE COLUMNS

a. REMOVED

b. Refer to the Addendum for Roof and Structure Disassembly Procedures.

10.5 PENTHOUSE

a. CHANGE
The penthouse will be removed in the largest pieces possible using the 60 ton crane. The pieces will be lowered to the ground and size reduced and loaded in containers for structural steel.

10.6 ROOF SECTION A-B/1-4

a. REMOVED

b. Refer to the Addendum for Roof and Structure Disassembly Procedures.

11.0 FLOOR REMOVAL

a. REMOVED

b. REMOVED

c. REMOVED

d. REMOVED

e. Refer to the Addendum for Roof and Structure Disassembly Procedures.

11.1 FLOOR AT ELEVATION 671'-0"

a. REMOVED

b. REMOVED

c. REMOVED

d. REMOVED

e. REMOVED

f. REMOVED

g. Refer to the Addendum for Roof and Structure Disassembly Procedures.

11.2 FLOOR AT ELEVATION 651'-0"

a. REMOVED

b. REMOVED

c. REMOVED

d. Refer to the Addendum for Roof and Structure Disassembly Procedures.

11.3 FLOORS AT ELEVATIONS 631'-0", 618'-0", AND 605'-0"

a. REMOVED

b. REMOVED

c. REMOVED

d. Refer to the Addendum for Roof and Structure Disassembly Procedures.

11.4 FLOOR AT ELEVATION 595'-0"

a. REMOVED

b. REMOVED

c. REMOVED

d. REMOVED

e. REMOVED

f. Refer to the Addendum for Roof and Structure Disassembly Procedures.

12.0 REMOVAL OF ABOVE GRADE CONCRETE

a. Above grade concrete will be removed flush with the existing grade slab using electric jackhammers and hydraulic breaking hammers on a machine and will be loaded into the top loading small metal boxes. This shall include concrete piers from the bridge crane and pipe rack, exterior tank and other miscellaneous equipment foundations, elevator pit walls, and building curbs. Steel columns and other miscellaneous steel projections will be cut off flush to the existing grade slab.

b. Damaged areas, with a depression greater than 1 (one) inch, of the base slab will be repaired with a patching grout to create a surface that shall be level with the existing surface of the base slab.

13.0 COMPLETION OF SIZE REDUCING AND WASTE CONTAINER LOADING

a. Except where noted, size reducing will be performed in place and materials will be loaded into the containers from the Structural Laydown area. After completion of disassembly operations of the bridge crane, pipe rack, and structure, size reduction operations will continue until all removed materials have been reduced and loaded. After reducing and loading operations are finished, the laydown areas will be cleaned of any loose miscellaneous materials or items, which shall be disposed of into the appropriate waste container type according to the nature of each material or item.

b. Materials will be inspected by the FERMCO Construction Manager and/or QC to insure proper sizing, segregation, and placement in appropriate containers prior to final wrapping or banding.

14.0 LEAD-BASED PAINT

a. Some items that contain lead-based paint may be cut by means of a cutting torch. The following engineering and administrative controls will be implemented to minimize environmental impact and personnel exposure when torch cutting lead-based painted items for exterior removal only:

(1) Torch cutting operations will require a minimum two man team to complete the cutting.
(2) In addition to other PPE, personnel will also be required to wear Type C supplied air respirators in the pressure demand mode until air analysis results indicate levels below PEL, at which time workers will wear other appropriate respiratory protection.
(3) The intake flex duct (equipped with spark arrestor) shall be held above and within 24" of the area being torch cut.
(4) Additional personnel will be available to handle larger or heavier objects that cannot be handled by the two man team.
(5) A competent person in lead abatement will direct cutting operations on lead-based painted items.

15.0 CONTROL MEASURES

a. Water will be utilized to control dusts created during the concrete removal operations. Outside, the concrete will be sprayed with water to control dust and excess water will be gathered up with a HEPA vacuum.

b. When equipment are in stationary positions for a period of time, the ground under and around the piece of equipment will be protected using an equipment diaper.

c. Accidental leaks from mobile equipment will be cleaned up using FERMCO's approved Spillage Clean-Up Procedures.

ADDENDUM TO STRUCTURAL STEEL DISMANTLEMENT PROCEDURES
For Overhead Crane Girders, West Canopy, and Pipe Rack

Overhead Crane Girders

Using cutting torches, laborers will isolate sections of the bridge crane girder by cutting the girder after the third "A" frame support between the knee braces. Laborers will work from a 40'-0" JLG manlift. After the crane girder is isolated, a 5/8" cable will be attached to the girder in two places. An eight ton block will be attached to the cable. Another 5/8" cable will run from this block to a second eight ton block, which will be attached to the crane girder on the opposite side. The cable then will run to an approved piece of equipment.

