STATEMENT OF COOPERATION BETWEEN THE STATE OF KANSAS, AN AGREEMENT STATE, MINE SAFETY AND HEALTH ADMINISTRATION AND THE NUCLEAR REGULATORY COMMISSION

The purpose of the Statement is to establish the basis for the preparation of a joint environmental assessment and on-site safety assessment for Rickano Corporation's low-level waste operation at Lyons, Kansas, as provided for under section 274 of the Atomic Energy Act, as amended. In addition to the statutory provision of the Act, each agreement entered into with a State for State assumption of regulatory authority over agreement materials contains an article pledging the use of best efforts on the part of the Commission and the State to achieve coordinated and compatible programs. The low-level waste operation proposed for the Lyons, Kansas salt mine is expected to have significant impact upon the human environment.

Whereas the State of Kansas Department of Health and Environment has the authority to issue the license necessary to operate the facility; and

Whereas the NRC has been requested by the State of Kansas, by letter dated August 30, 1978 and at a meeting between NRC and State representatives on April 18, 1979, to provide assistance under the provisions of section 274; and

Whereas the Mine Safety and Health Administration has the authority to oversee and inspect operations conducted in mines, it is mutually agreed that:

I. The State of Kansas Department of Health and Environment (KDH&E), the United States Nuclear Regulatory Commission (USNRC) and the Mine Safety and Health Administration (MSHA) will work jointly to prepare an environmental assessment and provide support where needed on the on-site radiological and non-radiological safety assessment for the Rickano Corporation, Lyons, Kansas Salt Mine Waste Facility.

II. The environmental assessment will describe the impacts, effects, and necessary mitigating measures for the proposed project, both on-site and off-site.

III. Each agency will be responsible for data collection and analysis and the preparation of text and illustration in their respective areas of responsibility which will be described in a scoping document. The agencies will contribute towards the development of all sections of the environmental assessment (EA), with the objective of minimizing the environmental impacts and effects of each part of this project upon the site and adjacent area.

IV. Each agency will provide leadership in specific areas as follows:

A. State of Kansas

1. On-site Radiological Safety, with assistance from NRC and MSHA.

2. Setting procedures for requiring a form of surety from Rickano Corporation to guarantee its performance in site operations, site decommissioning, and long term maintenance and monitoring.

3. The state, as licensing authority, will contact the appropriate agency of the State and County of Kansas to verify that the necessary Federal, State and local permits and approvals required by Rickano Corporation have been applied for.

B. NRC

1. Surface physical resources and operations with assistance from State.

2. Socio Economics.

3. Environmental impacts with assistance from State.

4. Lead action in preparing the scoping document for the EA with assistance from the State and MSHA.

C. MSHA

1. Mining and subsurface resources and operation with assistance from the State.

2. On-site non-radiological safety with assistance from the State.

V. It is the intent that the EA will be used by the State in the decisionmaking process for issuance of a license and is to be concurred in by:

A. Secretary, Department of Health and Environment, Kansas.

B. Director of MSHA.

C. Director, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, NRC.

and each participating agency's separate view as to unresolved environmental issues will be accurately stated in the environmental assessment.

VI. Each agency will designate an EA team member. The EA team will prepare operating documents for the following matters:

A. Detailing of each participating agency's area of responsibility and interface.

B. Coordination of effort, involvement of resource specialists, and review and approval procedures for both draft and final EA.

VII. The NRC will act as coordinator of the EA and provide project management for the effort and will be responsible for incorporating the product of each agency into the draft and final EA.

VIII. The State, MSHA, and NRC will cooperate, to the extent allowed by regulation, in public meetings or hearings to assure the dissemination of factual information and to provide testimony to those portions of the EA prepared by or for their respective agencies. The State will be responsible for organizing any local public meetings of an informational nature.

IX. The State will not issue a license to the applicant prior to the completion of the EA.

X. It is understood that work on the EA will receive appropriate attention and that each participating agency will fund its own activities and agrees to use its best efforts to complete the EA by October 1980.

XI. The licensing process within the State shall continue to be the responsibility of the State. This agreement shall in no way alter, diminish or affect the Agreement between the State and NRC under section 274(b) of the Atomic Energy Act (as amended) effective February 1, 1968.

XII. Nothing in this agreement is intended to restrict or alter the statutory authorities of NRC, MSHA, or the State.

Signature _____ Kansas

Signature _____ MSHA

Signature _____ NRC

STATEMENT OF COOPERATION BETWEEN THE STATE OF KANSAS, AN AGREEMENT STATE, MINE SAFETY AND HEALTH ADMINISTRATION AND THE NUCLEAR REGULATORY COMMISSION

Concurred In By

On September 25, 1979

Gerald W. Allen, Director
Bureau of Radiation Control

Melville W. Gray, Deputy Director
Division of Environment

Gerald Stoltenberg, Director
Division of Environment

Joseph Harkins, Secretary
Department of Health and Environment

STATEMENT OF COOPERATION BETWEEN THE STATE OF KANSAS,
AN AGREEMENT STATE, MINE SAFETY AND HEALTH ADMINISTRATION
AND THE NUCLEAR REGULATORY COMMISSION

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Signature _____ Kansas

Signature _____ MSHA

Signature _____ NRC

RICKANO CORPORATION
P.O. Box 748
LYONS, KANSAS 67554
Phone (316) 257-5186

WM-11

PDR

October 27, 1979

Dr. Joseph Hendrie
Chairman, Nuclear Regulatory Commission
Washington, D.C. 220555

Dear Dr. Hendrie:

In view of the impending nuclear medicine crisis resulting from the announced closing of the low level nuclear waste sites in Beatty, Nevada and Hanford, Washington, I thought it might be helpful to you to be aware of our efforts to establish a low-level radioactive waste disposal site here in Lyons, Kansas.

Our initial application for a disposal license was submitted to the Kansas Department of Health and Environment in April 1978, requesting licensing of a low-level radioactive waste facility in an abandoned salt mine in Lyons, Kansas. My associate, James L. Harvey, and I are enthusiastic about this porject as we feel salt mine disposal constitutes a significant environmental improvement over the current land fill process.

There are a number of reasons why we selected the Lyons salt mine for a proposed low-level redioactive waste disposal site.

1. The room and pillar design of the salt mine has excellent qualities. Radioactive material will be stored in a completely controlled environment 1034 feet below the ground surface, in a dry even-temperature atmosphere...free from adverse climatic conditions and possible surface water migration that constitute potential concerns at landfill sites.

2. As I am sure you are aware, this salt mine in Lyons, Kansas was the site of the AEC's Operation Salt Vault that included several years of research by the AEC, providing a wealth of data on this specific mine and its geological qualities.

3. It is located only about 10 miles from the geographic center of the continental United States of America.

4. Salt mine storage allows for visual surveillance of the stored material to assure container integrity.

5. This mine offers about 50 million cubic feet of storage space.

[redacted]

[redacted] 242

6. The final appeal is the community of Lyons, itself. Although there has been some concerns expressed neighboring communities due to misunderstanding of the project (which is to be expected), the people of Lyons have been most receptive and helpful in our efforts. The leadership of the community has an extraordinary layman's understanding and comprehension of the nuclear industry as a result of their lengthy association with the various Operation Salt Vault scientists and technicians.

With this background information, I would like to inform you of our progress since our initial license application in April of 1978. The 1979 Kansas Legislature passed legislation, Senate Bill 170, which was signed into law by Governor John Carlin. This bill among things established a perpetual care fund for our proposed operation.

During the summer of 1979, the Kansas Department of Health and Environment engaged in dialog with your agency seeking guidance and procedural recommendations.

Following this the Kansas Department of Health and Environment directed a number of questions to us, asking us to expand on our application's procedures and policies. We are completing the final draft of our response to them this week.

It is our understanding that the next step is an environmental impact assessment that is projected to require an additional twelve months to complete.

In view of the recent (and, perhaps, continuing) medical crisis expressed by Dr. Leonard Freeman, president of the Society of Nuclear Medicine, we felt that this information of our planned operations might be of value to you. Also in light of this crisis, we can assure you that we will do whatever we can to cooperate with your agency, the state of Kansas and the medical community in expediting this project and getting the facility into service.

I would welcome the opportunity to meet with you and any members of your staff at your earliest convenience and discuss our salt mine storage application in detail.

Sincerely,

Fredrick P. Beierle

Fredrick P. Beierle, President
RICKARD Corporation

PDR

WM-11

RICKANO CORPORATION

P.O. Box 748
LYONS, KANSAS 67554
Phone (316) 257-5186

POOR ORIGINAL

November 13, 1979

Harold R. Borchert, Chief
Materials Licensing and Contr[illegible] Section
Bureau of Radiation Control
Department of Health and Environment
Forbes Field
Topeka, Kansas 66620

Dear Mr. Borchert:

Enclosed please find two(2) copies of documents containing information as requested in your letter of September 5, 1979, regarding the Low Level Retrievable Storage Facility, Lyons, Kansas.

We have endeavored to supply as much information as possible but we feel that there are many specifics that can only be finalized as we move along the licensing process and hopefully have some guidelines from your organization as to what may o may not be required.

We do want to make it clear that we intend for the Lyons Low Level Retrievable Storage Facility to be an exclusive repository for institutional type radioactive wastes. Consequent comparison to the types of waste that are received at shallow lan burial facilities is not an accurate comparison, and this facilit should be analyzed strictly on the basis of the types of waste materials that are generated at institutional facilities.

Institutional facilities who will probably be using the Lyon Low Level Retrievable Facility are hospitals, medical research institutions, education institutions, and associated facilities.

Also, we would like to point out that the low hazard materials we are proposing to handle are going into a very superior geo-technical environment.

Significantly then, other aspects such as packaging, transportation and handling of these type materials should be of less concern to the general public than the type of wastes that are handled at shallow land burial sites.

We are absolutely positive that occupational exposures to our employees and the public will be only a fraction of the currently allowable limits.

We also feel that this project warrants strong support from regulatory agencies and generators of such wastes because of the improvement over old practices.

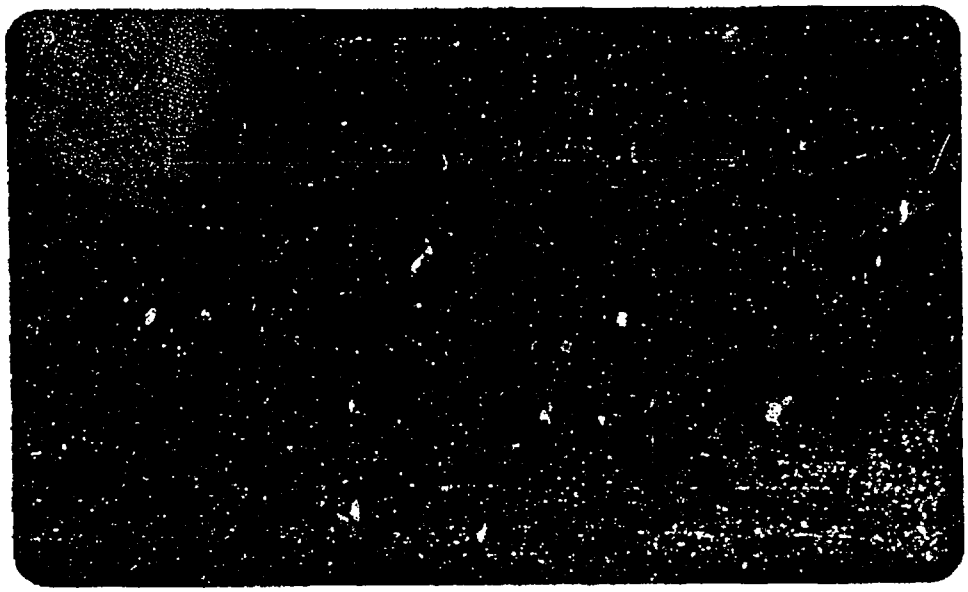
Hopefully we have been able to give you the information requested, but please feel free to ask for any other information or clarification that you may desire.

Sincerely,
RICKARD CORPORATION

James L. Harvey
Vice President

JLH:rc

Encl.



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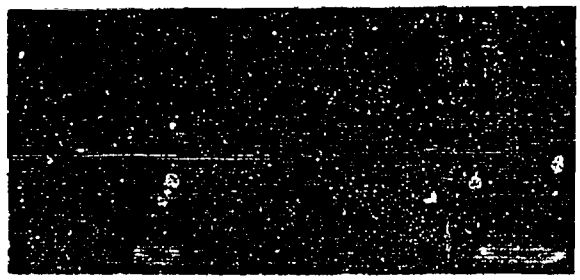


THE CEMENTATION COMPANY OF AMERICA INCORPORATED

STANDARD SPECIALIST PROPOSAL

Fittings Forming Part of Standard Grout Unit

1	2" Mollasses Valve
1	1" Gate Valve
1	½" Gate Valve
24	1" x 3" H.D. Nipples
6	3/4" x 3" H.D. Nipples
6	1/2" x 3" H.D. Nipples
12	2" H.D. Close Nipples
6	½" Joy Fittings
4	1" Joy Fittings
3	1" H.D. Tees
2	1" 90° Elbows
6	1" H.D. Unions
2	2" H.D. Couplings
4	2" x 1" H.D. Reducers
5	1" S.A. Grout Valves
4	2" Valve Balls
1	Cameron Gauge #3000 psi
1	1" x 6' Suction Hose
1	1" x 20' Air Hose
1	1" x 20' Water Hose
2	25' H.P. Grout Hoses
12	FX Rings
4	Main Seats
1	FX Ring Puller
1	Box Grout Pump Packing (½")
2	24" Pipe Wrenches
2	18" Pipe Wrenches
2	12" Crescent Wrenches
1	6" Screwdriver
1	12 ox Ball Peen Hammer
1	Hacksaw Frame w/blades
Assorted Hose Bands	

Question 1 (a,b,c,d,e,f,g,i,li)

A description of the operations building, parking lots, and associated facilities and equipment along with a detailed analysis to bring the shaft and hoisting equipment up to Mine Safety and Health Administration (M.S.H.A.) standards is attached.

A cost of approximately $250,000 plus a time of up to 150 days is required for the operations building and parking area and associated equipment.

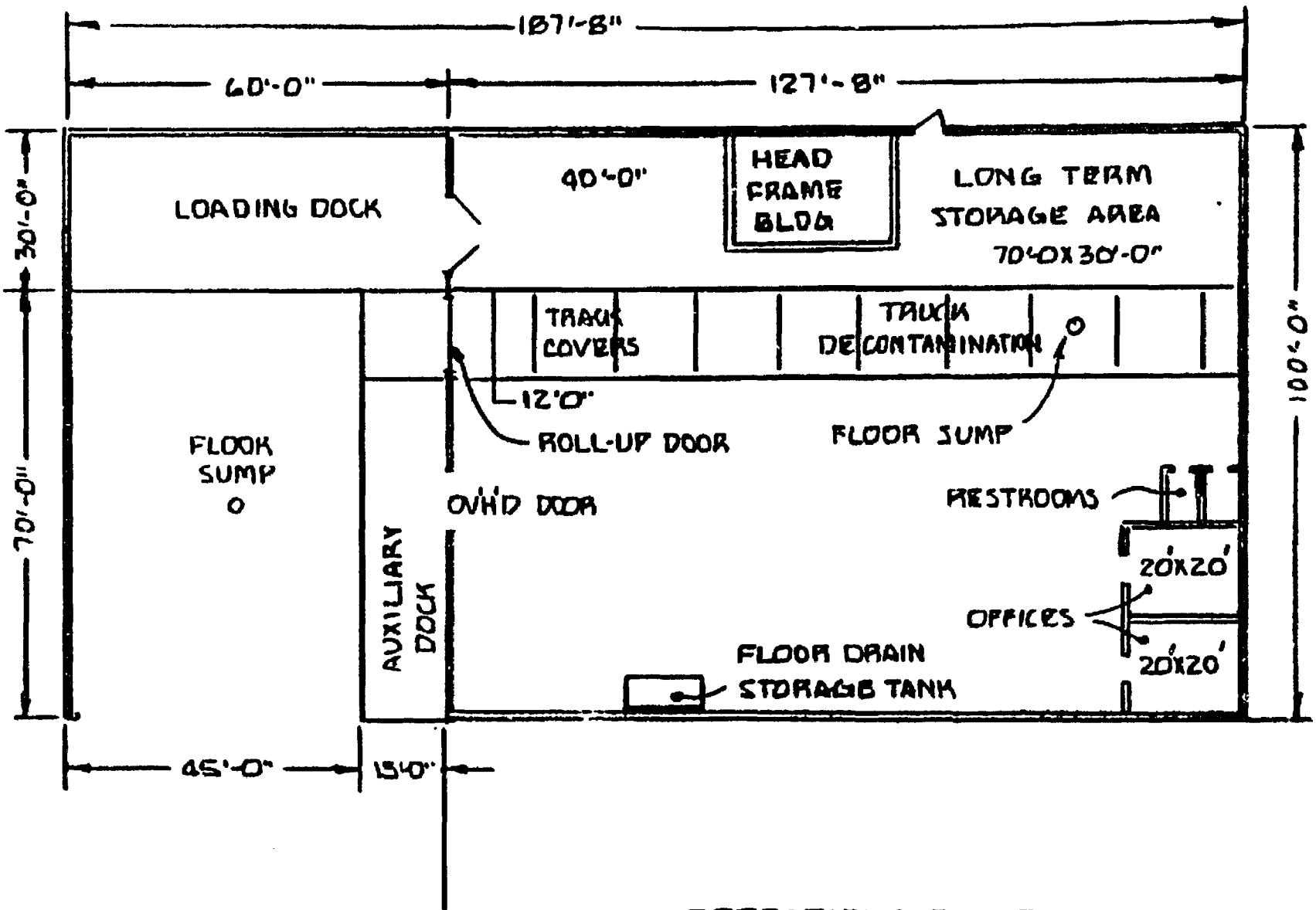
A cost of approximately $963,000 plus a construction time of up to 25 weeks is required to complete the mine shaft and equipment repairs.

NOTE: The mine ventilation will be approximately 40,000 cfm ± using the 100 hp motor suggested by Cementation. The 80,000 cfm mentioned in the Lindholm Construction Company, Inc. Bid is in error.

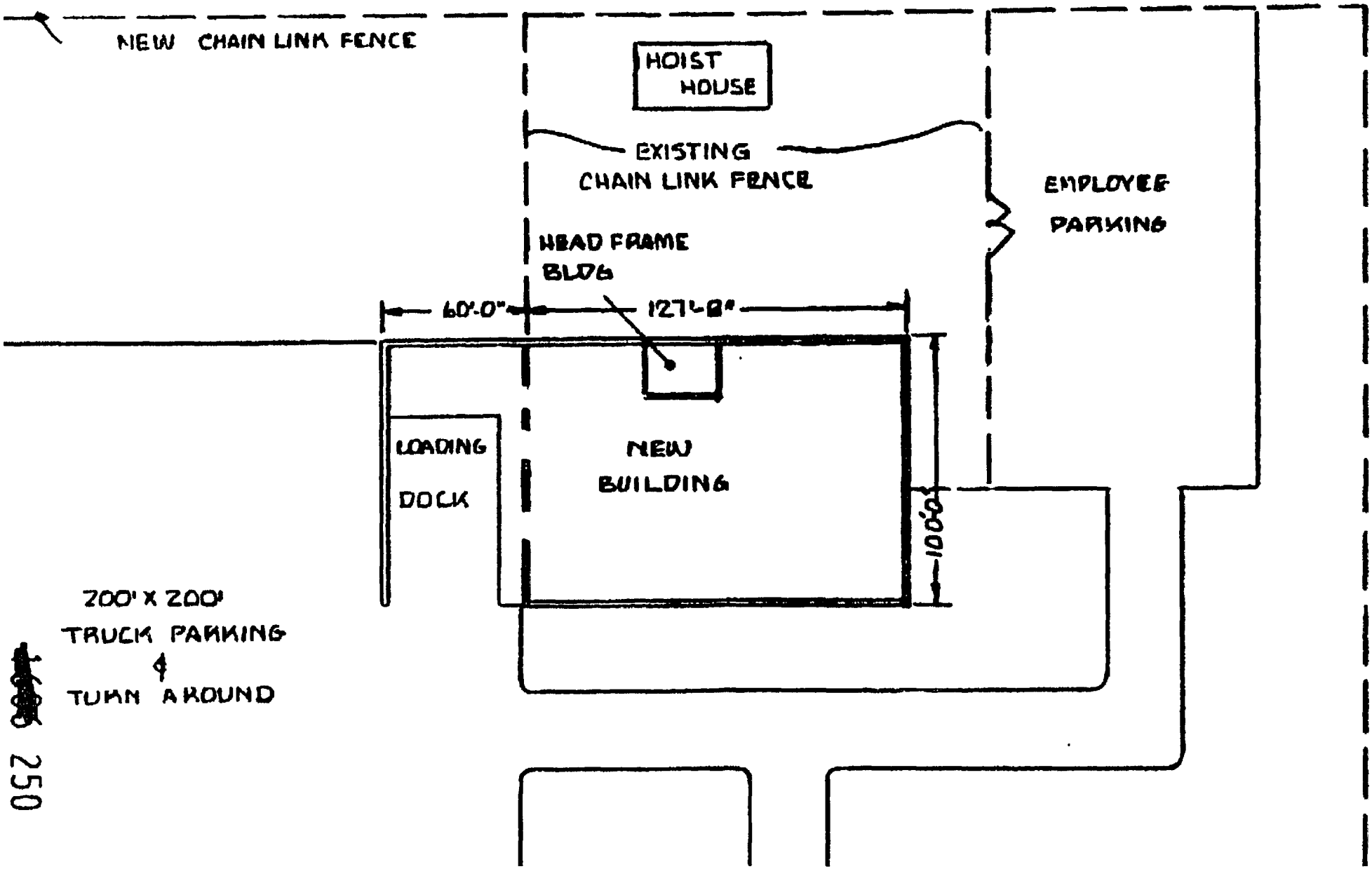
Question 1 (h)

Waste water processing will be required only in the event that water that is collected in the floor drain storage tank from the truck unloading area or any spillage from the operations building proves to exceed the limits specified in Kansas Radiation Protection Regulations 28-35-232, Appendix A, Table 1, Column 2.