Laborers will cut, with torches, the front leg of the three "A" frame supports above the base. The cut will not be completely through the support, as approximately 1" of material will remain. The anchor bolts on the back leg of the three "A" frame supports will then be cut off. The forklift will pull the section of the crane girder over in a controlled manner. The girder and "A" frame supports will be down-sized on the concrete and moved to the laydown area.

West Canopy

Laborers using cutting torches will isolate the canopy from the building structure. The electrical conduit and piping will be removed from the canopy. The canopy is supported by the "A" frame supports of the bridge crane girders and will come down with the sections of the girders.

Pipe rack

The pipe rack will be removed by laborer(s) using a cutting torch(es) and performing controlled-hinge-drops. The pipe rack will be removed starting with the end at Plant 7, and proceeding to the North and then to the West.

The laborer making the cuts, working from a 40' JLG manlift, will first cut one end of the rack section approximately 90 to 95% complete, leaving a hinge. The laborer will then cut the other end of the rack section completely through. This end of the rack section will slowly lower to the ground due to the hinge left at the other end. The laborer will then complete the cut on the first end, removing the hinge. The rack section on the opposite side will then be removed using these same procedures.

As pipe sections are removed and lowered to the ground, columnar support sections will be isolated. The support will be attached to the crane. At the column bases, the bolts holding the columnar support in place will be cut away by a laborer using a cutting torch. Then the crane will pick up the support and place it on the ground where it will be downsized.

Protective Measures

The dust will be controlled by misting the ground and steel with water. HEPA filter units will be used to collect the fumes from the burning operations. Laborers will be wearing respiratory protection rated for lead fumes. HEPA filter units will be used to collect the fumes from the burning operations.

ADDENDUM TO STRUCTURAL STEEL DISMANTLEMENT PROCEDURES
For Structural Steel and Roof Disassembly

PROCEDURES FOR CONTROLLING DEMOLITION OF PLANT #7

The distance from Column Row #1 of Plant #7 to Building #4A is approximately 160'-0". Plant #7 at this point is 80'-0" by 60'-0" by 114'-0" high. The safe zone required for the demolition of the building is approximately 120'.

The basic procedure to be followed in the explosives dismantling of Plant #7 would be the placement of linear shaped charges on key structural supporting columns between Elevation 579' and Elevation 600', in Column Rows #1 through #3. These specialized steel cutting charges would be detonated sequentially thereby removing column sections. This sequential elimination of key structural supports would allow Controlled Demolition Inc. (CDI) to utilize the weight and construction of this structure to allow it to incline in a Northwesterly direction away from adjacent exposures and fall into a pre-determined open area.

1. Preparation For Explosive Operations--
   General procedures to be used by Project Development Group/Best Group, Inc. (PDG/BGI) in preparation for the explosive placement are as follows.
   - A. All asbestos would be pre-removed from the structure.
   - B. All exterior transite would be pre-removed prior to any preparation operations.
   - C. Lowrise portions of the structure between Column Rows #4 and #6, and the elevator shaft and the elevator from the Northeast corner of the structure and the penthouse would be pre-removed prior to demolition operations (per attached Drawing No. 07394-01).
   - D. All masonry would be pre-removed from the structure prior to explosives preparation operations, except a 20'x40' concrete floor slab on the second floor and a 10'x10' concrete floor slab on the fifth floor.
   - E. All material and equipment stored on floors will be removed, packaged, removed from the Plant #7 site. This will be accomplished by removing a section of siding girders between columns on each floor and removing the material and equipment through the side of the building using a crane. A line will be attached to each load and secured to the structure to stop the load from swinging.
   - F. A visual inspection of the building will be made to make sure that no material or equipment remains that can come loose as the building is demolished.
   - G. An inspection will be performed to identify any fixed contamination of the building columns where the cuts are to be made.
   - H. Due to the height of Plant #7 and the fact that there is a large area North of Plant #7, we would request that we remove Building #4C. The same procedures used for Plant #7 will be used to remove the mechanical, electrical, HVAC equipment, ductwork, interior transite, batt insulation (if any), and exterior transite. The structural steel will be removed and down-sized using a shear.
   - I. As marked and observed by CDI's field engineer, PDG/BGI would perform precision torch cutting of selected structural columns in Plant #7 for subsequent placement of CDI's linear shaped charges (per attached Drawing #07394-03).
   - J. At Elevations 605', 631', and 651' perform pre-severance of selected splice plates to facilitate the processing of steel once the structure is on the ground.
   - K. To augment the structural integrity of the building and insure that it inclines away to the Northwest, 3/4" cable with tensile strength of 35 KIP would be strung from exterior columns to interior columns at Elevations 605', 615', and 631' (per attached Drawing #07394-02).