If this water does exceed the above limits, it will be solidified with cement and treated as radioactive waste.



OPERATIONS BUILDING


NEW CHAIN LINK FENCE
HOIST HOUSE
EXISTING CHAIN LINK FENCE
EMPLOYEE PARKING
HEAD FRAME BLDG
60'-0"
127'-8"
LOADING DOCK
NEW BUILDING
100'-0"
200' X 200' TRUCK PARKING & TURN AROUND
250

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

TECHNICAL APPRAISAL

Report following Mine Visit

September 17-19, 1979

Contents

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

TECHNICAL APPRRAISAL

Report following Mine Visit

September 17-19, 1979

Contents (Cont'd.)

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

I. HOISTING SYSTEM

A. Hoist

(1) The existing hoist, manufactured by Litchfield F. Dry Machine Co. of Litchfield, Illinois, was originally steam driven, and has been converted to 150 HP AC electric drive through a bull gear. It is rated to hoist at 750 feet per minute (XII Plate 1 & 2). It has two 5' wide, 8' diameter drums both fixed to a common shaft. The drums are grooved for 1 1/8" diameter ropes. The hoist appears to be generally in good condition mechanically. However, we recommend a thorough cleaning and inspection.

(2) Hoist capacity is rated as follows:

$$\frac{150 \text{ lbs.} \times 33{,}000 \text{ ft. lbs./min.}}{750 \text{ ft./min.}} = 6600 \text{ lbs. rope pu}$$

(3) To meet present safety standards, the following work must be performed:

(a) Install a dead man control.

(b) Add over-travel track limit cut-out controls (55.19-7).

(c) Extend hoist drum flanges to a minimum of 4" over last wrap of hoist rope (55.19-11).

(d) Have the overspeed device inspected and approved by MSHA (57.19-7). The present device may require replacement by a Model 'D' single governor Lilly control.

(e) From visual examination, the hoist electrics appear to be in good shape. However, since concern was expressed by the hoistman at the time of the inspection that the system would "blow up" if lowered on power, a thorough examination and testing of the electrics should be made. Mine regulations do not permit the lowering of men using only brakes (55.19-65).

B. Hoist Ropes

1) The present hoist rope needs replacing. It is excessively corroded, and "dead", meaning it has lost its spring. The second drum, presently empty, would be wound at the same time. We recommend using 1 1/8" diameter rope to conform with the grooving on the hoist drums, though this is a larger rope than is actually necessary to safely handle the proposed load.

2) The rope lengths should be 1615' each, which would allow required periodic test cuts to be taken. Federal regulations (55.19-124) require that hoist ropes should be cut off and reconnected to the conveyance as often as necessary to assure adequate inspection of the rope condition and to distribute wear of the rope. At least 6' should be cut from above the highest connection. An additional 85' must be allowed for a minimum of three wraps around the 8' diameter drum and the anchoring tail (55.19-22) and 230' from the collar, over the head sheave to the hoist:

1100' shaft	1100
Collar to Sheave to Hoist	230
Hoist drum wraps and anchor	85
Spare for cuts	200
Total Recommended Rope Length	1615'

3) Recommended hoist rope specifications:

1 1/8" diameter
18 x 7 non-rotating - round strand
Synthetic core
110,450 lb. breaking strength
2.12 lbs./ft.

4) Safety Factor

Rope weight (1100')	2332 lbs.
Cage weight	900 lbs.
Payload	3368 lbs.
Total Suspended Load	6600 lbs.

Factor of Safety $\frac{110,450}{6600} = 16.7$

The minimum factor of safety required by Federal Regulatio for over 1000' length of rope in the shaft is 6.0 when new and must be replaced when testing indicates 5.0 or less (55.19-21).

5) A rope reeling frame, which could be fabricated locally, would be required in order to install the new ropes.

6) Due to its age, the present rope attachments to the conveyance (cage) should be replaced with a new solid thimble and minimum of 5 new clips at 6 3/4" centers (55.19-24).

C. Signals

1) To bring the signal system up to standards, two methods of signalling must be installed wherever signals are given or received, one of which must be an approved telephone syste (55.19-90). There must also be a signal system from all positions in the shaft (55.19-92).

2) It is proposed that a multi-conductor cable be run from the hoist and down the shaft with sufficient wires to allow the establishing of an adequate signal system.

3) Additionally, a mechanical rapper system with a steel bell wire, hung down the shaft so that it can be reached from the cage throughout the entire length of the shaft should be installed. This system commonly used in shaft sinking, allows signalling to the surface through an entirely mechanical method. The mechanical rapper at the collar is however electrically connected to the signal system in the hoistroom.

D. Cages

1) Two new cages should be designed and fabricated to suit the handling of the waste containers. The cages should be equipped with spring loaded wheels to ensure a smooth ride down the shaft guides as well as an approved safety mechanism (safety dogs) which would stop the cage in the event of rope failure. However, these cages need not be installed until the rehabilitation work is complete.

2) A temporary work deck is needed for the repair work in the No. 2 compartment.

3) The shaft repair work in the No. 1 compartment may be done from the top of the present cage, provided a temporary bonnet is added.

E. Emergency Hoisting

Federal Regulations require that there be two escape-ways for a mine, or method of refuge be provided (57.11-50).

For Rickano's on-going storage operation, we recommend that the emergency hoist, run by diesel motor, be restored, and the present 'torpedo' be used (XII Plate 3).

During the rehabilitation work, we envision the need for a second hoist that would allow access to the ventilation compartment of the shaft. The emergency generator system would be capable of running this hoist. Additionally, a refuge area at the bottom of the 19" borehole would be established.

II. HEADFRAME AND SHEAVE WHEELS

A. Structure

The structural steel headframe appears to be of more than adequate strength for the proposed loads in spite of its age and corrosion spots (XII Plate 4).

It must be of sufficient strength to withstand a pull greater than the breaking strength of the hoist rope (57.19-35). To make this evaluation, engineering drawings of the structure are required.

B. Paint

Though not urgent, we recommend that the whole headframe be sandblasted or comparably cleaned, and immediately repainted. We would recommend one coat of 3 mil minimum dry film thickness of Amercoat Corp. Dimet No. 4 paint. This work could be sub-contracted out locally either prior to on-site mobilization or after demobilization by the prime contractor.

C. Sheave Wheels

The two 8' diameter, spoke-type sheave wheels should be lifted from their bearings, cleaned and checked for surface cracking, groove wear and painted (XII Plate 5). While the sheave wheels are out, the bearings should be stripped and checked thoroughly. We are expecting the sheaves and their bearings to be found to be satisfactory.

D. Sheave Deck

The sheave wheel platform deck is somewhat corroded and should eventually be replaced. Temporary decking could be used during rehabilitation work.

III. SURFACE PLANT AND EMERGENCY SERVICES

A. Ventilation

1) Adequate ventilation is necessary during all phases of the rehabilitation operation. During the repair of the shaft and shaft bottom area, the existing ventilation should be adequate. Preliminary estimates based on the 10 HP squirrel cage fan and the 19" borehole would indicate a present air flow of approximately 5000 cfm. During the rehabilitation of the shaft this would be adequate. During the repairing of the shaft, the ventilation compartment would be repaired to allow for the additional ventilation that will be necessary during the initial drift excavation and support work. This will include replacing all broken or warped lumber which would allow leaks or cause restrictions in the compartment.

2) The surface or top end of the vent compartment will be sealed around the two fan ducts feeding the compartment, and a collector or manifold built at the lower end to accommodate the transition to ventline.

3) In order to operate diesel equipment underground, we would recommend using a 100 HP fan mounted to blow air down the ventilation compartment of the main shaft. From the shaft bottom, the air would be carried by vent pipe and bag to the working face.

4) This sysrem may not be adequate for ventilating the storage areas during rehabilitation or for ventilating access to the stored material as the air volume is contingent on the method of control; i.e., will the rooms be sealed off after being filled and quantities stored?

5) Additional ventilation may be required as the operation expands.

B. Emergency Generator

A standby emergency generator should be installed capable of supplying sufficient power to run the ventilation fan, site lighting, signals, and the second hoist to be recommended for use during rehabilitation work. The generator should be capable of 200 KVA at 480 volts and 3 phases for rehabilitation operations.

C. Emergency Hoists

1) The emergency escapeway through the 19" borehole should be rehabilitated for a permanent emergency set-up. The borehole needs reaming (the brush is on site), and a hoist be installed capable of handling the "torpedo" now on site (XII Plate 3).

2) During shaft rehabilitation work however, a temporary hoist is required to be installed to allow access down the ventilation compartment of the main shaft. This would serve as the second means of egress and would be capable of running off power supplied by the standby generator.

IV. SHAFT REHABILITATION

A. Observations from Shaft Inspection

1) It is our opinion that unless immediate remedial action is taken there is a strong possibility that approximately 300 ft. of shaft bottom could be lost.

As the above implies, the bottom 300' of shaft is in a very dangerous and unsafe condition, and we would strongly recommend that travel in the shaft be reduced to a bare minimum, and limited to miners and experienced personnel.

2) Water inflow into the shaft (approx. 5 gpm) is the main reason for the bad condition of the shaft. The water collection ring 292' below the collar catches approximately 60% of the water, the remainder seeps down the shaft and erodes the salt behind the shaft lining over the bottom 300'. This situation is compounded by reported lengthy breakdowns of the pump in the pump station. The water collects on the shaft bottom where there is no means of pumping it to surface, and consequently the salt at mine level is very badly eroded. Large sections of the drift walls are undercut. The water ring itself needs cleaning, and repairs, or possible replacement to remedy the present overflow into the shaft.

3) Our inspection of the lower 300' of shaft confirmed that the salt had been completely eroded away over the total width of the shaft on the east side. Voids of 8 ft. were estimated between the shaft timber and the ground. Water could be seen on the salt face, which eventually will find its way down to the shaft bottom.

4) At the shaft bottom, we estimate that there is approximately 15' of salt above the station brow. The brow is very badly cracked and water can be seen dripping through these cracks. Unless remedial action is taken, we believe that in the near future this section will collapse, bringing the lower shaft timber lining with it.

5) The salt erosion around the lining of the shaft is not uniform. Consequently, the bearer beams at the shaft bottom are not taking uniform loading. The beams on the west side of the shaft are over-stressed and badly deformed. The columns supporting these beams are no longer vertical due to a combination of excessive vertical loads and lateral force.

6) In the shaft itself there is misalignment of the shaft guides and work will have to be performed for them to meet the specifications. Deformed shaft sets must be replaced (XII Plate 6).

B. 1) It is imperative that the water problem should be solved immediately. No water should be allowed to reach the salt section of the shaft under any circumstances.

2) We would recommend the following course of action:

a) Implement a thorough survey of the shaft to determine the source and origin of the water which is reaching the lower levels of the shaft.

b) Make changes to the pump station entrance to ensure that once water is fed into the station, it cannot find its way back down the shaft.

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

B. 1) c) Either upgrade the quality of the present water ring or construct a new water ring immediately above the present one in order to catch all the seepage. There should be no water reaching the shaft bottom.

d) Over the total length of the water bearing zone above the pump station we should install panning (i.e., corrugated sheeting) around the full inside periphery of the shaft, draining all water into the water ring.

e) On completion of the above work, checks are to be made on the status of water below the pump station.

f) The sump in the pump station should be cleaned of silt and solids. This will be a slow, tedious operation due to difficult accessibility and the fact that most of the work will have to be done with bucket and shovel. In the event that our investigation determines that water is seeping from the pump station down the shaft, then the pump station sump will have to be lined. This can be accomplished by the fabrication of a steel tank from which to pump the water while concreting takes place.

g) All the water in the shaft bottom should now be pumped to surface. Before pumping commences, the brine which has eroded under the ribs should be displaced with a colloidal grout (XI. Fig. 1 & XII. Plate 7). Pumping of the grout should commence at the furthest end of the void, working slowly toward the ribs (XI Sketch 1).

h) Four timber bearer beams, keyed into the rock, should be installed at regular intervals through the badly eroded zone at the bottom 300' of shaft (XI. Fig. 2). At intermediate sets; i.e., 7'6" centers, the existing timber sets should be stulled to the salt. Over the wide opening at the back of the shaft timber a vertical column should be installed down to the sump (XI Sketch 2)

i) A work shop to assemble and service mining equipment should be established, along with electrical switch gear and a temporary compressor station.

j) All the sand and the silt in the shaft bottom should now be cleared and stored in the drift entires. The shaft sump should be mucked out and the existing foundations examined.

k) All timber in the shaft that was removed for inspection purposes should be replaced or repaired. The timber guides should be checked and realigned or replaced where necessary.

B. 1) 1) The sump must be cleaned out and concrete foundation to the shaft station bearer set inspected.

m) The shaft brow secured using long anchor bolts or the sets.

n) Clean up of the station abandoned rails, scrap lumber and cars. These should be cut down and sent to surface.

o) The shaft station bearer set should be replaced.

2) It must be emphasized that the bottom 300' of shaft is in extremely bad condition and the above recommendations are based on a "best possible" case. As work progresses and a better understanding of the actual condition is known it may be that more extensive repairs are required to secure the shaft.

V. MINE LEVEL REHABILITATION

A. Scope of Work

The scope of work envisioned to rehabilitate the station and level in order that limited storage operations could commence involves work to a distance of approximately 300' from the shaft.

B. Necessary work would involve the following:

1) Mining equipment, compressor, and electrical switchgear lowered and assembled.

2) Previously dumped salt laying on either side of the roadway should be picked up and transported, using an Eimco 913 loader or similar to a designed room.

3) Working away from the shaft, the roadway will be widened and graded to match the mine haulage ways. The ribs and brow will be drilled using a specially designed platform attachable to a front-end-loader, and blasted to the desired configuration. To maintain a smooth back, pre-splitting or smooth wall blasting technique will be carried out. On completion of the ribs and back, the floor will be leveled, popping where necessary. To obtain a smooth grade fine salt should be spread and compacted with the loader.

VI. Equipment & Procedure for Salt and Muck Disposal

A. Procedure

The cleaning and preparation of the access drifts and rooms requires the removal of salt and muck from the back or ceiling and from floor heaves. This waste is to be disposed of in abandoned rooms and drifts that are not suitable for storage of the nuclear waste.

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VI. B. Equipment

1) A 3 cubic yard wheel loader to handle an optimum payloa and to provide the weight and breakout force necessary remove floor heaves is recommended. The 3 yard loader would be suitable for tramming short distances such as from one room to the other, or any other operation requiring movement of 400' or less. Since, however, mu of the waste salt will have to be moved considerable distance, ten ton underground trucks are recommended fo handling the longer hauls.

2) If the 3 yard loader is equipped with an ejector type bucket, it could be used to stack the waste salt up to the ceiling or back, thus reducing the waste storage sp Loaders and trucks should be equipped with operator pro for roll-over or from roof falls or slabs, and have an proved diesel engine for underground use.

3) The platform for drilling and loading of explosives wil mount on to the loader.

4) A 250 cfm portable, electric driven compressor is recon for use underground to supply air for the drills. For port of personnel and tools, etc., we recommend the pur of a small diesel tractor approved for underground use. This would be used for transport of personnel and could be used to pull a trailer or conveyance required to hau nuclear waste containers. If this tractor was fitted w a forklift, it could also be used to load and off-load pallets of containers. It would be prudent to have two these tractors to ensure availability of equipment.

C. Repair Shop

A repair shop for underground machinery would also be necess for the operation, as well as underground fuel station, and powder magazine.

D. Equipment Spares

Initially, one loader and one underground truck could perfo the work, however there would be no backup and when one piec of equipment is down, the operation would stop. Tradition- ally, 70% availability of equipment is considered excellent; thus, a minimum of 30% down-time can be expected if only one of each unit is used.

It is recommended that an in-depth evaluation be made to de mine the optimum equipment requirements for the on-going Rickano operation, and that any additional equipment be acq during the rehabilitation program so as to provide spares.

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VII. EQUIPMENT REQUIRED

(To Be Purchased by Client)

	Number Required	Estimated Used Cost (Each)	Estimated New Cost (Each)
913 L.H.D.	2	$ 55,000	$105,000
Diesel Underground Truck	2	50,000	90,000
Personnel Carrier	1	-	25,000
Diesel Fork Lift	1	-	35,000
200 k.v.a. Standby Generator	1	20,000	40,000
Portable Welder	1	-	5,200
50 H.P. Electric Compressor	1	8,000	12,000
Forklift for Surface	1	8,000	20,000
Emergency Hoist	1	20,000	50,000
TOTAL		$329,200*	$385,200 to $580,200*

* Includes new equipment whre used is not listed.