L. During preparation of the building, PDG/BGI would construct boxes made of plywood, 2x4 lumber, and conveyor belting, which will be placed over steel cutting charges mounted on selected columns. These boxes would prevent dislodged material from leaving the buildings periphery during explosives detonations.

2. Explosives--
The following types and approximate quantities of explosives would be used.
   A. Approximately 154 pieces of copper clad, linear shaped charges which are manufactured by Explosives Technology of Fairfield, California, or their technical equivalent, would be used as the primary steel cutting charge (see attached linear shaped charge information). Net weight of RDX explosives is 24 lbs.
   B. Approximately 95 ICI brand "EXEL" 1/2 second, non-electric detonators of various delays would be used.
   C. Approximately 10 lbs. of 40% strength "gelatin dynamite" manufactured by ICI would be utilized. This explosive would be used to displace structural columns after severance by steel cutting explosives charges.

3. Explosives Loading Procedures--
   A. Beginning approximately 2-1/2 days prior to explosives demolition, steel cutting charges would be delivered to the site by West Kentucky Explosives Co., a subsidiary of ICI USA. Explosives charges would be assembled and placed onto selected columns located in Columns Rows #1, #2, and #3 of the structure between Elevations 579' and 600'. All charges would be placed by personnel in accordance with manufacturers recommendations and guidelines established by the Institute of Makers of Explosives (IME).

4. Initiation System--
   A. The explosives charges placed by CDI would be detonated by a **redundant** non-electric blasting systems. The use of this non-electric system is much safer, because there are no concerns with radio frequency or electricity hazards. All systems would be designed and assembled in accordance with guidelines suggested by the manufacturer and IME. The entire system would be double checked by CDI prior to demolition operations.

5. Initiation Sequence--
   A. Explosives charges placed on columns in Plant #7 would be detonated sequentially by the use of internal delay non-electric blasting caps. The use of the delay blasting caps would allow CDI to control the direction of the fall of the structure to be sure that resultant steel will fall in the pre-established areas. Additionally, the use of delay blasting caps would minimize the amount of explosives being detonated over any one 1/2 second interval.

6. Protection--
   A. The linear shaped charges that would be utilized on this project produce very little displaced material. Plywood boxes and conveyor belting would be placed around charges to insure that material would not leave the building's periphery during explosives charge initiation. Additionally, a curtain of chain link fence and possibly geotextile fabric would be hung on the East side of the structure at the ground level to further prevent any displacement. It is anticipated that a minimum of dust and debris would be generated from the demolition as only the structural steel framework would be blasted. In demolition operations, most dust is generated

by masonry material, all of which would be pre-removed from the structure. the only dust would be from the explosives themselves.

7. Site Security--
   A. Explosives demolition operations offer the minimal amount of disruption to ongoing operations in the Fernald Plant. It would be anticipated that demolition operations would take place early on a Sunday morning when onsite activities are at a minimum. Approximately two hours prior to demolition, a pre-determined safety perimeter would be established by Plant Security Personnel in accordance with PDG/BGI. Countdown (to be established) would start one half hour prior to demolition. Radio communications with Plant Security and other key authorities during this time would be maintained. Explosives would be detonated from a command post located 700' away from Plant #7 only after assurances have been received that a safe perimeter had been secured. Personnel without radio contact would be alerted of the impended demolition by use of auditorial signals. Within minutes after the structure is on the ground, CDI would promptly survey the area and notify proper authorities when the area is clear.

8. Site Conditions After Explosive Operations--
   A. CDI would intend to fell the structure in a Northwesterly direction. After the charges were detonated, the structure would impact within seven seconds. The minimal amount of dust generated from the demolition would prevail in the immediate area for less than a minute depending on weather conditions and wind speed at the time of demolition. Due to the sequential elimination of structural columns and pre-severed upper floors of the structure, we would anticipate the structural steel would not project in a Northerly direction more than 60' beyond Column Row #1. Additionally, we anticipate that the entire structure would collapse with the highest structural member being less than 35' off the ground and being well within the reach of shears mounted on excavators.

Once the building is on the ground it will be down sized using a shear and loaded into containers using a grapple.

DUST CONTROL

The area North of Plant #7 will be watered down for approximately 6 hours before the day of the controlled demolition.

Principles of Jetcord Function

The explosive phenomenon known as the Munroe Effect is generally described as the interaction of the detonation products and cavity liner material emanating at high velocity from a shaped charge as the explosive detonates. The explosive decomposition releases large quantities of gas almost instantaneously under extreme pressure — as much as several million pounds per square inch. In Jetcords, shock waves produced by the expanding gases move outward radially as well as longitudinally, and conform generally in shape to the cord cross section. The shock waves emanating from the lower portion of a typical Jetcord converge in a plane parallel to the cord axis and cause an extreme pressure concentration along the plane of convergence. These directed shock waves, together with the products of explosive decomposition and the metal fragments from the sheathing material, form the primary cutting action — the jet.

Deformation of the target material begins within one microsecond (one one-millionth of a second) of the passage of the detonation front at any given point on the Jetcord. The adjacent drawings depict the development of the jet during this short period of time.

Figure 1-A represents a typical Jetcord cross section prior to detonation. At T_d (time of detonation) plus .25 microseconds (Figure 1-B), the detonation products have begun to move outward, expanding and cracking the metal sheath, but not rupturing it. A thickening at the liner apex indicates the jet is beginning to form. By T_d plus .50 microseconds (Figure 1-C), the detonation products have begun to vent through the disintegrating metal sheath. The shock waves produced by the expanding gases and the cavity liner material emanating from the lower portion of the Jetcord are converging, the jet is taking definite form, and penetration of the target is beginning. In Figure 1-D (T_d plus 1.0 microseconds), the jet is fully developed and deformation of the target is well under way. The extent of this deformation is discussed in the following paragraphs.

FIGURE 1-A

FIGURE 1-B

FIGURE 1-C

FIGURE 1-D

Typically, if a length of Jetcord is detonated on a metal witness plate, the jet exerts a force of several million pounds per square inch along a very narrow line. This force causes the metal to be pushed out of the way of the advancing jet by plastic flow. The resulting groove is commonly termed "penetration." On a thin plate, however, the performance of Jetcord depends not only on the cavity liner material and the intense, directed shock waves to erode the target, but also on the rapidly expanding gases to physically dislocate and fracture it. The shock waves, when reflected from the surface opposite the cut, can also cause spalling from that surface. The total effect is termed "cutting." Jetcord consistently cuts a target of greater thickness than can be penetrated.

Jetcord Application

The cutting ability of Jetcord is an inverse function of the square root of the density of the target material. This is described by the equation

$$t = t' \sqrt{\frac{\rho}{\rho'}}$$

where t is the unknown thickness of a material with known density, ρ, and t' is the known thickness of a material of density, ρ', which has been cut by the Jetcord configuration under consideration. For example, Jetcord of a given size will cut a greater thickness of aluminum than steel. Equivalent thicknesses of more dense materials require larger explosive coreloads.

Jetcords are available that easily cut several inches of steel as well as significantly greater thicknesses of aluminum and other less dense metals. For optimum performance, lead sheathing is suggested where explosive coreloads of less than 100 grains per foot are required, while aluminum and copper are recommended for the larger sizes. Generally speaking, copper Jetcords are slightly more effective in the larger sizes than aluminum Jetcords of the same coreload. Silver Jetcords are used only for special applications.

The strength and hardness of the target material play an important, though secondary, role in the ease with which it is cut by a given Jetcord. A tough, hardened material is less easily cut than the same material in a soft or annealed state. Consequently, for optimum cutting performance, a greater explosive coreload is required. This characteristic is reflected in the requirements for cutting hard tool steel as compared to those for cutting soft, mild steel.

Jetcord will also easily sever most synthetic structural materials such as ablatives and reinforced plastics. Woven fiber reinforced plastics, for example, are most easily cut by controlling the cutting direction and angle of the jet to correspond with the warp fiber orientation.

Stand-Off

Maximum penetration into a target may be achieved by control of the stand-off (spacing) between the charge and the target. This varies for each type and size of Jetcord. Optimum stand-off for various Jetcords is shown in Figure 2. The cutting abilities of lead, aluminum, copper and silver Jetcords at optimum stand-off are compared in Figures 3, 4, 5 and 6. Without stand-off, these values are somewhat reduced — to 70-80% of optimum for lead and silver sheathing, and to 30-40% of optimum for aluminum and copper sheathing.

Performance Data

The Jetcord performance data as presented in this brochure are minimum values, rather than average or maximum values which can be misleading for design considerations. ET suggests that this data be used as a guide to the selection of the proper Jetcord. Many system requirements can influence the functional characteristic of Jetcord, and for specific applications, trial cuts should be performed under simulated structural and environmental conditions. (For test purposes, the recommended and most economical minimum initiator is a No. 6 blasting cap or equivalent.) This testing will more accurately determine such performance-affecting factors as explosive type, coreload, sheath material and stand-off, and will subsequently assure optimum product and system or sub-system performance.