** $385,200 using one L.H.D. and one truck. An added $195,000 for the second units.

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VIII. SPECIAL ITEMS

(To Be Purchased by Client)

	Number Required	Estimated Cost
1,000 Gallon Diesel Tank		600
Drilling Machines	3	15,000
Air Legs	3	3,000
Chippers	2	2,000
Powder Magazine		5,000
A Frame		3,000
Underground Welder		1,200
Electrical Material		35,000
Bell Rappers	2	1,500
Cable for Bell Rappers		500
Shop Tools		10,000
Come-alongs & Chain Hoist		2,000
Materials for Hoist Repair		4,000
Miners Lamps	10	500
Rack & Charger		600
Emergency Hoist Rope		1,500
Man Hoist Ropes		8,080
Hoist Cages	2	28,000
100 H.P. Fan & Starter		11,500
20 H.P. Booster Fans	2	4,000
48" Ventline		25,000
20 G.P.M. Pump		2,000
Rope Reeling Frame		5,000
Cage Bonnets		2,000
Concrete Bucket		1,500

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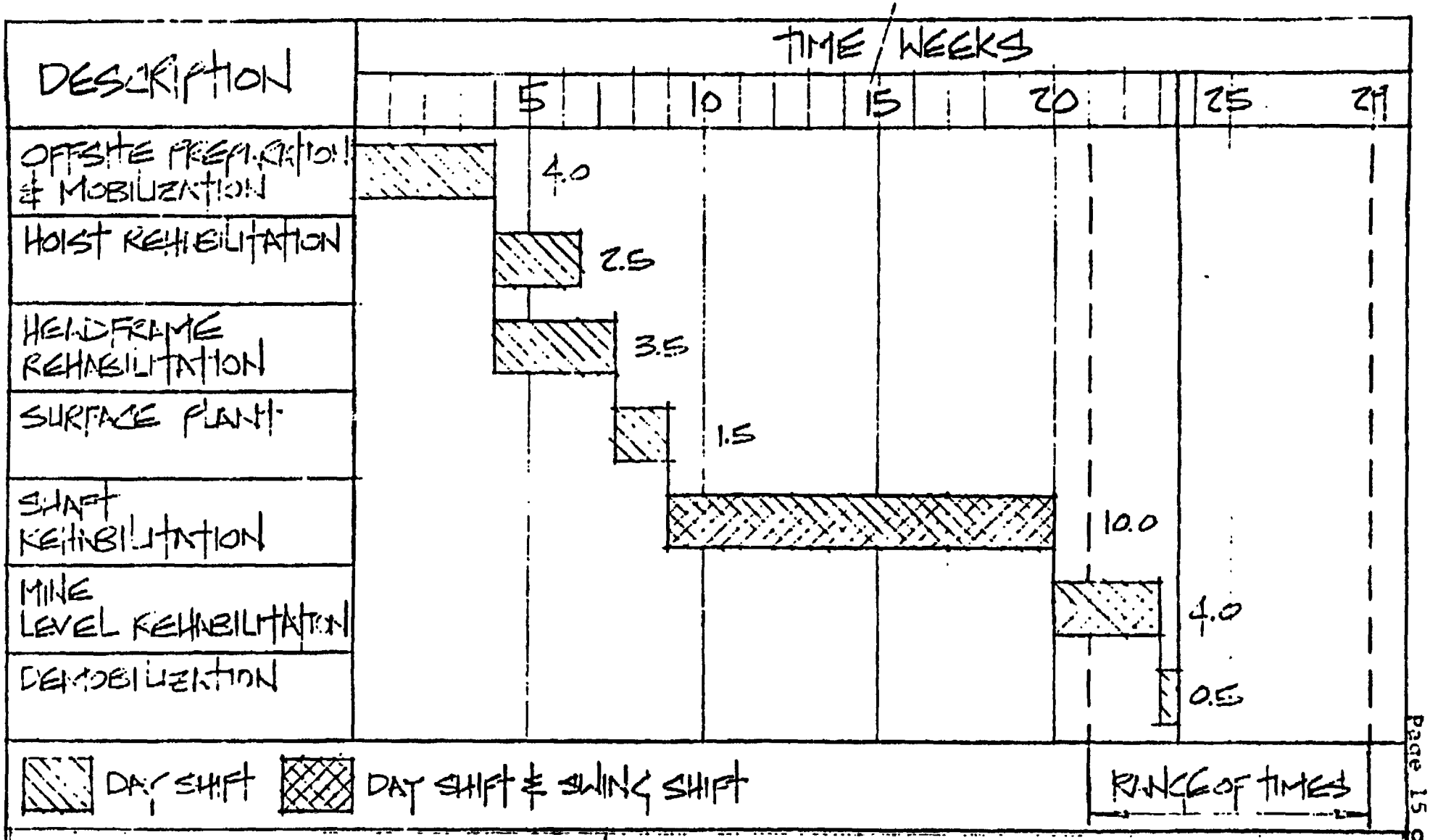
IX. MATERIALS TO BE SUPPLIED BY CONTRACTOR

		Estimate Cost
Drill Platform		$ 1,000
Temp Work Platform		1,000
Back Sheeting		3,000
Timber		8,000
Misc. Steel		2,000
Grout for Station		5,000
Gravel for Station		500
Foundation Concrete		750
Concrete for Station Floor		500
Materials to Repair Sheaves		150
Schedule 80 2" Pipe		1,680
		23,580
Other Consumables		30,000
	Subtotal	53,580
	15% Profit	8,037
TOTAL		$61,617



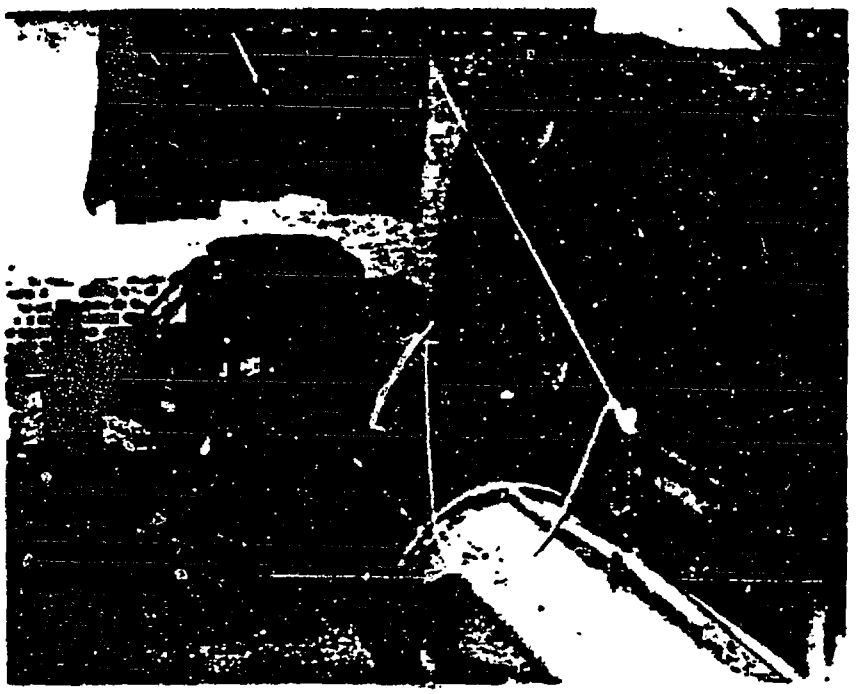
MINE REHABILITATION SCHEDULE
RIVANO CORP. LYONS, KANSAS.

SALT OUTLINE
POSTS
BEAMS
EXISTING SHAFT
TIMBER OUTLINE

ATTACHMENT A

SECTION THRU STATION AT SHAFT BOTTOM SHOWING ERODED ZONES TO BE FILLED

XI FIG. 21
Page 17 of

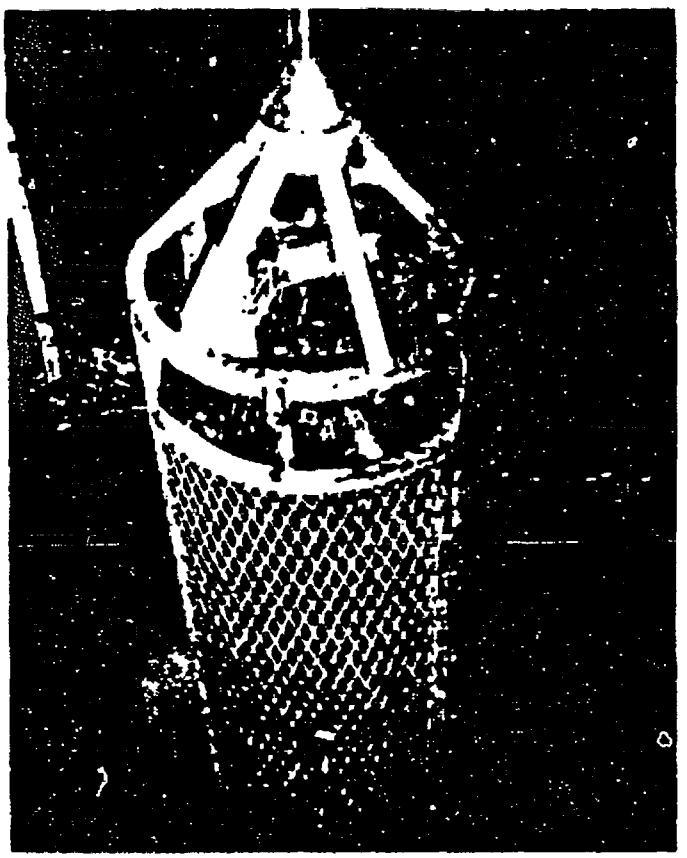


POOR ORIGINAL

EXISTING CONDITIONS

EXISTING 150 H.P. HOIST

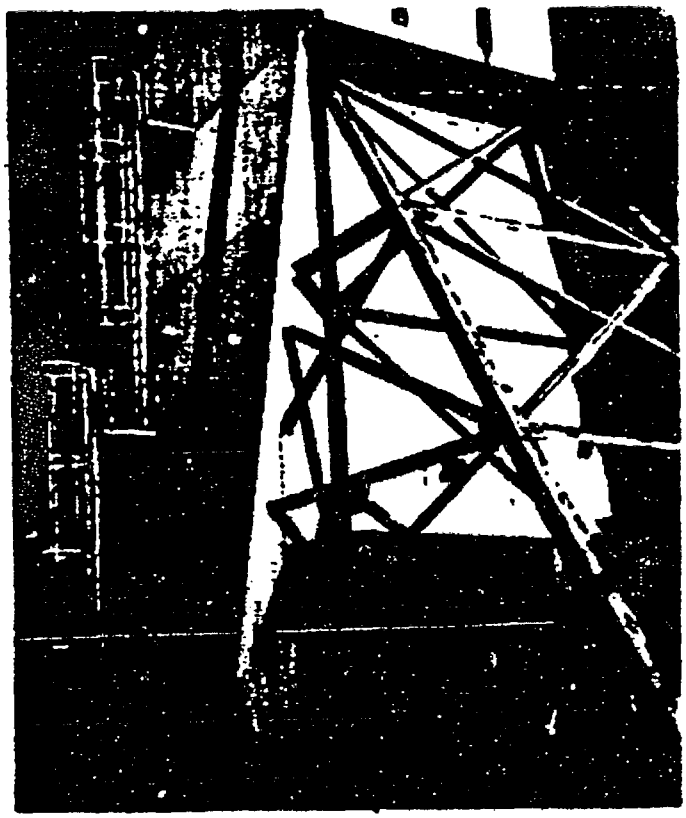
POOR ORIGINAL



EXSTING EMERGENCY CAGE

POOR ORIGINAL

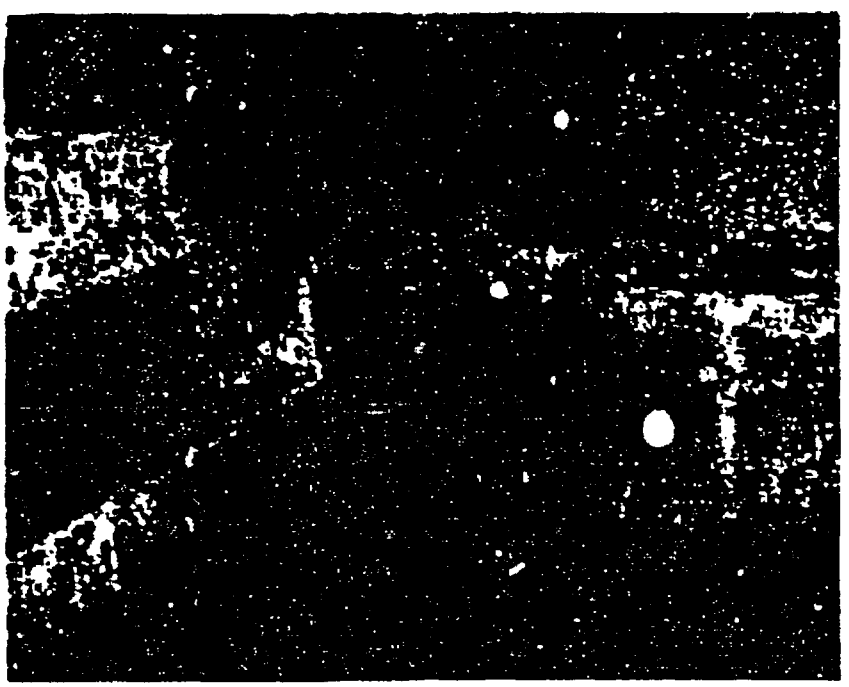
THE CEMENTATION COMPANY OF AMERICA INCORPORATED



HEALTHE ...STRATES RUSTING OF SKILLED MEMBERS

POOR ORIGINAL

3 1/2 SPOKE TYPE SHEAVE WHEEL



STATION FLOOR

ILLUSTRATES HOW WATER HAS ERODED THE SAND UNDER THE RIBS

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

COST ESTIMATE
for
Rickano Corporation
Mine Rehabilitation
Lyons, Kansas

Contract Item No.			Rickano Corporatio Cost
(1)		Offsite Preparation	$ 4,600
(2)		Transport of Equipment to and from Site	4,600
(3)	(a)	Transportation and Travel Expense of our Personnel to and from Site	3,330
	(b)	Other Relocation Costs (as agreed)	
(4)	(a)	Fee for Supplying Supt.	40,000
	(b)	Fee for Supplying Shift Supv.	-
	(c)	Fee for Supplying Site Engineer	28,000
(5)	(a)	Fee for Supplying Leadman	56,100
	(b)	Fee for Supplying Hoistman	46,200
(6)		Accomodation & Daily Travel Expense	21,385
	(a)	Initial or Temporary	-
	(b)	Other	-
(7)		Involvement By:	
	(a)	Senior Company Staff	11,000
	(b)	Other Off-Site Technical Staff	3,160
(8)		Local Labor	105,895
(9)		Weekly Rentals	
	(a)	Grouting Unit	
	(b)	Pickup 2	
	(c)	Colcrete Pump 1	
	(d)	Mixing Tank 1	19,400
	(e)	Sheave Wheel 1	
	(f)	Temp. Secondary Hoist 1	

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

COST ESTIMATE
for
Rickano Corporation
Mine Rehabilitation
Lyons, Kansas

Contract Item No.			Rickano Corporation Cost
(10)		Materials, Stores and Supplies Consumables (Cementation Purchases)	$ 61,617
(11)		Furnished by Owner	
	(a)	Special Equipment	385,200
	(b)	Special Materials (Rickano Purchases)	172,480
			$962,967

The basis upon which this Cost Estimate is made is given in Attachment C, and Parts VII, VIII and IX of Attachment A.

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

STANDARD SPECIALIST WORK - Schedule of Pat...

1.		Offsite preparations	Cost + 1...
2.		Transport of Equipment to and from site (See Page 4, Item a)	Cost + 15%
3.	a)	Transportation and travel expense of our personnel to and from site (See Page 4, Item b).	25¢ per mile plus accomodati cost and meals @ $17.50 per
	b)	Other relocation costs	Costs + 15%
4.	a)	Fee for supplying Supt. See Page 4, Item c.2.)	each $2,000 per week (1)
	b)	Fee for supplying Shift Supvr. (See Page 4, Item c.2)	each $1,850 per week (1)
	c)	Fee for supplying Site Engineer (See Page 4, Item c.2.)	each $1,400 per week (1)
5.	a)	Fee for supplying Leadman (See Page 4, Item c.1.)	each $1,700 per week (1)
	b)	Fee for supplying Hoistman (See Page 4, Item c.1.)	each $1,400 per week (1)
6.		Accommodation and daily travel expense.	
	a)	Initial or Temporary	Accommodations at cost plus @ $17.50 per day Daily travel @ 25¢/mile (1)
	b)	Other	Accommodation to be agreed. Daily travel @ 25¢/mile (1)
7.		Involvement by:	
	a)	Senior Company Staff	each $525 per day (1)
	b)	Other off-site Company Staff (Technical)	each $200 to $400 per day
8.		Local Labor	Cost plus 10% overhead plus 10% profit
9.		Weekly Rentals:	
	a)	Provision of 1 grouting unit (Pumps and Tank (s)	$350 per week (2)
	b)	Provison of pickup or panel truck (Note running costs charged under Items 2 & 3)	$150 per week or suppliers invoice to us plus 15% (2)

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

STANDARD SPECIALIST WORK - Schedule of Rates (Cont'd.)

9.	c)	Additional equipment for Chemical Grouting; e.g. storage tanks, mixer, pressure pumps, gauges, meters, truck tanker.	To be determined when requirements are known (2)
	d)	Colcrete Pump	$150 per week (2)
	e)	Temporary Secondary Hoist with Sheave Wheel	$350 per week (2)
	f)	Mixing Tank	$100 per week (2)
	g)	10 c.y. Underground Truck (Eimco 980)	$5,000 per month (2 month min
	h)	3 c.y. L.H.D. Leader (Eimco 913)	$5,500 per month (2 month min
	i)	200 kva Standby Diesel Generator	$2,600 per month (2). (3)
10.		Materials, stores and supplies such as but not limited to special grouts, packers, grout valves, drill steels, bits, explosives, rock bolts, mesh, straps, concrete, cement, timber, bolts, nails, hoses, pipe fittings, fuel, oil, lubricants, etc.	Cost plus 15%
11.		Equipment or special items required for the mine operation proper.	

NOTES:

(1) Rates are reviewed each April 1st.

(2) See Page 4, Item d.

(3) The Cost Estimate (Attachment B) assumes that the Client would acquire this equipment. Should delivery be such that the schedule would be affected, Cementation has this equipment available for rental. The cost estimate would be affected accordingly.

THE CEMENTATION COMPANY OF AMERICA INCORPORATED

Items Supplied by Client

Our porposal is based on the customer supplying the following, delivered to the site of the work, where applicable, and free of charge to the Contractor (unless otherwise specified).

(a) Water

(b) Suitable office accommodation and change facilities.

(c) Electric power supply and lighting.

(d) Use of special equipment materials. (See lists Attachment A.)

SPECIALIST GROUTING PROPOSAL

E. CONDITIONS

a. Cost is inclusive of all packing, crating, loading and unlc at depots, freight bills, duty brokerage, etc.

b. Cost includes all fares, car expenses, taxis, motels, meals traveling from present location to new location and return depots and also for accumulated leave periods of one week c more which have been mutually agreed may be taken during th period of the project.

c.1. Item 5 is based on a standard work week at site of six days eight hours each. If any hours are worked in excess of thi i.e. over eight hours in any one day or work on Sundays, th the rate charged will be one and one-half times 1/48 of the for each hour worked when the employees are paid for time a one-half overtime and two times 1/48 of the fee for each ho worked when the employees are paid double time. Statutory holidays are considered as time worked and will be charged an eight hour day. These employees are also entitled to on day's leave for every two weeks without break on a job whic does not permit them to travel home weekends. Each Day's l so accumulated will be charged as an eight hour day. Contr weekly time sheets are to be signed by customer representat

c.2. Item 4 is based upon payment of the weekly rates given for term sickness or accident lost time or excused absences but for vacation periods. Statutory holidays are considered as worked and will be charged as one sixth of a week. These employees are also entitled to one day's leave for every tw weeks without break on a job which does not permit them to home at weekends. Each day's leave so accumulated will be charged as one sixth of a week. Contractor's weekly time s are to be signed by customer representative.

d. Plant rental commences on day equipment received on site an terminates day equipment returned from site. Day rate is 1 weekly rate. (See attached for list of fittings forming pa grout unit.)

e. Cost is inclusive of freight, taxes, duty, etc.

f. (i) The Contractor shall not be responsible for any loss, or damage, however caused, to or with respect to the W arising from damage to the Work, or arising from const of the Work.

SPECIALIST GROUTING PROPOSAL (Cont'd.)

f. (ii) The Client hereby releases and discharges the Contractor o and from all actions, causes of action, claims and demands whatsoever which it may have for or by reason of any loss, expense or damage, however caused, to or with respect to t Work, arising from damage to the Work or arising from the construction of the Work including, but without limiting t generality of the foregoing, all actions, causes of action claims and demands for loss, expense or damage caused or contributed to by the negligence, fault, acts or omissions of the Contractor, its employees, agents, successors and assigns.

(iii) The Client hereby saves and holds Contractor, its agents a employees harmless and whole from and against all liabilit from claims of personal injury including death or damage t property of others which may arise from operations in connection with Contractors's Work for Client, whether such operations be by Contractor or by any sub-contractor or by anyone directly employed by either of them and whether due to negligence of the Contractor, any sub-contractor or anyone directly or indirectly employed by either of them, and Client at its own expense shall defend any and all actions based thereon and pay all charges of attorneys, costs and expenses arising therefrom.

(iv) The Client agrees to insure or self-insure the work agains all risks including but without limiting the generality of the foregoing, the risks set forth in subparagraphs (ii) a (iii) hereof.

(v) Contractor will, after full payment by the Owner, keep the premises free and clear of all mechanic's liens and will furnish the Client with certificate and waiver as provided by law.

(vi) Contractor shall provide and keep in force the following insurance until the work is completed and accepted by Client and final payment is made to Contractor:

(a) Employer's Liability Insurance to cover claims based on common law filed by Contractor's employees for traumatic injuries as well as occupational diseases (including death);

(b) Comprehensive Automobile Liability Insurance coverage both bodily injury (including death) and property damage.