Holders

For optimum Jetcord performance, blocks or charge holders of the required thickness are frequently used to provide and maintain the desired stand-off. Blocks may be of any suitable material; however, charge holders are generally extrusions of materials such as polyethylene or silicone rubber. Inverted, U-shaped charge holder cross-sections are standard and are available from Explosive Technology. Custom cross-sections to fit individual envelope requirements can be designed upon request. The desired stand-off may also be obtained by bonding the Jetcord to a suitable back-up strip or shielding material.

Reliability

Explosive Technology's explosive and pyrotechnic products are lightweight, lack moving parts, and exhibit performance reliability suitable for use in man-rated systems. This high level of inherent reliability is enhanced in systems applications by the use of multiple detonators and single or multiple cords.

Availability

Many of the explosive and pyrotechnic items manufactured by the Products Division are inventoried at Fairfield, California, and are readily available upon receipt of order. Nonstandard items and standard items requiring special processing or testing necessitate lead time of no more than four weeks.

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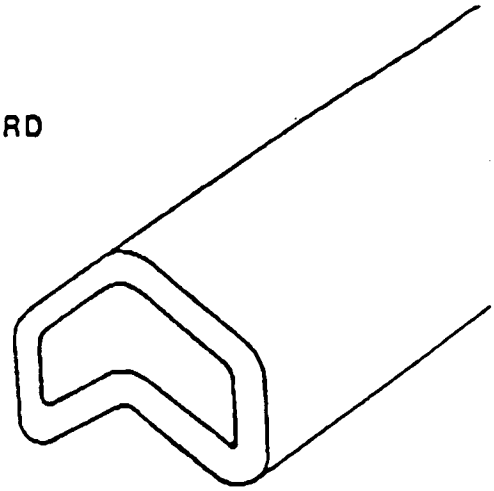
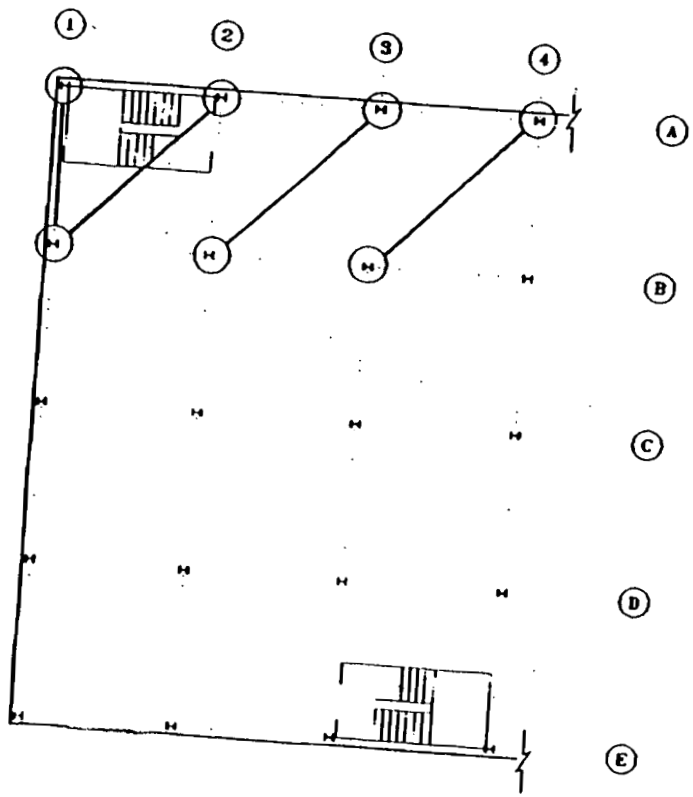
TABLE III
COPPER-SHEATHED JETCORD
(nominal dimensions)



Coreload gr/ft	Height in.	Width in.	Weight lb/ft	PART NUMBER	
				RDX	PETN
100	0.24	0.28	0.125	2014-21	2024-21
150	0.29	0.34	0.145	2014-22	2024-22
200	0.33	0.39	0.180	2014-23	2024-23
250	0.37	0.43	0.210	2014-24	2024-24
300	0.40	0.47	0.235	2014-25	2024-25
400	0.46	0.54	0.310	2014-26	2024-26
500	0.51	0.61	0.410	2014-27	2024-27
750	0.62	0.74	0.530	2014-28	2024-28
1000	0.71	0.85	0.8	2014-29	2024-29
1500	0.88	1.02	1.2	2014-30	2024-30
2000	0.99	1.19	1.7	-31	-31
4000	1.36	1.63	3.4	-32	-32

6/11

REVISIONS			
REV.	DESCRIPTION	DATE	BY
A	MODIFIED	6-7-94	MLJ



DIRECTION OF FALL

16'
SCALE

NOTE:

1. CABLE AT ELEVATION 605, 615 AND 631.

LEGEND:

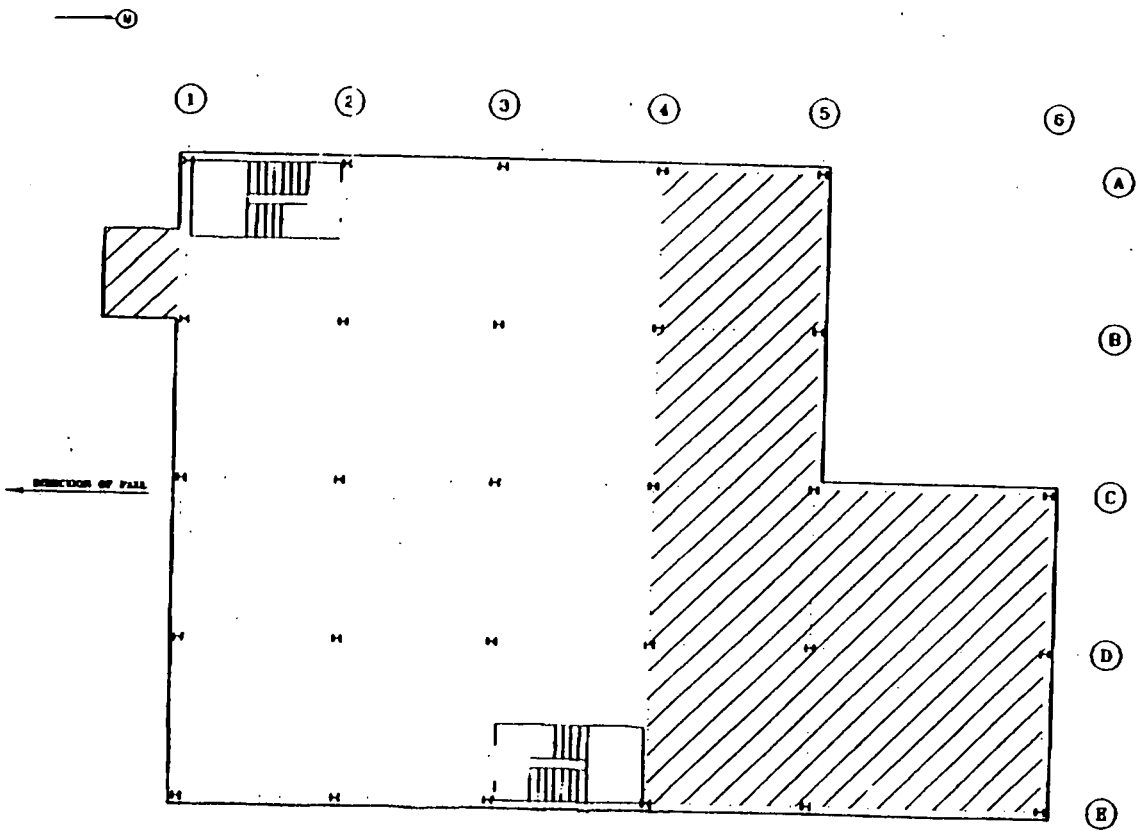
CABLING

CONTROLLED DEMOLITION, INC.
PHOENIX MARYLAND USA

PROJECT: PLANT 7 DISMANTLING
CINCINNATI, OHIO

FOR: THE BEST GROUP, INC.
DETROIT, MICHIGAN

REVISIONS			
REV.	DESCRIPTION	DATE	BY
A	MODIFIED	6-7-94	MLJ



LEGEND:

CONVENTIONALLY DEMOLISH

SCALE

CONTROLLED DEMOLITION, INC.

PHOENIX MARYLAND USA

PROJECT: PLANT 7 DISMANTLING
CINCINNATI, OHIO

THE BEST GROUP, INC.
DETROIT, MICHIGAN

DWG. REF: COLUMN LAYOUT - ELEV 580'