SPECIALIST GROUTING PROPOSAL (Cont'd.)

f. (vi) (c) Contractor will secure and maintain Workman's Compensation Insurance under the Laws of the State of Kansas as required.

(d) Certain of the Contractor's Employees will be insured under the Workman's Compensation Laws of Arizona and Contractor agrees to continue this insurance for the duration of the work.

g. Payments to be made monthly following submission of our Invoice.

Question 2

Concerning the shaft building, shaft repairs and miscellaneous equipment, The Cementation Company of America, Inc. has inspected the shaft and mine and their recommendations are presented in their report which is included in our answer to Question 1.

Rickano proposes to use Cementation's expertise and services to bring the mine and all of the associated equipment up to M.S.H.A. standards.

Questions 3 and 4

At the present time, Mr. Fredrick P. Beierle and Mr. James L. Harvey will perform all managerial functions. As additional personnel are hired for particular managerial positions as outlined in Rickano's application, Section II "Radioactive Waste Management Plan", Item C "Facility Management Personnel, Qualifications, Responsibilities and Duties" Pages 56 through 60, their qualifications will be submitted.

Question 5

Enclosed is the indoctrination lecture to be given as Part one to all employees at Rickano's Lyons Facility. This lecture will be a one day class which will consist of the lecture, demonstrations with instruments and sources and a question and answer period.

Part Two will be a minimum three day course if taught at the company facilities, and a copy of the typical examination is attached. A grade of 80% will be considered passing.

However, Rickano will send any employees who have not completed previous courses to a school or organization offering such courses if they are to be considered as Health Physics Technicians or Radiation Monitors. Such courses are given by Rockwell International, Energy Systems Group, Canoga Park, California; Georgia Institute of Technology and others.

Any courses that are taught at the Lyons Facility will be conducted by a Certified Health Physicist.

ORIENTATION LECTURE

Welcome to Rickano Corporation. You are in this orientation seminar this morning so that we may tell you what Rickano is doing at this facility and to give you some background information about radioactive materials.

One of the primary objectives of Rickano Corporation as we conduct our business of radioactive waste disposal is promoting the protection of personnel and the environment from unnecessary exposure to radioactive materials.

Those of you here today will be told what radiation is; how to recognize signs and symbols denoting radiation areas; what hazards to expect or more important, what not to expect; and how we will operate this facility in a completely safe manner.

As you are undoubtedly aware by now, Rickano Corporation is in the business of storing radioactive waste materials. You are probably wondering what radioactive wastes are, what they look like and are they as bad or worse than what you have heard or read about. Today we hope to dispel any fears you may have and make you realize that handling radioactive materials is no different than handling many other hazardous materials that are much more familiar to you such as electricity, gasoline, acids, and a list too long to enumerate here today of dangerous chemical compounds except that radiation is much easier to detect and measure.

Such things as electricity, gasoline, and acids are not that frightful to you because you have co-existed with them all your lives. However, let's take electricity to start, how many of you would touch a bare wire in an extension cord or stick you finger in a light socket? Talk about glowing in the dark, that would certainly do it! You would receive at the very least a mild electrical shock, then ranging on to burns and possible death under the right circumstances. Yet you may say to yourself that only a very stupid person would deliberately touch bare electrical wires or stick their finger in a light socket. Correct! Therefore, what you would be saying is that you have learned to respect electricity and you know that as long as it is handled safely you can live with it very nicely. Radioactive materials are no different. They too can be lived with.

Instead of an electrician to properly wire your house with electricity, we have technicians who see that radioactive materials are used properly.

How many of you would light a match around gasoline? What about the acid in your car's storage battery? As a matter of fact, how about your car? These things are intimately involved in your daily life and you would have a hard time doing without them. But unless each and every one of them is properly treated, they are dangerous.

What I have been saying so far is that civilization has taken technological advances that could and have been considered to be the "end of world" type developments and very nicely adapted and assimilated them into our way of life.

Radioactive materials are no different. We are going through our first phase of public reaction exactly the same way as dynamite, airplanes, automobiles, electricity, and the steam engine. All of these things were new, strange, and terrifying to the general unknowing public. Look at them now, how would we do without them. Far from destroying the world, let's look at the population growth of the United States from about the time of the automobile, airplane, and electricity were first invented and becoming a part of our lives. The population in 1900 was about seventy six million. In 1970, the population was two hundred three million. What happened to the prophesies of the doomsdayers?

Hopefully, I have been able to put radioactive materials into some sort of perspective with other technological advances that at the time of their advent were also very frightening to the public, and have proven to be more beneficial than harmful.

Now let us go into radioactive materials and wastes specifically. Almost every act of man leads to wastes of one sort or another - hunters' ejected cartridges, soft drink cans and bottles, smoke from factory chimneys, wastepaper in schoolrooms, or the curls of childhood left on the barbershop floor.

The nuclear industry is no exception. Managers of nuclear installations are concerned with the handling, processing, and disposing of wastes. In many ways this activity is comparable to other disposal processes, but it is different in a few important respects.

The most significant difference between nuclear wastes and those of other industries is that nuclear wastes are radioactive, and this accounts for the special methods required for their disposal. Since 1942 when the first self-sustaining chain reaction was achieved, the nuclear industry has grown vigorously. In addition to nuclear power plants now in use, radioactive materials are increasingly regarded as important tools for research, medicine and industry. As the nuclear era continues, there will obviously be more radioactive waste. Clearly the methods used for the control and disposal of wastes must not only be appropriate to a widespread, lusty endeavor but also safe and economical.

Many kinds of radioactive wastes are produced by the nuclear industry. State and federal licensing procedures and regulations deal with more than 900 radioisotopes of 103 elements (radioisotopes of 103 elements (radioisotopes are radioactive forms of elements). Wastes containing these radioisotopes may be in the form of gases, liquids or solids, may be soluble or insoluble, and may give off various types of radiation at many energy levels. Although many radioisotopes die off (decay) rapidly, some require hundreds of years to decay to safe levels.

The hazards of radioactive materials stems from their basic characteristics. Radiation cannot be detected by the senses; its effects are often cumulative and may not be evident for some time; and it can damage both to an individual and, by impairing his reproductive cells, future generations of his decendants. Fortunately, the nature of radioactivity also makes it possible to detect its presence with certainty and remarkable accuracy.

Now, the reference I just made to reproductive cells and affecting future generations may have you on the edge of your seats. But please keep in mind, these things only happen if you are not properly protected from radiation, just as if you were not properly protected from electricity. Both radiation and electricity are safe until you do something wrong such as a finger in the light socket or not heeding a warning sign or following instructions when handling a radioactive material container.

An important point that you should know is that all radioisotopes are immune to outside influence. Each radioisotope decays at its' own particular rate regardless of temperature, pressure, or chemical environment and continues to do so no matter what is done to it. Allowing radioisotopes to decay naturally is the only practical means of eliminating

their radioactivity. All processing, storing, and use of radioisotopes must therefore be considered as an intermediate step leading finally to disposal by decay.

Now let me tell you a little bit about the radiation that is emitted from radioactive wastes. Here at the Lyons repository we will be primarily handling wastes with only three types of radiation, alpha, beta, and gamma. I will go into some detail now and try to describe these three types of radiation. However, before we get to these, let us take a look at the atom from which these three types of radiation are emitted.

All ordinary matter is made up of atoms. The atom is the smallest particle of any element resembling exactly every other particle of the same element. It is composed of sub-atomic particles common to all elements. For example, let us consider a half-pound cube of pure Uranium-238. Each atom of the hundred-thousand-million-million-million atoms present is identical with every other atom present.

Let us now discuss the fundamental make-up of the atom. The nucleus is the heart of the atom. Each atom has only one nucleus. For the present, we shall say that the nucleus contains two types of fundamental particles, called protons and neutrons. The proton has a single electrical charge and the neutron is uncharged or electrically neutral, thence the name. The proton and neutron are about the same size which is, of course, extremely small.

Revolving around the nucleus are small "particles" containing a single charge of negative electricity. These are called electrons and each is only about 1/2000 of the size of a proton. There is the same number of electrons in orbit around the nucleus as there are protons within the nucleus. Therefore, since electrons have one negative charge and protons have one positive charge, and there are an equal number of each present in an atom, the atom is therefore electrically neutral. It may help to visualize the atom as a solar system in which the planetary electrons revolve about the nucleus in elliptical orbits. Figure 1 here on the wall may help you understand somewhat better. This also shows isotopes of the basic element.

Now let us get back to the three types of radiation we referenced earlier. You will often hear them referred to as "rays", which is partially true as we will soon see.

Alpha Particles

Of the naturally occurring radioactive isotopes, some are found to be alpha emitters. The alpha particle is a helium nucleus which consists of two protons and two neutrons bound together. These particles generally travel in a straight line; only travel a few inches in air, but only about a thousandth of an inch in aluminum, and similar small distances in water and body tissues. Logically then, we can assume from this that alpha particles are primarily an internal hazard because of the soft tissue present inside the body with protective tough outer layers of skin to stop the alpha particles from penetrating. Therefore, when handling alpha emitting isotopes, the prime protection to be followed is that of prohibiting inhalation or ingestion in any manner. Alpha particles are readily detected by a properly trained person using the proper instrumentation.

Beta Particles

Beta emission is another type of radiation comprised of particles. A beta particle is simply an electron discharged by a nucleus. Beta particles travel at much higher speeds than do alpha particles since they have a mass which is about 1/7000 that of an alpha particle. Because of their high speeds, the beta particle has a longer path length. The most energetic beta particle may travel many feet in air, several inches in tissue, a few inches in aluminum or less than 1/10 an inch in lead. Most radioactive materials that we will be handling emit less energetic beta particles that will have penetrations of a ¼ inch of aluminum, or a sixteenth of an inch of iron or lead. As you can see, beta particles can penetrate further into skin tissue than alpha particles so they must be considered an external as well as internal hazard. But to set your mind at ease, all of the radioactive waste received at the Lyons Facility will be in sealed containers, therefore, beta particles will not penetrate the walls of most of these containers. This is not the case with our third type of radiation as we will now see.

Gamma Rays

Gamma rays are more penetrating than either alpha or beta particles. Now if you will note the emphasis on rays and particles heretofore, you should have come to the conclusion that they are not the same. You are right. Gamma rays are not a particle, but are comprised of pure energy. Gamma rays have no mass or charge and penetrate several inches into iron or lead. Therefore, radioactive materials that emit gamma rays have to be packaged in small quantities in order to reduce the amounts of gamma rays coming out of a package

with enough iron, lead or concrete surrounding them to reduce the amount. Fortunately, gamma rays are very easy to detect and are quite easily protected against.

We have now looked at the three types of radiation we will be "seeing" at the Lyons Facility, and you may be wondering why they are ejected by an atom in the first place.

The reason is relatively simple, there is just not enough room in the nucleus for all of these tiny particles that may be there and the atom is "kicking them off" in order to return to a nice stable atom. After a radioactive atom "kicks off" enough of these atoms (known as decay) it ends up a nice stable non-radioactive isotope. So I guess we can say that nature has built in its own system to correct the problem but as we said earlier, it can take very short periods of time or up to thousands of years.

As you walk around the Lyons Facility you will see a sign that has a magenta or purple three-sided symbol resembling a propeller on a yellow background.

This is the radiation symbol to denote radiation containers and/or areas where radioactive materials are stored. In addition to the radiation symbol, the word "CAUTION" will be printed on the sign and and any one or a combination of the following words will be on the sign. "RADIATION AREA", "HIGH RADIATION AREA", "AIRBORNE RADIOACTIVITY AREA", OR "RADIOACTIVE MATERIAL".

Wherever these signs are displayed, you as non-radiation area workers are to avoid these areas unless you are escorted by or have received permission to work or conduct any business in those areas by the Radiation Safety Office.

Avoiding these areas where radiation may be present is part of our radiation control program. The chances of any of you receiving any harmful quantities of radiation is extremely remote, but here at the Lyons Facility we are practicing what is known in the industry as "ALARA", an acronym for "as low as is reasonably achievable". So doesn't it make sense that if your functions can be conducted away from radiation that it should be? So do we!

This is obviously a task that everyone working here must be cognizant of and develop practices that keep you from being exposed to little radiation or none at all from the materials being handled at this facility.

But how about radiations that you may be exposed to outside of your work area. Believe it or not, radiation was in your life long before the establishment of this facility. We are talking about radiation from the sun, from natural radioactive materials contained in soil, cosmic rays, and materials that your homes are constructed of. This radiation is known as "background" radiation. Other radiation that you probably have been exposed to is dental x-rays, chest x-rays, and many other x-ray examinations that are used by the medical profession.

To give you an idea of how much radiation you receive from these sources just mentioned, let's take a look at them on this list here.

Type of Exposure	Radiation Level
Background - per year	100 mrads
Dental x-ray, each time	100-300 mrads
Chest x-ray, each time	50 mrads
Coast-to-coast flight, flying at 35,000 feet	2 mrads
Mammogram x-ray, each time	1,000 mrads

I am sure that most of you here have had dental x-rays and chest x-rays and therefore have received some radiation from them. I am also sure that you were not very concerned about how harmful they might have been, and rightfully so. These examinations are very important diagnostic tools used by your doctors and dentists and the benefits far outweigh the risks.

The reason for even bringing this to your attention is to once again try to bring radiation in perspective. Now let's take a look at the amounts of radiation that occupationally exposed workers are allowed. For those of us who will be unloading trucks and moving the containers into the mine, we will be allowed a maximum of 5,000 mrads per year. That is the maximum, however, experience at other burial sites has demonstrated that workers annual exposures are usually well below this maximum quantity.

Radiation levels that you receive from natural background and medical sources, and occupational sources have been touched upon, and you may be wondering how do we know how much radiation we receive from the containers being handled here at the Lyons Facility.

This brings us to instruments and personnel dosimetry. Radiation can be detected by instruments designed for the purpose. To the average person, such instruments are "geiger counters". A geiger counter is but one of the available types of radiation detection instruments. Geiger counters and other appropriate instruments will be used at the Lyons Facility for measuring radiation so that proper procedures for safe practices can be established.

For the protection of individuals on a day-by-day or even minute-by-minute basis, we use devices which measure the accumulated radiation exposure. There are two types that will principally be used here, Thermoluminescent (TLD) dosimeters and pencil dosimeters.

Thermoluminescent dosimeters, usually called badges are worn for a full month and then exchanged for a new badge and the used one is sent to a laboratory for reading and a report is returned to us that is reviewed by the radiation safety staff and then becomes a permanent record of radiation exposure. TLD badges do not provide a record of immediate exposure, so for a readily available accumulative record a pencil dosimeter is used.

A pencil dosimeter is a device which will record the radiation which is received, starting from zero, when the device is properly set, to the limit of the scale of the particular dosimeter. The dosimeters we will be using here at the Lyons Facility can be read directly by holding them up to the light. These readings can be used to provide the wearer with information as to how much he has accumulated on a particular task, and they can and will be recorded on a daily record as a check on the TLD badge that is processed monthly.

I hope this seminar has helped you better understand what we are doing here at the Lyons Facility and to help allay any fears you may have regarding radiation. Remember, radiation is no more dangerous than many other materials present in your daily life, but can be dangerous if not properly treated.

I would like to bring to your attention a point that is of vital importance to both you and your company. This point is that all of our activities here at this facility are licensed by the State of Kansas Department of Health and Environment in a manner of very specific terms and conditions. A license to operate a facility such as this one is not a piece of paper like your driver's license or a hunting

license, rather it is a very detailed document that tells us exactly what we can and cannot do. Any changes in operation that we may contemplate cannot be performed until a formal request for an amendment is made to and approved by the State of Kansas Department of Health and Environment.

Contained within the state's Radiation Protection Regulations are regulations that are designed to protect all workers and requires us to give you certain notices, instructions and reports. A copy of these regulations are at your disposal at any time you desire to read them. In addition, we are giving you here today a reprint of Part 10 of the Kansas Radiation Protection Regulations which is entitled "Notices, Instructions and Reports to workers; Inspections". This part tells you what we must do to protect and inform you regarding work at this facility. It also tells you what options and rights you have as individuals under the regulations.

In summary, let me leave you with the thought that more is known about the risks from radiation exposure than almost any other hazard in the environment, and standards for exposure are under constant review by state, national and international bodies and agencies that deal with and regulate exposures.

Teaching Aids to be used with this Seminar

1. Sketches of the atom
2. Sketches showing penetrations (shielding)
3. TLD and pencil dosimeters
4. Various instrumentation, GM counters, ionization chambers, and alpha detectors.
5. Kansas Radiation Protection Regulations

Question 6

Concerning the question regarding compliance with D.O.T. regulations for packaging and transportation of radioactive materials, we use the "Code of Federal Regulations, 49, Transportation Parts 100 to 199 revised as of October 1, 1975 with ancillaries covering Hazardous Materials Regulations by Air, Rail, Highway, Water, and specifications for shipping containers.

Specifically Part 173.389 thru Part 173.399 deals with radioactive materials classification.

We plan to submit at a later date our Quality Assurance (Q.A.) program. The reason for doing this is that the present rules are being revised to complement or comply with the internationally adopted I.A.E.A. regulations.

We expect adoption to take place sometime in early 1980. We then plan to submit our (Q.A.) program in packaging and transportation of radioactive material. To do so now would constitute duplication of effort at a time we know significan changes are forthcoming which would negate our (Q.A.) program before issuance of a license or operation of the mine is contemplated.

As stated in the Monday, January 8, 1979 Part II of the Federal Register Vol. 44, No. 5, Department of Transportation Materials Transport Bureau on Radioactive Materials Requirements For Transportation, on Page 1852, under the subheading Summary: states, "This notice proposes to change the requirements of the Hazardous Materials Regulations concerning radioactive materials to make them compatible with the latest revised international standards for transportation of radioactive materials as promulgated by the International Atomic Energy Agency (I.A.E.A.)".

Further on Page 1854 Item III entitled "Substantive Proposed Changes": While this notice proposes an extensive revision of that portion of the regulations dealing with the transportation of radioactive materials, the majority of the changes are not substantive in nature".

Again these regulations are expected to become effective sometime in 1980, however until they are effective Rickano is forced to adopt a wait and see attitude.

Concerning the records, test results, etc. we have discussed this in section G, H, and I and these will be covered in our (Q.A.) program as previously stated.

SOUTHWEST NUCLEAR COMPANY

RADIATION SAFETY EXAMINATION

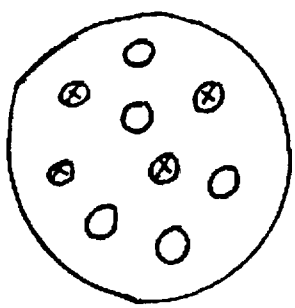
NAME_____

COMPANY_____

DATE_____

Part of Atom	Particles	Charge	Mass

1. An atom consists of a small core called the ——→
2. . . . surrounded by particle paths called ——→
3. Two kinds of particles make up the core called——
4. The particles moving in paths around the core are called ——
5. The electrical charges of these particles are ——
6. The weights or masses of these particles are approx. ——
7. In an atom with the following core, what are the atomic number and the mass number?



Atomic No. _____

Mass No. _____

8. Complete the following table:

Type	Consists of	Charge	Mass	Range (air
Alpha				
Beta				
Gamma				
Neutron				

Each of these types of radiation consists of atomic particles or electromagnetic radiation. Identify each ——

The charges on individual units of this radiation are ——————————

The atomic weights or masses of individual units are ——————————————

The maximum ranges in air of these type of radiation are ——————————————————

9. The activity of a radioactive material disintegrating at the rate of 3.7×10^{10} d/s is _____.

10. One (1) gram of radium represents how much activity in these units _____.

11. What is the disintegration rate of 1 millicurie of:

    (a) Ir^{192} _____

    (b) Co^{60} _____

12. The energy acquired by an electron accelerated across a potential of 100 kv in an X-ray tube is _____.

13. One (1) Mev is equal to _____Kev.

14. The three mechanisms by which X-rays produce ionization in matter are:

_____ _____ _____

15. The half life of a radioactive material is the time required for _____ percent of the atoms of the material to go through radioactive decay.