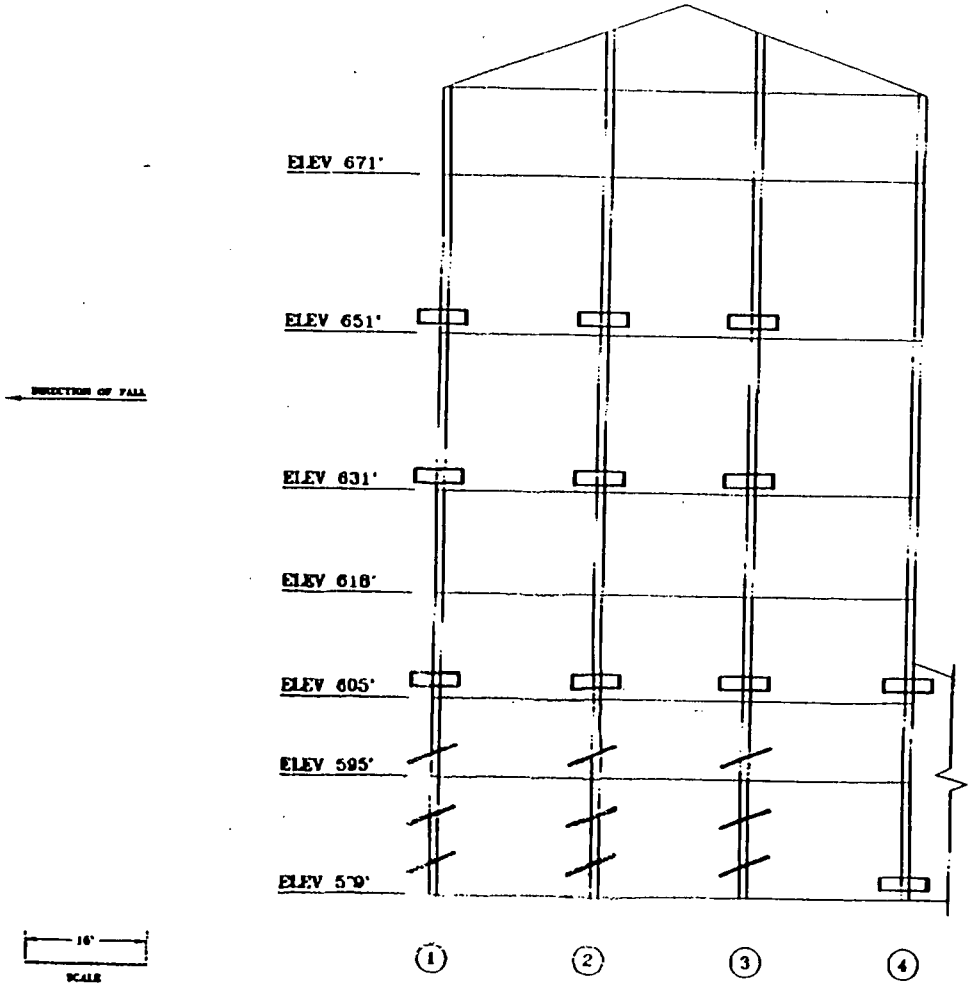
000022

5765

000023

7/11

REVISIONS			
REV.	DESCRIPTION	DATE	BY
A	MODIFIED SEVERANCE POINTS	6-7-94	MLJ



LEGEND:

SEVERANCE POINT

CHARGE POINT

CONTROLLED DEMOLITION, INC.
PHOENIX MARYLAND USA

PROJECT: PLANT 7 DISMANTLING
CINCINNATI, OHIO

FOR: THE BEST GROUP, INC.
DETROIT, MICHIGAN

DWG. NAME: WEST ELEVATION SECTION

576

Fernald Environmental
FERMCO
Restoration Management Corporation P.O. Box 398704 Cincinnati, Ohio 45239-8704 (513) 738-6200

AR

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July 8, 1994

U. S. Department of Energy
Fernald Environmental Management Project
Letter No. C:CRU3:94-0093

Mr. Johnny Reising
Deputy Assistant Manager for Environmental Restoration
Department of Energy
Fernald Field Office
P. O. Box 398705
Cincinnati, Ohio 45239-8705

Dear Mr. Reising:

CONTRACT DE-AC05-92OR21972, PLANT 7 DISMANTLING REMOVAL ACTION 19 DESIGN MODIFICATION

FERMCO requests written concurrence to proceed with modification to the dismantling procedures designed for Removal Action 19, "Plant 7 Dismantling". These changes will result in three major improvements:

1) Enhanced worker safety and environmental protection.
2) Enhanced structural steel demolition procedure for Plant 7.
3) Early removal of Building 4C.

Enhancement 2 is a change in the Plant 7 dismantling design and is not a change to the Removal Action Work Plan (RAWP) document. The RAWP states that the "... structural steel will be removed down to the base slab". (Section 6.3, pg. 6-5). The RAWP does not specify the dismantlement technique.

The modifications to the design will increase safety, improve cost effectiveness, and complete the project earlier. This proposal was presented June 23, 1994, at the Fernald Residents for Environmental Safety and Health (FRESH) meeting where DOE and OEPA representatives were in attendance. The proposal has also been discussed with USEPA. Favorable responses were received from all four organizations.

The current Plant 7 design specifies torch cutting the structural steel and lowering it, in approximately 80 modular lifts, to grade level. When torch cutting the structural steel, a point source vacuum would collect airborne particulates. After the structural steel is lowered to the ground, it would be monitored for radiological contamination, size-reduced, and packaged.