16. The half life of an isotope is 3 days. You have 16 curies of the isotope to start with. How much is left after:

    3 days? _____

    12 days? _____

17. When gamma radiation interacts with matter, it always causes (choose one):

    a. Fission
    b. Fallout
    c. Ionization
    d. Gamma radiation _____

18. The result mentioned in question 17 may (choose two):

    a. Cause the emission of neutron radiation
    b. Produce harmful effects
    c. Produce large amounts of energy
    d. Allow detection of the radiation _____ & _____

19. The unit in which X or gamma radiation exposure is measured is the _____.

20. This unit is defined in terms of ionization in air (yes or no): _____

21. The various forms of radiation such as light, ultraviolet rays, X-rays, etc., are usually r[illegible]red to as _____ radiation. (Choose one)

    a. Ionizing
    b. Electromagnetic
    c. Bremsstrahlung

22. X-rays have _____ wavelengths than visible light. (Choose one)

    a. shorter
    b. longer
    c. the same

23. The shorter the wavelength of the X-rays the (higher, lower) its energy, and the (less, greater) its penetration.

24. X-rays are produced in the following way: (Describe in one or two sentences)

25. The two most important electrical parts of an X-ray tube are the _____ assembly and the _____ assembly.

26. Why is the air removed from the inside of an X-ray tube?

27. The current in an X-ray tube is usually measured in units of _____.

28. When the current in an X-ray tube doubles, the amount of X-rays produced _____. (Choose one)

    a. remains the same
    b. is cut in half
    c. doubles

29. The voltage in an X-ray tube is usually measured in units of _____.

30. The voltage in an X-ray machine is increased, the X-rays produced become _____ penetrating. (Choose one)

    a. more
    b. less
    c. the same

31. The _____ is that area of the target which is bombarded by _____ from the _____.

32. In addition to the X-rays produced at the target, what other form of unwanted energy is produced in the operation of the X-ray machine? _____
    This energy is normally removed by _____.

33. X-rays which hit an object and bounce off are called _____ X-rays

34. The workload ($\dot{W}$) of an X-ray machine is defined as the number of _____ per week the X-ray machine is used.

35. Radiation not serving any useful purpose is usually termed _____ radiation.

36. Permissible radiation doses are always expressed in _____ to account for the biological effects of different types of different types of radiation.

37. The unit of absorbed dose corresponding to the absorption of 100 erg/g is the _____.

38. The $LD_{50/30}$ is the dose lethal to _____ percent of those exposed within _____ days of receiving the dose.

39. Low doses of radiation may produce what kind of effects? (Choose

    a. Lethal
    b. Genetic
    c. Electrical
    d. Magnetic

    _____

40. An approximate rule (2-4-6) was given relating biological effect to acute whole body doses. What was it?

Dose (Rem)	Sick (%)	Die (%)

41. Bone marrow, eyes and gonads are all radiosensitive parts of the body (yes or no). _____

42. Bone marrow cells are more sensitive to radiation than nerve cells (yes or no). _____

43. Nausea, vomiting and disrrhea are symptoms of serious radiation sickness (yes or no). _____

44. The three important means by which radionuclides may enter the body are:

_____ _____ _____

45. The relative toxicity of a nuclide in the body may be assessed by consideration of the following factors:

_____ _____ _____ _____

46. Biological half life is the _____ required for the body to eliminate _____ percent of the activity present in some organ.

47. Explain the meaning of the following physiological symptoms produced by large doses of gamma radiation:

Erythema _____

Epilation _____

Anemia _____

Leukopenia _____

48. The three (3) primary methods of controlling radiation dose are:

_____ _____ _____

49. An operator works in a radiation field of 300 mR/hr for 20 minut What exposure does he receive? _____

50. Assuming his exposure limit is 10 mR what would be the maximum permissible working time in this area? _____

51. What is the name of the law relating radiation level from a poin source to the distance from the source? _____

52. The radiation level from a source is 36 R/hr at 1 ft. What is it at 2 ft.? _____ at ½ ft.?_____

53. A half-value layer is the thickness of any material that reduces radiation levels by what percentage when placed between source and detector? _____

54. The half-value layer of lead for Co^{60} radiation is approximately ½ inch. At the radiographer's position, the exposure rate is 80 mR/hr. How much shielding would you use to reduce it to

(a) 40 mR/hr? _____

(b) 5 mR/hr? _____

55. What are the two (2) basic types of survey instruments in common use?

_____ _____

56. Which of these types would normally have the higher range?

_____

57. What should be done with survey readings and personnel monitor readings?

58. What are two (2) common monitoring devices used in personnel dosimetry?

_____ _____

59. After turning on a survey instrument before a survey, what checks or adjustments might be made to insure that the instrument is operating properly?

_____ _____ _____

60. A 5 curie Co^{60} source fell out of its shield but remained intact. The recovery of the source is essentially a: (Choose one)

a. Contamination control problem
b. Radiation control problem
c. Contamination and radiation control problem _____

61. A sodium-iodide crystal coupled to a photomultiplier tube is commonly called a _____ detector.

62. Thermoluminescent materials, such as LiF, emit _____ upon heating, in an amount proportional to the radiation exposure.

63. Irradiated silver-activated phosphate glass dosimeters emit light when excited with _____ light.

64. Film badges, when exposed in a calibrated holder, indicate the (Choose one)

a. Photon flux
b. Dose equivalent in Rem
c. Maximum allowable dose _____

65. Who is the person directly responsible to the State for radiation safety in your company? _____

66. The occupational dose limits which should not be exceeded are as follows:

	Rems Per Quarter	Rems Per Year
Whole Body	_____	_____
Hands and forearms, feet and ankles	_____	_____
Skin of the whole body	_____	_____

67. What whole body dose may a person continually present at the boundary of your controlled area receive as a maximum in any one hour? _____

68. How much may he receive in any one week (7 days)? _____

69. What personnel monitoring devices are required for radiographers?

_____ _____

70. How often are they to be checked? (Indicate which is which)

_____ _____

71. What is to be done with the readings? _____

72. If one of the above devices is found to be discharged, what is to be done with the other device?

73. Does the State require physical examinations for all radiation workers? _____

74. "Radiation Area" means any accessible area in which an individual could receive a whole body dose in excess of _____ mRem in any one (1) hour.

75. What must appear on the radiation warning signs around a radiation area?

_____ _____ _____

76. What type of personnel dosimeter is mandatory for operators of X-ray diffraction machines? _____

77. Each sealed source used for radicgraphy shall be tested for _____ prior to initial use and for _____ at lease every _____ months.

78. The maximum allowable amount of removable contamination from a sealed source is _____.

79. What should be done with a source if a leak test shows the presence of more than the allowable amount?

_____ _____ _____

80. How often should survey reports be turned in or filed?

_____

81. If someone enters an exposure area in spite of warning, what steps do you take?

_____ _____

_____ _____

82. Under what conditions may a radiographer leave a source unattended? _____

83. What information is to be marked clearly on all containers in which curie amounts of radioactivity is transported, stored or used?

_____ _____ _____

_____ _____

84. In the event of an accident or emergency which causes or threatens to cause serious radiation exposure, the following steps should be taken:

_____ _____ _____

_____ _____ _____

85. How often must a physical inventory of sources be made?

_____

86. How often must survey meters be calibrated? _____

87. Instruments must be available to measure the range

_____ to _____

88. A sealed source not fastened to an exposure device must have a durable tag at least 1 inch square permanently attached with the following information on it:

_____ _____ _____

_____ _____

89. The standard radiation warning colors are _____ and _____.

90. Licensed materials may be stored in an unrestricted area. If so, the area must be _____.

91. Theft or loss of licensed material must be reported immediately to the _____.

92. Inspections may be conducted at reasonable times. Inspectors must be allowed to inspect:

_____ _____ _____

93. The NRC or the State has the right to withhold or recall by-product material. _____

Question 7

Due to changes in packaging of radioactive materials for transport and burial the question of internal corrosion has been greatly simplified. These changes have essentially prohibited any packages from containing free liquids. Therefore, the major quantities of radioactive waste materials will be dry solid materials.

Repackaging of containers that may have lost integrity is a very uncomplex operation. For instance, if a fifty-five gallon drum appears to have a breach that suggests replacement, it is simply placed in a larger drum such as a 65 or 83 gallon readily available standard drum.

The same applies to a wooden box, a larger box can be fabricated and the faulty box placed into the new one. In both the case of the drum or box, a suitable materials such as vermiculite can be used in the void spaces to afford further protection from moisture or physical abuse.

In the matter of fiberboard boxes, it is our belief that by the time the Lyons Facility is ready to accept radioactive materials there will be no fiberboard containers authorized for transport of radioactive waste materials. This is based on the proposed rule making by the Department of Transportation published in the Federal Register issue of Monday, January 8, 1979, Part II. In these proposed rules, the use of "strong tight packaging" for LSA materials would be deleted in favor of a specific requirement for Type A packages. It has been our experience in numerous tests that fiberboard containers cannot meet the prescribed test conditions for Type A containers.

The company will also be very selective insofar as types of materials that will be accepted which will include those used for solidification of liquids. First, no absorbed liquids will be accepted, and secondly, no urea formaldehyde material will be accepted.

Please refer to Page 75 of the application, Section K (3) for a description of protection of containers from coming into contact with salt.

Question 8

Concerning contamination surveys performed on waste containers, we plan to wipe test each container as they are unloaded from the truck. In addition the workers will have routine surveys performed on their protective clothing, gloves, coveralls, etc. at least twice daily (lunch and quitting time).

Floor and equipment surveys will be performed at least once per shift or more often if requested by the RSO, or in the event of a spill involving contaminated material. If a damaged or leaking container is noted while off loading operations are being conducted all off loading operations on that vehicle will cease until a complete evaluation can be made to determine the extent and magnitude of the problem.

If damage or leaking is discovered on any of the containers the following will be performed:

1. All work in the immediate area will cease.

2. The RSO or his appointed alternate will be notified.

3. A survey will be performed to determine the extent of the contamination.

4. The damaged or leaking container will be isolated in a protected temporary radiation zone. (The drum will remain in this area until repairs and/or repackaging can be performed).

5. Upon completion of the survey, discussed in Item 3 above, the area will be decontaminated and returned to normal operation.

6. The damaged and/or contaminated containers will be handled as follows:

    a. Determine the extent of the contamination on the package or container.

    b. Decontaminate the container if possible. In the case of a wood container, if decontamination is impractical, then fix or seal the contamination with paint or varnish.

Question 8 (cont'd)

c. Perform additional wipe tests to assure that no loose contamination is present.

d. Repeat b and c until all contamination wipe surveys are negative.

e. If the container has been damaged beyond reasonable or expedient repair and decontamination operations, then repackaging is in order.

f. Wrap the contaminated container in plastic or other suitable material, extreme care being exercised to contain the contamination. If possible, it is more desirable to place the container inside of a plastic bag then seal the bag, leaving it in the control area until an appropriate outer container is acquired or constructed.

g. Place the wrapped or bagged damaged or contaminated container inside of the new container.

h. Note the activity, isotope and storage code on the new container.

j. Move the new container which now contains the original damaged or contaminated package to the storage area.

NOTE: Application Page 81. (L) Emergency Procedures; (1) Leaking or ruptured containers.

The levels of allowable contamination are 1000 dpm/100cm^2 beta/gamma and 220 dpm/100cm^2 alpha.

NOTE: Application Page 99. (M) Radiation Safety Operation; (7) Permissible contamination levels.

All container surveys will initially be performed inside of the transport vehicles or at the exit point of the transport vehicles. Repackaged or decontaminated containers will be surveyed on the off-loading dock or inside the Operations Building.

Question 9

As stated in our application, radiation levels will be in compliance with D.O.T. regulations which could entail packages having radiation levels up to 1000 mRem/hr at 3 feet from surface areas.

Procedures for handling packages with a Transport Index of 10 or more are covered under "Personnel Radiation Monitoring" under Section M, (9) pages 101, 102, and 103 of the application.

Before operation of the low-level waste repository begins, specific work procedures for routine work will be written and posted to cover each phase of the handling and storage operation. These procedures will include monitoring requirements, (i.e.: constant monitoring or initial setup monitoring) protective clothing required, dosimetry required, and any special instructions required.

For any handling that is not considered routine, specific work procedures will be written for that particular operation. In most instances where a specific work procedure is required, the Radiation Safety Officer or Deputy Radiation Safety Officer will be in personal charge of the operation.

Question 10

A detailed description of the hoist system, head frame supports, and weight limitations are to be found in the Cementation report submitted with Question No. 1, Attachment A, Pages 3 and 4.

The size limitations for packages will necessarily be restricted to the inside dimensions of the elevator cage, and, of course, the weight cannot exceed 3,368 pounds in any single load.

Question 11

Segregation will be restricted to choosing containers that are most compatible in respect to sizes, weights, and physical configuration. For example, drums would probably all be stacked together, boxes would probably be placed in a separate storage area, and other odd-shaped containers would be stored in a manner most suitable for their protection and configuration.

There will be no attempt to segregate radioactive materials by half-life or isotopes, although such segregation could be feasible at sometime in the future if required or deemed advisable.

Question 12

A drawing of the transport trailers (M-trailer for mini-trailer) is attached (see Kenasco drawing No. KS-204-09-79).

The speed of the M-trailers will be up to about 7 or 8 miles per hour in the tunnel area and will be drawn by an electric or diesel powered tractor. These trailers can be pulled in tandem as the workload necessitates.

The M-trailers will only be used in the tunnel area. No trailers will be used on the elevator, instead specially designed pallets (M-pallets) as shown in Kenasco drawing KS-204-09-79 will be loaded at the surface in the operations building, loaded onto the elevator by forklift, transported to the bottom of the shaft and the M-pallets will then be removed from the elevator and loaded onto a waiting M-trailer.

The operational hours of the equipment is expected to be a minimum of forty (40) hours per week and could be as much as 168 hours per week.

Loading Procedures

1. In the operations building place the waste containers onto the M-pallet in a horizontal position until it is fully loaded (9 drums). Each loaded M-pallet will be individually weighed so as not to exceed the elevator weight limit of 3,368 lbs.

2. Check to see that the load is secure before loading onto elevator.

3. Move the M-pallet onto the elevator with a forklift.

4. Close the elevator doors.

5. Lower the loaded M-pallet to the bottom of the shaft.

6. Open the elevator door adjacent to M-trailer and remove the M-pallet.

7. Place the M-pallet aboard the M-trailer. Place an empty M-pallet onto the elevator and close the elevator door.

8. Notify the elevator operator that the elevator is ready to move. (the elevator operator will be

monitoring the elevator loading and unloading operations on the closed circuit TV cameras).

9. After the elevator has reached the operations building level, the loading technician will open the elevator door and remove the M-pallet at which time the loading of the M-pallets will be repeated as per Loading Procedures steps 1 through 9.

Moving M-Trailer

1. After the M-trailers have been securely latched onto the tunnel tractor, the tunnel tractor operator will pull the M-trailers to the designated storage area. Here he will remove the loaded M-pallets and put empty M-pallets in their place aboard the M-trailers. The M-trailers will then be towed to the elevator shaft area where the empty M-pallets will be removed.

Unloading and Stacking Procedures

1. Place the full M-pallet into position next to the stacked containers or stacked container area. (The area will have already been prepared by leveling the mine floor and placing sisalcraft paper on the floor).

2. Next the unloading technician will assist the forklift technician in placing the waste container into the proper stacked position.

3. Repeat steps 1 and 2 until all the waste containers have been unloaded from the M-pallets. Care should be exercised to keep radiation exposures to a minimum. Radiation and contamination surveys along with radioactive material accountability have been outlined previously in Rickano's report entitled "Geotechnical Studies and Radioactive Waste Management Plan for Low-Level Retrievable Storage Facility, Lyons, Kansas" under Sections: (I.) Receiving Wastes from Transport Vehicles page 66; (J) Preparation on Packages and Records for Below Ground Storage page 69; (K) Handling in Tunnel Area page 74.

Question 13

Cementation has addressed cost and equipment for rehabilitation of the mine.

The total costs are noted in The Cementation Report, Page 1 and 2 of Attachment B. Equipment, special items, and materials along with a work schedule is discussed on Pages 12 of 24 through 15 of 24 in Attachment A of The Cementation Report.

Cementation Report Attachment A Page 10 of 24, Section V "Mine level rehabilitation" describes the scope of work. Section VI "Equipment and Procedure for Salt & Muck Disposal" discussed removal and disposal of the ceiling and floor heaves.

Answer to Cementation Report is attached to Question 1.

Question 14

Our plan concerning salt disposal is to move the excess loose salt that is generated as a result of roof raising, floor leveling, heave removal and wall clearing and place this excess salt in mined out areas that are not planned to be used for storage of radioactive materials. (See Page 10, Attachment A, Section VI of Cementation Report).

We do not plan to remove salt from the mine. If a plan for removal of the salt from the mine should develop in the future, we will present it to the Kansas Department of Health and Environment for approval by the appropriate regulatory authorities.

Question 15

Concerning storage and working areas both above and below ground we submit the following:

Above Ground

The above ground storage and working areas are noted in sketches submitted with Question 1.

As can be seen on this drawing, the storage and working areas wherein Radioactive Material are actually handled consist primarily of the unloading dock and the north and central sections of the operations building.

These above ground areas are all under roof, within metal walls with concrete floors. The unloading area is black top or asphalt except for the dock which is concrete.

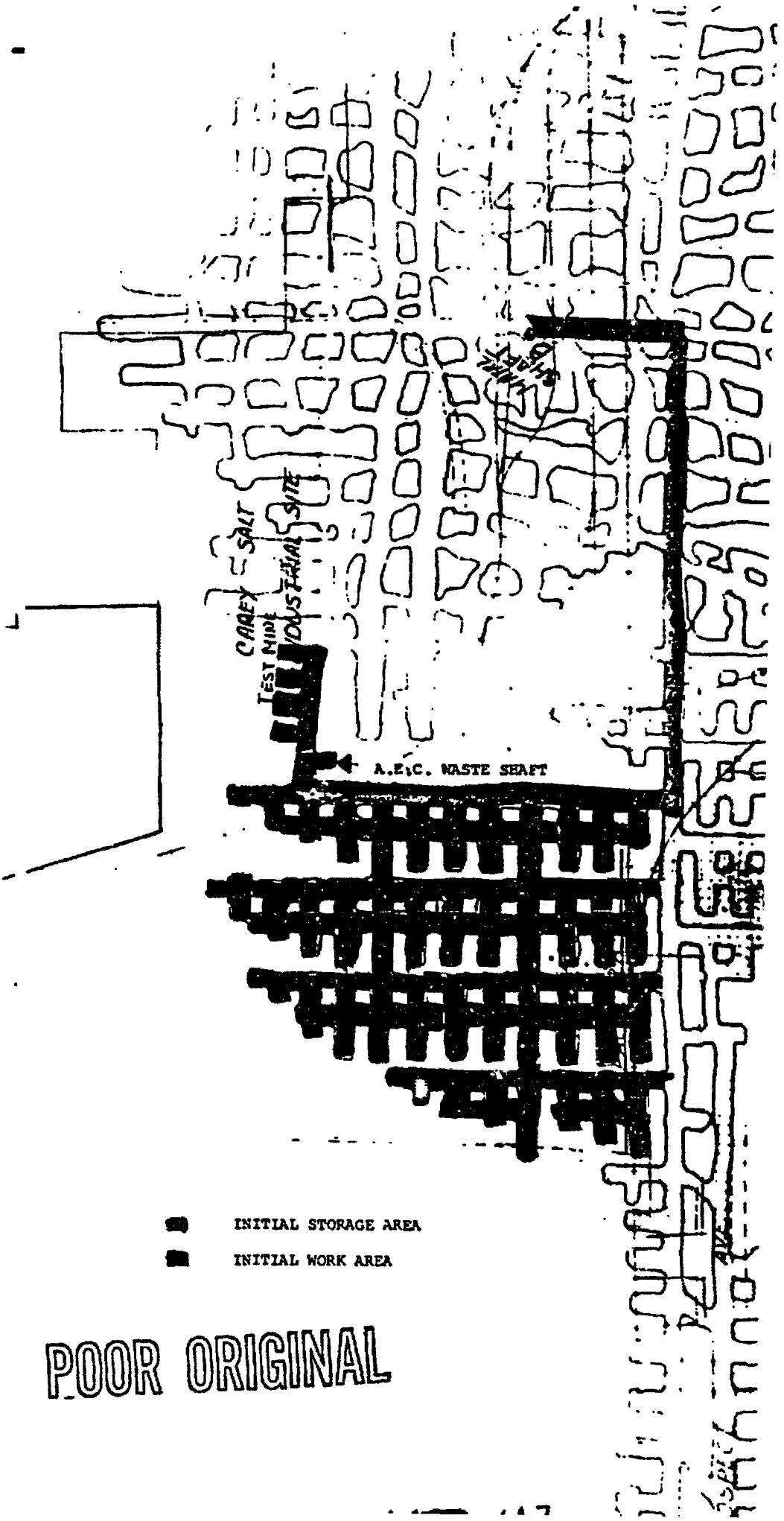
Below Ground

The working areas of the mine will essentially encompass those areas that are involved in moving containers from the elevator to the designated storage area. This "path of travel" will most likely remain unchanged for long periods of time, with the only changes being at the "end of the line" when moving from one storage room to one adjacent as they are filled.

Storage areas will be those rooms that have already been excavated and are in condition to begin receiving waste containers with very little further preparation. Those rooms are described and delineated on Page 58 of the application, Illustration No. 4. Also, attached is an enlarged section showing these same areas. This initial storage has a volume of approximately 4 million cubic feet and is expected to be adequate for 4 to 5 years of storage.

The below ground working area therefore will also remain constant for such a period of time.

Rooms and tunnels in the above described storage area vary somewhat in size but not substantially except for a variance in height which ranges from about 9 feet to 17 feet.



Question 16

The identity of our off-site instrument calibration laboratory is Controls For Environmental Pollution, Inc., 1925 Rosina Blvd., Santa Fe, NM.

Their qualifications and procedures are part of their Radioactive Materials License.

They are a recognized authority in the field of instrument calibration and radioactive materials sample analysis.

Brochures of their services are attached.

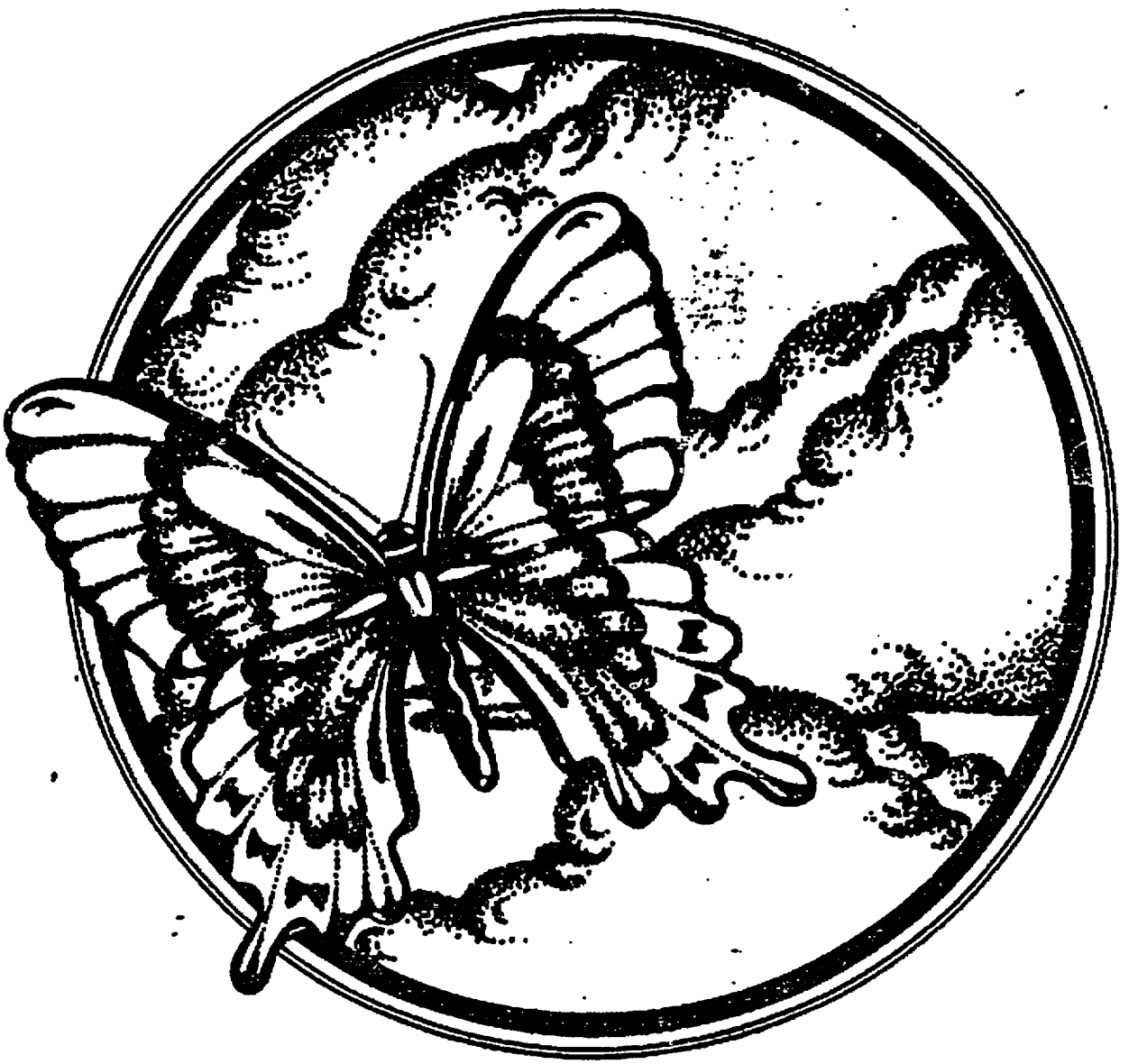
Our procedures for laboratory instrument calibration are covered in our Application Page 123 under subheading H entitled "Calibration of Laboratory Counting Equipment".

Our qualifications have been previously submitted, and in addition Rickano will have the following consultants available.

Floyd W. Wilcox
Paul L. Ziemer

Both Mr. Wilcox and Dr. Zeimer are Certified Health Physicists.

OUR EARTH AND PESTICIDE POLLUTION



Controls For Environmental Pollution, Inc.

OUR EARTH AND PESTICIDE POLLUTION

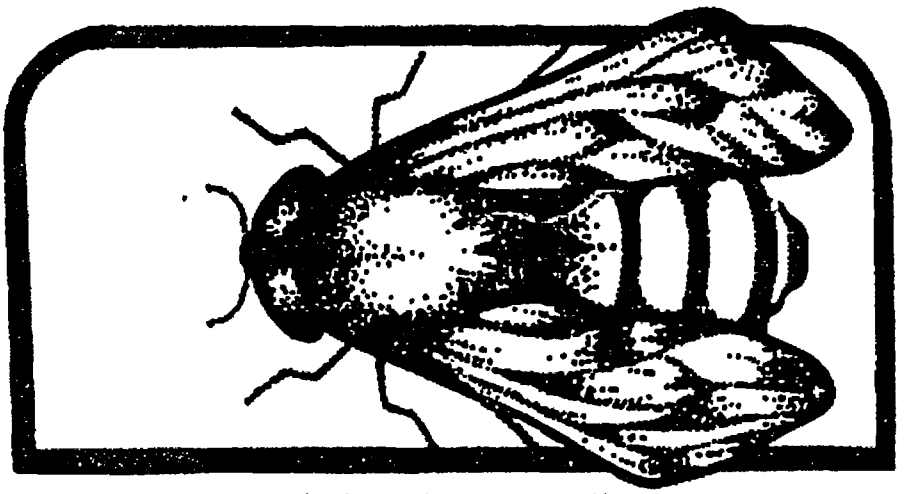
Man, that creature who believes his purpose is to control and conquer nature, is just now beginning to remember the obvious—that he is part of nature himself. With this realization we have begun to experience the effects of our war upon nature, for we've dealt direct blows to ourselves. In the process of the growth of technology we have not only sacrificed environmental quality but have disturbed complex interactions which normally take place throughout the eco-system.

Our use (and misuse) of insecticides and herbicides illustrates this most clearly. Synthetic pesticides have universally contaminated our environment to the extent that they can be found in our air, soil and water (major river systems as well as ground water), wildlife and in man himself. Some pesticides persist in our surroundings and residues of the chemicals linger in soil for years, or gradually move up the food chain through biological magnification. Inevitably there are unwanted active or potential side effects for it is impossible for such synthetic creations to simultaneously be humane, selective, effective and safe. It is this series of events which has given rise to the need for monitoring, checking, and control programs to combat the dangers of pesticide pollution.

ORGANIC CONTAMINATES

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC. (CEP) conducts extensive research on all aspects of pesticides in the environment. Monitoring of soil, air and water provides knowledge of the levels and pathways of pesticide contaminations so that we can maintain a safe water and food supply.

The term "pesticide" encompasses all the chemicals within INSECTICIDES, for the use against harmful insects; HERBICIDES, for weed control; FUNGICIDES, for control of plant disease; RODENTICIDES, for killing rats and mice; NEMATOCIDES and GERMICIDES. Also included would be plant growth regulators, attractants and repellants. CEP will then conduct analysis on these organic compounds to determine the presence of chlorinated hydrocarbons, organophosphates, polychlorinated biphenyls, chlorophenoxys, algicides, PCB'S. etc. in your sample media of soil, water, food or other biological specimens.



PESTICIDE ANALYSIS

CEP's formulation of analytical procedures includes a variety of checks and balances within the company as well as up-to-date methods of research and analysis:
RESIDUE ANALYSIS: It is vitally important to identify 'persistent' compounds such as the chlorinated hydrocarbons since they are relatively resistant to nature's recycling system. Ultimately they will persist in the environment until they accumulate in the tissues of birds, fish, animals and man. Therefore, CEP's laboratory is prepared to perform RESIDUE ANALYSIS of any pesticide or combination of pesticides by chemical and physical methods as well as by spectrophotometry and gas chromatography. It is important to determine the concentrations of pesticide residues below EPA and FDA tolerance levels. We are then able to provide data on safety and methods for identifying and removing excessive residues.

PHYSICAL ANALYSIS involves the isolation without altering or chemically changing the pesticide.

CHEMICAL ANALYSIS involves alteration of the pesticide for evaluation of the concentration of the toxicant in the formulation. These methods include colorimetric analysis, conversion to inorganic chlorine, evolution of gas, or chemical degredation to liberate a specific compound.

INSTRUMENTAL ANALYSIS utilizes colorimetric methods as well as ultraviolet and infrared absorption and polarographic techniques. Gas chromatography, recently developed, formulates analysis of the chlorinated hydrocarbons, organophosphates, herbicidal compounds, nematocides and hydrocarbon solvents. Through this method, analyses of pesticides are simplified and contaminates more easily detected.

QUALITY CONTROLS FOR TOTAL ASSURANCE

CEP has developed an extremely comprehensive quality control program wherein all procedures are documented, checked and rechecked to insure accuracy. Within the company there exists an interlaboratory check sample program to analyze data as well as provide an ongoing measurement of staff performance. In addition to CEP's internal monitoring, random media samples are also sent to state and federal agencies for verification.

THE ESSENCE OF LIFE

The extent of water pollution by pesticides is, in reality, the pollution of our entire environment. We have contaminated our groundwaters, irrigation waters, river systems, wells and streams—and ultimately the waters flow into the final accumulation site, the ocean. It becomes a seemingly irreversible cycle: one that requires public awareness and monitoring. If it is possible that pesticides are introducing poisons and cancer-producing agents into our public water supplies, we must somehow protect ourselves from the hazards we created.

The impact of pesticides upon soil is equally alarming for we can't begin to know the extent that insecticides are absorbed from contaminated soils into plant tissues, and then into our own bodies. We are in need of environmental controls and concentrated efforts at stabilization, but more importantly, we are in need of a new awareness of life . . . of OUR LIFE.

"Whatever befalls the earth
befalls the sons of earth."

ROUTINE DETECTION LIMITS FOR ORGANIC COMPOUNDS

Listed below are the ROUTINE DETECTION LIMITS for organic compounds in water analyzed by CEP. If other compounds or media analyses are required, please contact CEP for details.

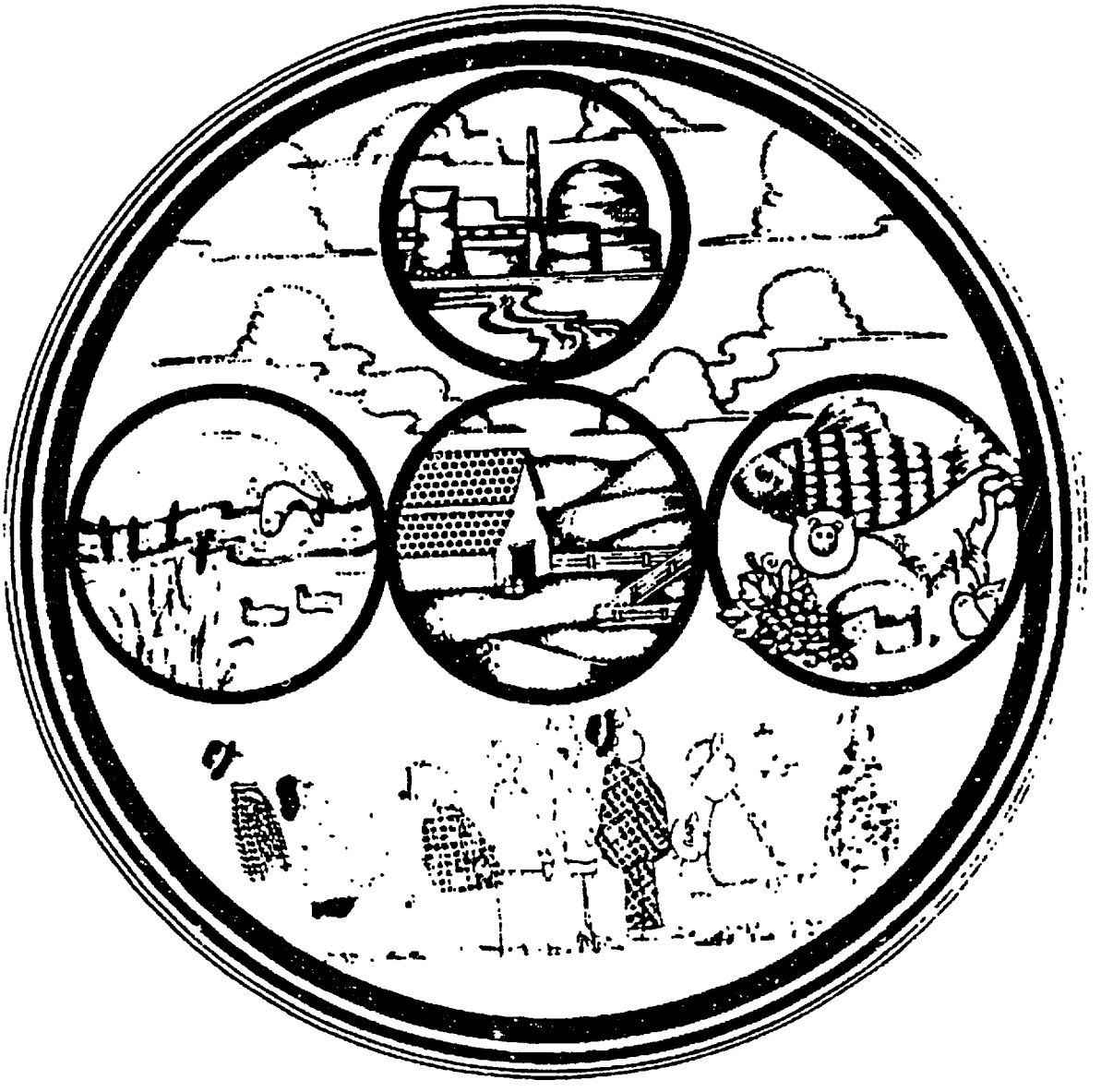
Parameter	mg/l
Aldrin	0.0001
α-BHC	0.001
β-BHC	0.001
Chlordane	0.003
Diazinon	0.002
Dieldrin	0.001
Dimethoate	0.0001
Endrin	0.0002
Ethion	0.1
Ethyl Parathion	0.001
Guthion	0.05
Heptachlor	0.0001
Heptachlor Epoxide	0.0001
Lindane	0.004
Malathion	0.001
Methoxychlor	0.1
Methyl Parathion	0.001
o, p'-DDD	0.001
o, p'-DDE	0.001
o, p'-DDT	0.001
p, p'-DDD	0.001
p, p'-DDT	0.002
p, p'-DDT	0.001
PCB	0.0001
PCP	0.1
p, p'-DDE	0.001
Perthane	0.1
Phosdrin	0.01
Sevin	0.05
Tedion	0.01
Thimet	0.05
Toxaphene	0.005
Trithion	0.01
2, 4-D	0.1
2, 4, 5-TP (Silvex)	0.01
2, 4, 5-T	0.01
δ-BHC	0.001

Many more organic compounds can be analyzed by CEP and lower sensitivities will be quoted upon request.

For further specific and/or technical information, please contact CEP.

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
1925 Rosina Street, P.O. Box 5351

RADIOCHEMICAL ANALYSIS AND YOUR ENVIRONMENT



Controls For Environmental Pollution, Inc.

RADIOCHEMICAL ANALYSIS

To exist in harmony with his environment man must learn not only how to work with nature but how to direct his technology along paths least detrimental to the environment. The development of nuclear energy and expansion of the nuclear power program requires knowledge of the routes of entry of radionuclides to the environment. The effect of radioactivity upon man is determined by the environmental pathways taken by the released nuclides. Thus, monitoring and surveillance must be conducted for our protection.

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC. (CEP) performs complete radiological surveys around uranium exploration sites, mining and milling sites, fuel element manufacturing facilities, nuclear power reactors, waste disposal sites and other areas involving users of radionuclear technology. In reference to your company's specific needs, CEP will provide you with the following information: (a) establishment of preoperational and operational levels, (b) establishment of the impact of operational levels on the environment, (c) records to prove compliance with regulations, (d) information for public relations use.

The purpose of the radiological survey is to provide baseline and operational information on the radionuclide levels around your facility. The type and extent of your survey would depend upon the kinds and amounts of radioactive materials that could be released into the environment. In the event of a release of radioactive materials, data must be obtained quickly to determine the extent of possible hazards to the environments so that corrective measures and monitoring can be initiated immediately. OUR ENTIRE CAPABILITIES ARE AVAILABLE TO YOU ON A MOMENT'S NOTICE.

QUALITY CONTROLS FOR TOTAL ASSURANCE

CEP has established an extremely comprehensive quality control program because we recognize the importance of accuracy and dependability. Within the company, CEP's Quality Control Department, being a separate entity which reports directly to company management, provides fail-safe insurance for you, our client.

Procedures are documented, checked and rechecked to insure accuracy. There exists an interlaboratory cross-check sample program to analyze data as well as to provide an ongoing measurement of staff performance.

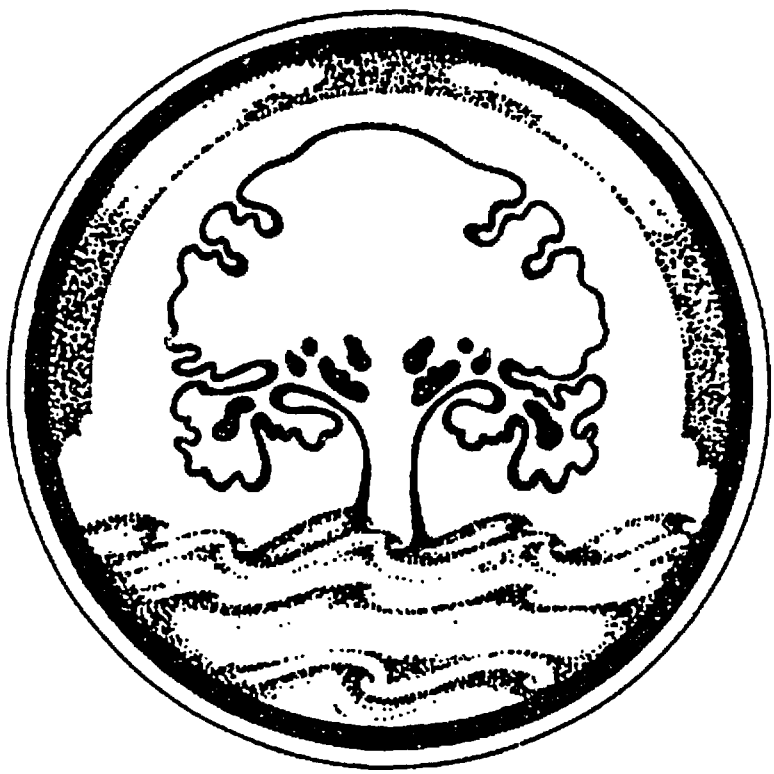
In addition to CEP's internal monitoring, random samples are also sent to various agencies for verification. Each instrument and monitoring device is maintained and calibrated consistent with regulatory standards.