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It is proposed that Plant 7 structural support columns be cut using controlled detonation. By using a specialized steel-cutting method of linear shaped charges with sequential charge detonation, the weight and shape of the building will fold within seven seconds. Plywood boxes and conveyor belting would be placed around the charges to prevent dispersion of material upon detonation; no toxic dust or fumes are anticipated from the detonation. Plant 7 would lean in a northwest direction and fall into the open area where Building 4C is now located. The steel will be size-reduced, monitored for radiological contamination and packaged once on the ground. Adjacent structures will be protected in accordance with FEMP Safety Assessment 93-0033.

To provide sufficient open area for Plant 7 to fall, Building 4C, a one-story building consisting of structural steel and transite, will be removed to grade in accordance with the procedures described in the currently approved RAWP for Plant 7. No new waste streams will be generated in the removal of Building 4C. Materials from Building 4C will be added to the Plant 7 materials and managed accordingly. This is a less than 10% increase in the Plant 7 waste volume.

Prior to controlled detonation cutting of Plant 7, the interior and exterior walls, asbestos-containing and asbestos-contaminated materials, piping, equipment, west canopy, south shed, and elevator (shaft, cab, and counterweight) will be removed and packaged. Plant 7 will be reduced to a simple structural steel skeleton and floor decking. The floor decking is comprised mainly of diamond plate steel and two concrete slabs (10' x 12' and 20' x 40'). The concrete slabs will be used to experiment with two methods (i.e., encapsulation and misting) to mitigate potential releases of concrete dust.

The surface soil and Plant 7 structure will be wetted down with water to mitigate release of contamination from the soil and structure upon impact. Run-off will be controlled with diking and pooling of water will be minimized. In accordance with the *Operable Unit 5 Remedial Investigation Draft Report (FEMP-OU5-RI-June 24, 1994)*, the survey of the Plant 7 area indicates that surface soils contain uranium contamination at or below 100 mg/kg. This level of radiological contamination does not present a significant airborne risk to human health or the environment.

The safety, environmental, and schedule enhancements gained from this dismantlement method are explained in the enclosure and summarized below:

<u>Safety enhancements:</u>

1) Reduce site worker exposure to additional torch cuts.
2) Reduce time workers are exposed to possible lead-based paint fumes.
3) Reduce worker time at high altitudes.

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4) Perform controlled fall of Plant 7 on a weekend to reduce the number of workers in the area.
5) Reduce heavy lifts.

Environmental enhancements:
1) Reduce environmental element exposure time (i.e., wind and rain).
2) Building 4C, a potential source of contamination, will be removed earlier than anticipated.
3) Reduce potential lead and radiological releases.

Schedule enhancement:
1) Two weeks versus eight weeks to dismantle.

The innovative technology/treatability studies to be gained from the modification include:

1) Evaluation of water misting and encapsulation techniques on concrete flooring to mitigate potential emissions.
2) Evaluation of controlled detonation cutting as a dismantling technique resulting in potential acceleration of OU3 remediation.

The modifications are expected to increase worker safety, be protective of the environment, reduce dismantling time, improve cost effectiveness, and provide useful information for future decontamination and dismantlement activities at the FEMP.

Your concurrence signature in the space below will signify DOE-FN agrees that these enhancements/improvements in the dismantlement method should be pursued by FERMCO. Your concurrence is requested prior to July 12, 1994. Delays beyond this date will adversely impact the schedule, cost, work force availability and commitment dates.

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FERMCO
Restoration Management Corporation

Mr. Johnny Reising
Letter No. C:CRU3:94-0093
Page 4

A draft letter to USEPA and OEPA is attached. If you have questions regarding the Plant 7 RAWP enhancements, FERMCO contacts are Ken Kolthoff (738-6375) and Harold Rice (738-9271).

Sincerely,

Dennis R Leeth for JEKing
J. E. King, Director
CERCLA/RCRA Unit 3

Frank Albertin
M. F. Albertin, Vice President
Construction

JEK:LSC:nmg
Attachment

Concurrence: Johnny Reising 7/12/94
Johnny Reising Date
Deputy Assistant Manager for
Environmental Restoration

c: K. L. Alkema
R. K. Atkinson
D. R. Beissel
J. T. Curtis
J. R. Craig, DOE-FN
J. R. Forrelli
L. C. Goidell
R. J. Hansen, DOE-FN
R. J. Janke, DOE-FN
K. R. Kolthoff
J. A. Loerch
R. N. Mendelsohn, DOE Contract Specialist
A. E. Murphy, DOE-FN
D. Ofte
J. L. Oxendine
W. J. Quaider, DOE-FN
H. A. Rice
J. W. Reising, DOE-FN
K. A. Solomon
M. J. Strimbu
K. N. Wintz
M. K. Yates
W. A. Zebick

CRU3 Project Files