EXTERNAL RADIATION MONITORING

The radiation dosage of your site can be measured by CEP utilizing thermoluminescent dosimeters and high resolution gamma scintillation equipment.

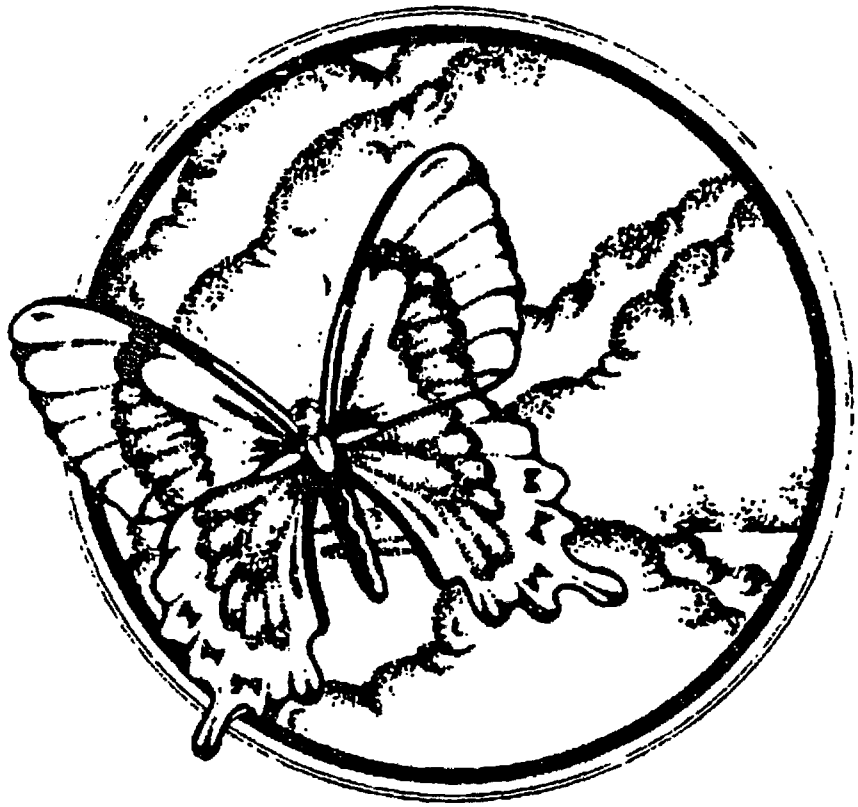
MEASURING RADON – 222

CEP can perform the measurement of the shortlived radon daughters whose activity is then related to the parent gaseous radon concentration. Radon-222 can be measured by several techniques which CEP will quote upon request.



SAMPLE COLLECTION

CEP will handle your field collection or train your personnel in any required program.



RADIONUCLIDES ANALYZED ROUTINELY BY CEP

CEP offers full scale radiochemical analysis for the determination of various nuclides in air, water, milk, vegetation, sediments, slime, soil, fish, animals and other media. Many more isotopes can be analyzed by CEP and minimum detectable concentrations will be quoted on request.

Gross Alpha
Gross Beta
Gross Gamma
Actinium-227
Americium-241
Barium-Lanthanum-140
Cesium-134
Cesium-137
Cobalt-60
Iodine-125
Iodine-131
Isotopic Plutonium (Pu-238, Pu-239)
Isotopic Thorium (Th-228, Th-230, Th-232)
Isotopic Uranium (U-234, U-235, U-238)
Lead-210
Nickel-63
Phosphorus-32
Polonium-210
Potassium-40
Promethium-147
Radiometric Uranium
Radium-226
Radium-228
Radon-222
Strontium-89
Strontium-90
Technetium-99
Thorium-230
Total Uranium
Tritium

GAMMA SPECTRAL ANALYSIS

CEP has computer based Gamma Spectrometry systems for the identification of gamma emitting nuclides in solids, liquids and air particulate samples.

Actinium-228
Antimony-122
Antimony-124
Antimony-125
Barium-133
Barium-140
Beryllium-7
Bismuth-214
Cadmium-109
Cerium-141
Cerium-144
Cesium-134
Cesium-136
Cesium-137
Chromium-51
Cobalt-57
Cobalt-58
Cobalt-60
Europium-152
Iodine-131
Iodine-133
Iridium-192
Iron-59
Lanthanum-140
Lead-212
Lead-214
Manganese-54
Molybdenum-99
Niobium-95
Potassium-40
Radium-226
Rhodium-106
Ruthenium-103
Silicon-85
Silver-110m
Sodium-22
Sodium-24
Strontium-91
Technetium-99
Tellurium-132
Thallium-208
Tungsten-187
Yttrium-88
Zinc-65
Zirconium-95
Zirconium-97

For further specific and or technical information, please contact CEP.

CEP®

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CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
1925 Rosina Street – P.O. Box 5351
Santa Fe, New Mexico 87502

BIOASSAY: GUARDIANS OF YOUR PERSONNEL

Controls For Environmental Pollution, Inc.

331

BIOASSAY: GUARDIANS OF YOUR PERSONNEL

An increase in chronic and degenerative diseases is due in part to environmental and behavioral changes that have resulted from industrialization and urbanization. Modern environment is a threat to the very life of man for we are unable to adapt quickly enough to the increasing, unpredictable changes. Modern technology has brought about new hazards to workers in all industries.

Among the potential hazards evolving in industry is increased usage of toxic materials. The toxicity of newly discovered combinations of chemicals presents new concerns about human adaptability. A program should be developed to periodically monitor your personnel. CEP can help in all aspects of this program from design and implementation to analyses of toxic or radioactive materials involved.

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC. (CEP) can help protect your personnel through a complete bioassay monitoring program. CEP's bioassay program comprises analysis for radioactive and stable toxic elements and/or compounds in blood, urine, feces, tissue, bone and other biological materials.

RADIOACTIVITY

Following are some nuclides and toxic elements routinely analyzed by our Biological Science Department for clients in nuclear and non-nuclear industries in the United States:

Americium-241
Californium-252
Cesium-137
Gamma Spectromalysis
Gross Alpha
Gross Beta Minus K-40
Gross Fission Products
Gross Gamma
Iodine-131
Isotopic Plutonium (Pu-238, 239, 241)
Isotopic Thorium (Th-228, 230, 232)
Isotopic Uranium (U-234, 235, 238)
Lead-210
Polonium-210
Radiometric Enriched Uranium
Radium-226
Strontium-90
Total Uranium
Tritium
TOXIC
Beryllium
Lead
Mercury
Selenium
and many other trace elements

Analyses of other radioactive or toxic materials are available on request.

CERTIFICATION

Controls for Environmental Pollution, Inc. is licensed under the Clinical Act of 1967 and its Director has been licensed since the inception of the Bioassay licensing program.

QUALITY CONTROLS FOR TOTAL ASSURANCE

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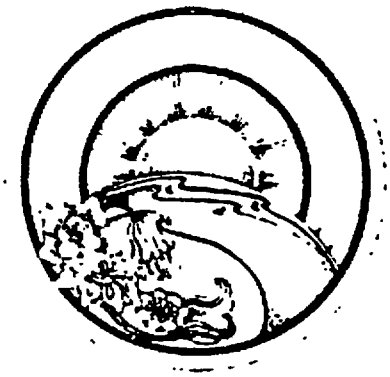
Procedures are documented, checked and rechecked to insure accuracy. There exists an interlaboratory cross-check sample program to analyze data as well as to provide an ongoing measurement of staff performance.

In addition to CEP's internal monitoring, random samples are also sent to various agencies for verification. Each instrument and monitoring device is maintained and calibrated consistent with regulatory standards.



HEALTH CONSCIOUSNESS

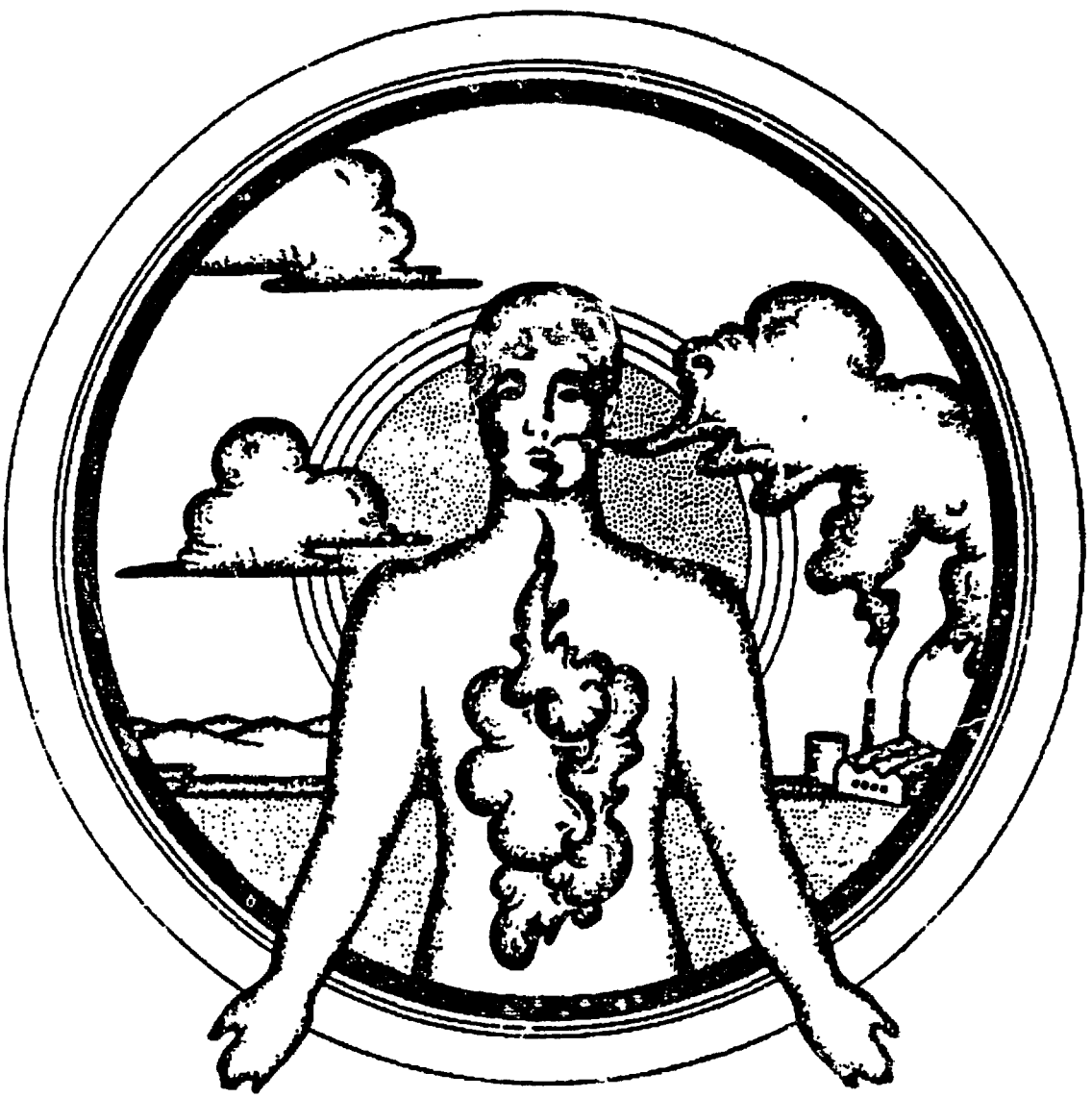
For a long time the American people seemed willing to pay any price in the name of progress. Our technology has expanded, increasing the amount and diversity of industry. Along with increased industrial development we have placed personnel in situations where there could exist exposure to various toxic materials. Now is the time to become more familiar with the expertise offered by CEP to assist you in your program.

For further specific and/or technical information please call [illegible]

CEP

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
1923 Rosina Street — P.O. Box [illegible]

INDUSTRIAL HYGIENE: GUARDIANS OF YOUR PERSONNEL



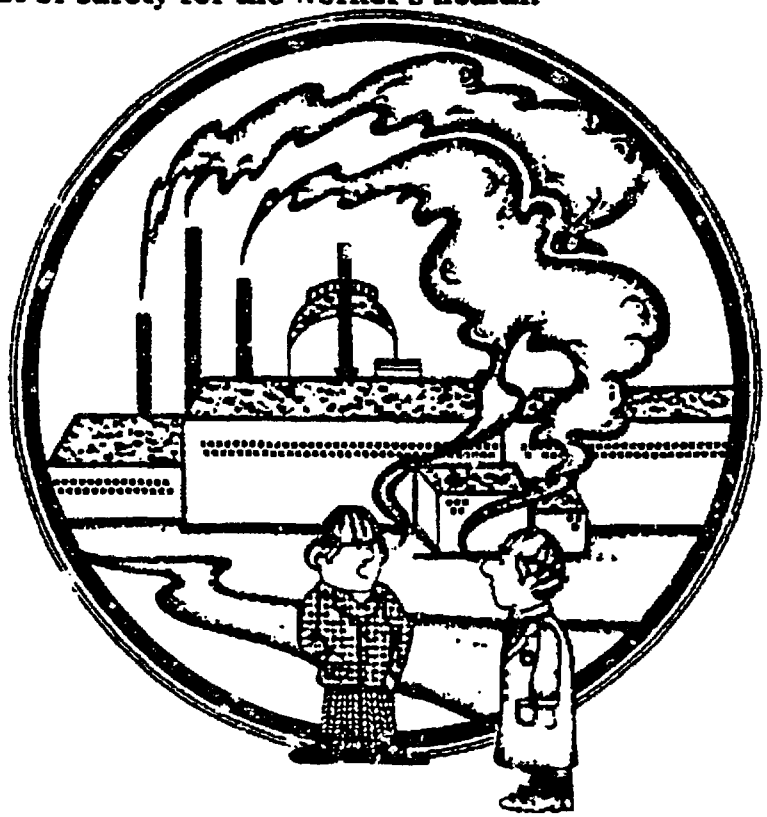
Controls For Environmental Pollution, Inc.

INDUSTRIAL HYGIENE

The principle reason to control all types of pollution is to protect human health and the ecological balance of man's life support systems. Our industries are vital to the nation's economy and progress. Yet never is health and life in a more threatened position than within the industrial society itself. It is here that our workers are exposed to often dangerous levels of pollutants from breathing various gases and vapors of toxic materials, airborne particulates and other sources of air contamination. Thousands of new chemicals being introduced each year can produce unknown hazards for the worker.

What each pollutant does to a human depends on the physical and chemical properties of the pollutant, the length, intensity and method of exposure; and the individual's ability to tolerate the pollutant (based on already existing health conditions).

We at CONTROLS FOR ENVIRONMENTAL POLLUTION, INC. (CEP) feel it is vitally important to promote extensive safety procedures within industries. CEP will help determine your sources of contamination, then apply control and monitoring methods for maximum containment of pollution in the interest of safety for the worker's health.



MONITORING CAPABILITIES

CEP is concerned with solving occupational health problems through a four-step approach:

RECOGNITION—CEP will visit your site to become familiar with the particular operation of your plant.

EVALUATION—A preliminary and environmental survey will be conducted to evaluate the existing environmental conditions.

a. The preliminary survey scopes the extent of work needed and serves to document important environmental features in the plant.
b. The environmental survey scopes the workers' exposure through a sampling program.

INTERPRETATION OF RESULTS—A report will be submitted interpreting the data as well as indicating the nature and intensity of exposure.

CONTROL TECHNIQUES—Control measures needed for environmental regulation will be cited in the report along with interpretation of data.

SAMPLE COLLECTION

CEP will handle your field collection or train your personnel in any required program.

GASES AND VAPORS:

In sampling any environment, a strategy will be decided upon before work is commenced. The amount of work required and the equipment will be affected by the type of samples taken, whether they be in a grid pattern throughout the plant, or whether breathing zone samples are obtained by use of hand-held or personnel samplers.

PARTICULATE:

Concentrations of particulate in the ambient air are generally lower than those of gaseous and vapor air pollutants. Sampling techniques must be used to separate the particles from the air sample. The methods and devices can be classified according to the physical principle or mechanism of particle separation:

1) sedimentation
2) inertial separation
3) electrostatic precipitation
4) thermal precipitation
5) filtration
6) miscellaneous methods

QUALITY CONTROLS FOR TOTAL ASSURANCE

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Procedures are documented, checked and rechecked to insure accuracy. An interlaboratory cross-check sample program to analyze data functions to provide an ongoing measurement of staff performance.

In additon to CEP's internal monitoring, random samples are sent to various agencies for verification. Each instrument and monitoring device is maintained and calibrated consistent with regulatory standards.

CHEMICAL ANALYSIS

The study of air pollution often requires a determination of the composition of air under investigation. There are several difficulties inherent in these anaylses. CEP realizes that concentrations of the substances of interest in the characterization of air pollutants are very low and frequently fluctuate widely. Because of this, CEP determines concentrations utilizing analytical procedures that are specific, rapid and sensitive for low concentrations.

Advances in analytical chemistry now make it possible to measure very minute quantities of specific compounds, ions, or elements. With this high degree of sensitivity, CEP will sample or train your personnel to take relatively small samples of the air to accurately determine the presence of the suspected contaminants. CEP's sampling team and analytical group work together closely so that the sampling team is totally aware of the limitations of the analytical instrumentation and is able to plan the sampling strategy efficiently. Various methods include: COLORIMETRIC; ION EXCHANGE; GRAVIMETRIC; VOLUMETRIC; GAS CHROMATOGRAPHY; INFRARED SPECTROSCOPY; MASS SPECTROSCOPY; ION SELECTIVE ELECTRODE; ATOMIC ABSORBTION; SPECTROPHOTOMETRY.

IONIZING RADIATION

CEP will perform a radiation survey of your plant to measure the exposure rate to your personnel.

CALIBRATION OF AIR SAMPLING INSTRUMENTS

CEP will perform calibrations of air sampling instruments.

In addition, CEP will train your personnel in proper operation and calibration of the instrumentation. We will also explain the limitations and calibration factors optimum for operation.

CHEMICAL PARAMETERS

CEP is capable of performing analysis for a wide variety of contaminants. Following is a partial list:

Aluminum
Antimony
Arsenic
Beryllium
Boron
Cadmium
Calcium
Carbon Monoxide
Chlorine
Chromium
Cyanides
Fluorine
Iron
Lead
Magnesium
Manganese
Nickel
Nitrogen Oxides
Ozone
Peroxides
Silicon Dioxide
Silicates
Sulfur Dioxide
Sulfuric Acid
Hydrogen Sulfide
Zinc
Aldehydes:
- Acrolein
- Formaldehyde

Amines
Ketones
Phenols
Proteins
Organic Sulfur Compounds
Quinones
Hydrocarbons:
- Benzene
- Divinyl Benzene
- Alpha Methyl Styrene
- Isopropyl Benzene
- Toluene
- Allyl Alcohol
- Allyl Chloride
- Propylene dichloride
- 3, 4-dichloronitro-benzene
- Nitrobenzene
- Aniline
- Isophorone
- Styrene
- Ethyl Benzene

Many more elements and compounds can be analyzed by CEP and will be quoted upon request.
For further specific and/or technical information or other services available, please contact CEP.

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
1925 Rosina Street, P.O. Box 5851
Santa Fe, New Mexico 87502 (505) 982-9841

OUR EARTH AND RECLAMATION

Controls For Environmental Pollution, Inc.

EARTH SCIENCES

We can look back with nostalgia upon our country's virgin soil, once fertile and fresh—untouched by man. In retrospect, we see how we've devastated the beauty of the land and tampered with nature in search of our own technological progress. Our strip mining has opened up the earth and left it barren and dying. We've damaged the soil's fertility through pollutants and negligence.

In the face of reality we must promote all the necessary control and monitoring devices available to us to reconstitute the land we live on. It is a time for soil conservation and reclamation of mining areas—a time for care and concern to remedy our past mistakes.

SAMPLE COLLECTION

CEP will handle your field collection or train your personnel in any required program.

SOIL INTEGRITY CAPABILITIES

Controls for Environmental Pollution, Inc., will assist in conducting and developing methodologies that will meet your needs efficiently and economically.

Controls for Environmental Pollution, Inc., will perform analyses of soils and plants to provide information on the chemical and physical properties which will serve as a basis for diagnosis,treatment and management of potential problem areas.

Analysis of your particular reclamation program will be conducted through surveys, sample gatherings, tests, interpretations and research.

You will receive updated reports, projections and consultations to keep you informed on the progress of the program.

QUALITY CONTROLS FOR TOTAL ASSURANCE

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Procedures are documented, checked and rechecked to insure accuracy. There exists an interlaboratory cross-check sample program to analyze data as well as to provide an ongoing measurement of staff performance. Each instrument and monitoring device is maintained and calibrated consistent with regulatory standards.

SOIL: DETERMINATION OF PROPERTIES

CEP offers full scale analysis for the determination of physical and chemical properties of soil.

Acid Base Potential
Aggregate-Size Distribution
Aggregation
Alkaline Earth Carbonates
Aluminum
Barium
Bicarbonate
Boron
Bulk Density
Cadmium
Calcium
Carbonate
Cation Exchange Capacity
Chloride
Cobalt
Conductivity of 1:1 and 1:5 Extracts
Copper
Density
Electrical Conductivity
Estimation of Soluble Salts from Electrical Conductivity
Exchangeable Cation Percentages
Exchangeable Cations
Exchangeable Potassium Percentage
Exchangeable Sodium Percentage
Exchange Acidity
Fluoride
Freezing Point Depression
Gypsum
Infiltration Rate
Inorganic Nitrogen
Intrinsic Permeability
Iron
Irrigation and Leaching Relationships
Lead
Magnesium
Manganese
Modulus of Rupture
Moisture Content of Saturated Paste
Moisture Retention
Molybdenum
Nickel
Nitrate
Organic Matter
Particle Density
Particle Size Distribution
Permeability and Hydraulic Conductivity
pH
Porosity
Pore-Size Distribution
Potassium
Potassium Adsorption Ratio (PAR)
Potential Acidity
Relationship of Conductivity to Salt Content and Osmotic Pressure
Salinity Appraisal from the Electrical Resistance of Soil Paste
Saturation Percent
Selenium
Sodium
Sodium Adsorption Ratio (SAR)
Soil Fertility
Soluble Boron
Soluble Cations and Anions:
- Bicarbonate
- Calcium
- Carbonate
- Chloride
- Magnesium
- Nitrate
- Potassium
- Silicates
- Sodium
- Sulfate

Strontium
Sulfate
Sulfur
Texture (Percent Clay, Silt, Sand, Very Fine Sand)
Total Exchangeable Bases
Vanadium

RADIOCHEMICAL ANALYSIS

Gross Alpha
Gross Beta
Gamma Spectrometric Analysis
Radium – 226
Radium – 228
Thorium – 230
Lead – 210
Total Uranium

Many more elements, nuclides and soil parameters can be analyzed by CEP and will be quoted upon request.

For further specific and/or technical information, please contact CEP.

Controls for Environmental Pollution, Inc.
1925 Rosina Street, P.O. Box 5851
Santa Fe, New Mexico 87502
Phone (505) 982-9841

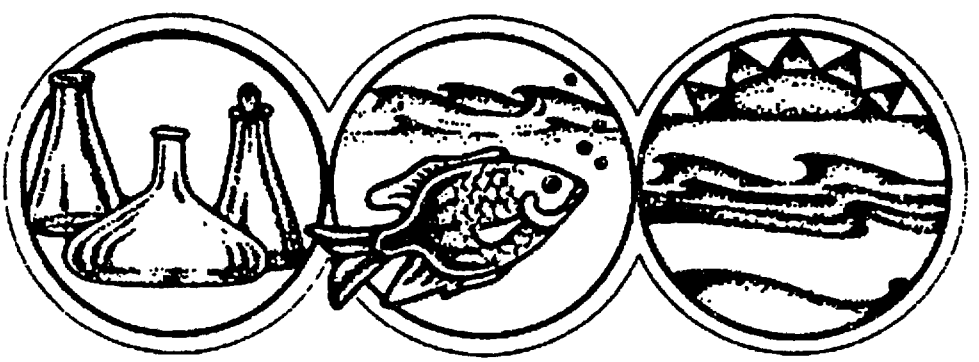
WATER:
OUR MOST PRECIOUS RESOURCE

Controls For Environmental Pollution, Inc.

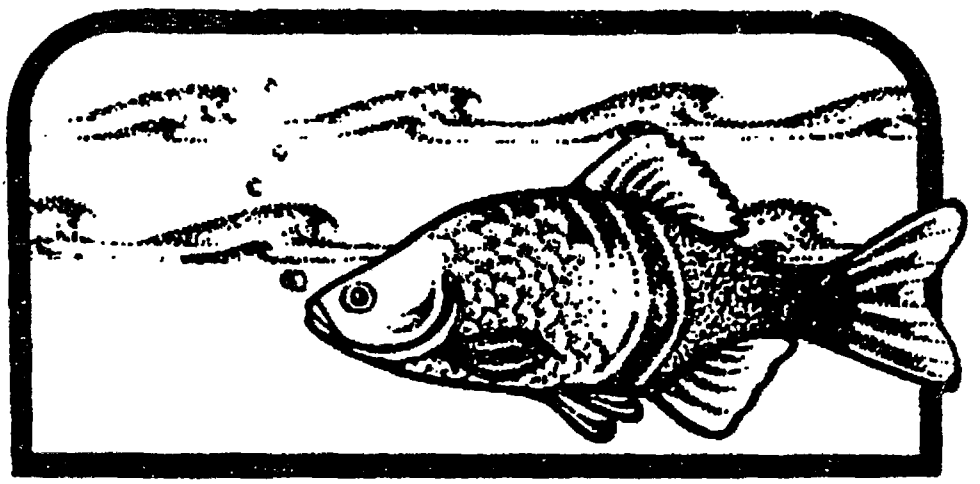
WATER:
OUR MOST PRECIOUS RESOURCE

Of all our natural resources, water is the most abundant, the most beneficial, the most precious—yet, the most abused. Although two-thirds of the earth's surface is water, most of it is unusable because of heavy sea salt and contaminations. In ever-growing amounts man-made pollution is encroaching upon our rivers, lakes, harbors, streams, groundwaters and irrigation waters.

Ever since man has learned to manufacture substances nature never invented, our waters have become complex and dangerous accumulation sites for technological wastes. Major sources of pollutants include: pesticides and fertilizer run-offs from agriculture; animal wastes from feedlots; sewage discharges from communities and ocean liners; oil spills; acid and sediment drainage from mining operations and industrial wastes. In essence, our waters are continuous flowing foundations for poisons and carcinogenic chemicals which inevitably cause serious damage in man's biological food chain.



The immediate problems in water pollution require analysis, monitoring and neutralization of toxic substances. It is a time for us to consult the most practicable technology for control and purification of our water systems. CONTROLS FOR ENVIRONMENTAL POLLUTION (CEP) is a company dedicated to complete research and analysis of the environment; instigating techniques for pollution control and the protection of water quality.



WATER CAPABILITIES

CEP offers a full range of aquatic studies and water quality tests including chemical, biological, microbiological, toxic, herbicide, pesticide and nuclear. Complete capabilities allow analysis of the following water sources: PRIVATE AND COMMERCIAL WELLS, MUNICIPAL SYSTEMS, BOTTLED WATER, STREAMS, RIVERS AND RESERVOIRS, SWIMMING POOLS, RAINFALL, SNOWFALL, TANKS, PONDS AND LAKES, MINE AND MILL TAILINGS, INDUSTRIAL USE AND SEWAGE SYSTEMS. Analysis of your particular pollution source will be conducted through surveys, sample gatherings, tests, interpretations and research. You will receive updated reports, projections, maintenance and consultations to keep you informed.

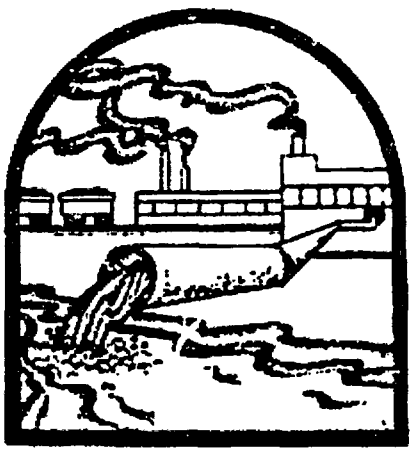
QUALITY CONTROLS FOR TOTAL ASSURANCE

CEP has developed an extremely comprehensive quality control program wherein all procedures are documented, checked and rechecked to insure accuracy. Within the company there exists an interlaboratory check sample program to analyze data as well as provide an ongoing measurement of staff performance. In addition to CEP's internal monitoring, random media samples are also sent to state and federal agencies for verification.

SELF-PRESERVATION

We now know that everything that man injects into his ecosystem ultimately finds its way into the earth's water. Our survival depends upon this entire closed life-system where all of nature is recycled and reused in continual support of each individual entity.

Therefore, it is vital that we cooperate with nature's way for it is the ONLY way to avoid self-destruction. We must approach life with a new environmental ethic—one that will elevate our quality of life and preserve and protect our waters, air and land.



ROUTINE DETECTION LIMITS FOR WATER SAMPLES

CEP offers full scale analysis for the determination of inorganic, organic, microbiological, and radiological constituents in water.

ORGANIC

Chlorinated Hydrocarbons	**mg/l**
Chlordane	0.003
Endrin	0.0002
Heptochlor	0.0001
Heptochlor Epoxide	0.0001
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005

CHLOROPHENOXYS	**mg/l**
2, 4-D (2, 4-Dichlorophenoxyacetic acid)	0.1
2, 4, 5-TP Silvex (2, 4, 5-Trichlorophenoxypropionic acid)	0.01

Cont.

RADIOCHEMICAL

Analysis	pCi/l
Gross Alpha	2
Gross Beta	3
Gross Gamma(Detection limit on request)	
Gamma Spectrometric Analysis (Detection limit for various nuclides on request)	
Radium-226	0.6
Radium-228	1
Strontium-89	1
Strontium-90	0.5
Polonium-210	2
Lead-210	1.5
Thorium-230	0.6
Tritium	500
Isotopic Uranium (U-234, U-235, U-238)	0.6
Isotopic Thorium (Th-228, Th-230, Th-232)	0.6
Isotopic Plutonium (Pu-238, Pu-239)	0.6
Cesium-137	1.0
Iodine-131	0.5
Americium-241	1.0
Total Uranium ugU/l	1.0

MICROBIOLOGY

Analysis	Colonies/100 ml
Total Coliform	< 1
Fecal Coliform	< 1
Fecal Streptococci	< 1

INORGANIC

Analysis	mg/l
Acidity	0.1
Algicides	0.0001
Alkalinity "P" (as $CaCO_3$) (Carbonate as $CaCO_3$)	0.1
Alkalinity Total (as $CaCO_3$) (Bicarbonate as $CaCO_3$)	0.1
Alk. (as $CaCO_3$) Total – Alk. "P"	0.1
Aluminum, Al	0.1
Antimony, Sb	0.01
Arsenic, As	0.01
Barium, Ba	0.1
Beryllium, Be	0.001
Bismuth, Bi	0.001
Biochemical Oxygen Demand	1.0
Boron, B	0.1
Bromide, Br	0.1
Cadmium, Cd	0.001
Calcium, Ca	0.1
Chemical Oxygen Demand	0.1
Chloride, Cl	0.1
Chlorine, Available, Cl_2	0.01
Chlorine Demand, 30 minutes	0.1
Chlorine Demand, 60 minutes	0.1
Chlorine Demand, 90 minutes	0.1
Chlorine Demand, 120 minutes	0.1
Chromium, Cr, Total	0.001
Chromium 6+	0.01

Cobalt, Co	0.01
Copper, Cu	0.001
Cyanide, CN	0.1
Fluoride, F	0.01
Gold, Au	0.001
Hardness, EDTA, (as $CaCO_3$)	0.1
Iron, Fe	0.01
Lead, Pb	0.001
Lithium, Li	0.01
Magnesium, Mg	0.1
Manganese, Mn	0.001
Mercury, Hg	0.0003
Molybdenum, Mo	0.001
Nickel, Ni	0.01
Nitrogen, Ammonia (as N)	0.01
Nitrogen, Kjeldahl (as N)	0.1
Nitrogen, Nitrate (as N)	0.1
Nitrogen, Nitrite (as NO_2)	0.
Oil & Grease	1.0
Oxygen, Dissolved, DO	0.1
Phenols	0.001
Phosphate, Ortho (as P)	0.1
Phosphate, Ortho (as PO_4)	0.3
Phosphate, Total (as P)	0.1
Phosphate, Total (as PO_4)	0.3
Potassium, K	0.1
Selenium, Se	0.01
Silica, SiO_2 (Dissolved)	0.01
Silica, SiO_2 (Total)	1.0
Silver, Ag	0.01
Sodium, Na	0.01
Solids, Suspended Volatile	1.0
Solids, Total	1.0
Solids, Total Dissolved	1.0
Solids, Total Suspended	1.0
Solids, Total Volatile	1.0
Specific Conductance umhos/cm	0.1
Strontium, Sr	0.1
Sulfate, SO_4	1.0
Sulfide, S_2	0.1
Sulfite, SO_3	0.03
Sulfur, S	1.0
Surfactants (as LAS)	0.01
Tin, Sn	0.001
Titanium, Ti	0.01
Total Organic Carbon (TOC)	1.0
Turbidity Jackson units	0.1
Vanadium, V	0.01
Zinc, Zn	0.01

For further specific and/or technical information or other services available, please contact CEP.

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
1925 Rosina Street, P.O. Box 5351

OUR WORLD
OUR CAPABILITIES
AND YOU . . .

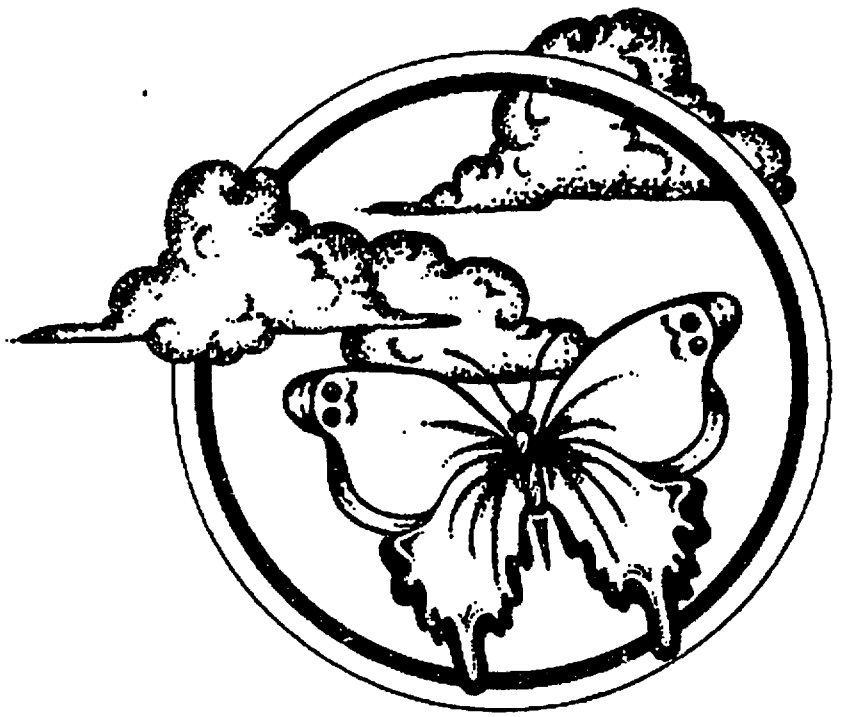
Controls For Environmental Pollution, Inc.

OUR WORLD

The planet we inhabit is quite possibly an "endangered species." Its air, waters and land are our most precious resources and the very basis of human life. We respect their importance, acknowledge their worth; yet consistently, in the name of progress we contaminate nature's purity. Sometimes unknowingly and sometimes without regard we have taxed all of nature's power to contend with man-made pollution, chemicals and waste.

There is still time, however, to mend our ways and live in harmony with earth. Because of increasing public awareness and governmental responses with anti-pollution regulations, environmental monitoring has become a necessity.

This is where we come in. CONTROLS FOR ENVIRONMENTAL POLLUTION, INC. (CEP) is a consulting and laboratory service company providing a total program to locate and monitor possible sources of pollution. Our comprehensive program of detection and study concentrates on your individual needs and the control of your problems.

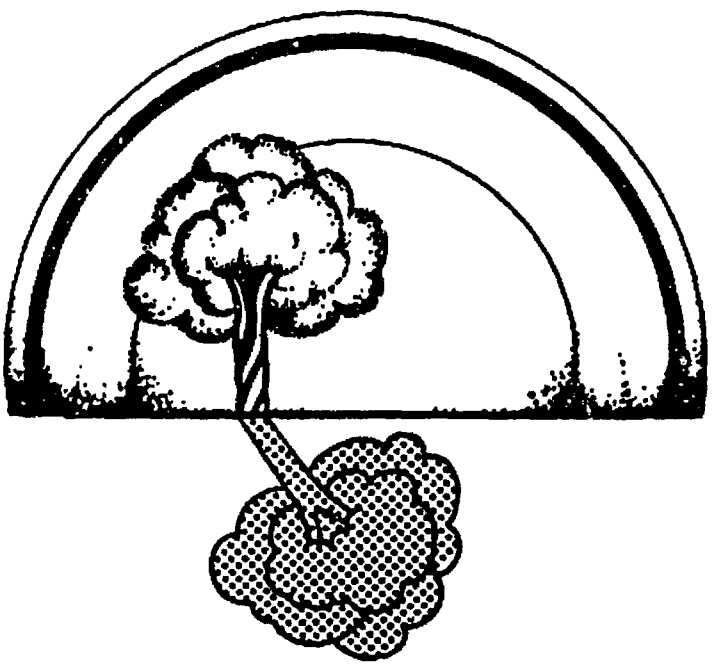


OUR CAPABILITIES

CEP offers a full range of services in drinking water quality, groundwater monitoring, pesticides, microbiological, ecological, radiological, personal bioassay, quality assurance and consultations for nuclear and non-nuclear industry. Our analytical procedures are the same as, equal to, or better than those currently used by the U.S. Public Health Service, Nuclear Regulatory Agency and the Environmental Protection Agency. We further our dependability by cross-reference of random samples from various state and federal agencies.

Quality Assurance: CEP offers consulting services to nuclear and non-nuclear industries for the review and recommendation of chemistry, environmental and health physics operating procedures, training of operations personnel and audit of plant operations. Within these services, CEP will develop a
(1) quality assurance instruction program,
(2) quality control program, and
(3) quality assurance surveillance program.

Radiological: CEP has developed and performs complete radiological surveys around Nuclear Power Reactors. In reference to your company's specific needs, CEP will provide you with the following information:
(1) Establishment of pre-operational and operational levels of natural surroundings.
(2) Establishment of the impact of operational radiation levels on the environment.
(3) Will provide your company with a record to prove compliance with health and safety regulations.
(4) Will provide your company with information for public relations use.



Ecological: This program would encompass a complete approach to questions regarding ecological interaction. In this respect we study the terrestrial population density in relation to your plants, trees, grasses, farming acreage and vertebrate animal calculations. In this same category, fresh waters and general terrestrial ecology are studied and documented. For example, aerial photography will show the topographic outlay of forests, rivers, streams and farms in relationship to your proposed site of industry.

Mining: Our programs for surveying uranium and other areas of mining encompass the correlation of your industrial problems to their environmental influences. In this study we analyze surface waters, soil, vegetation, wildlife, airborne particulate and other media in the environment.

Groundwater: CEP will establish a monitoring program to meet the requirements of federal, state and local regulatory agencies. On-site and off-site wells of the proposed site will be sampled to establish a preoperational water quality baseline.

Organic Contaminates: Analysis for organic compounds can be performed on a wide variety of materials such as water, soil and biological specimens to determine the presence of chlorinated hydrocarbons, PCB'S, phosphate insecticides, chlorophenoxys, algicides and other low and high volatile organic compounds.

Inorganic Contaminates: CEP can perform a wide variety of analysis on various sample media to determine impurities from A to Z (acidity to zinc)

Microbiology: Complete sanitation analysis of drinking and wastewater are also performed by CEP under standards established by the federal government.

Bioassay: CEP offers a bioassay program covering radioactive and stable toxic elements and compounds in various biological materials such as blood, urine, feces, tissue, bone, etc. CEP has a license under the Clinical Laboratories Improvement Act of 1967 (42 U.S.C. 268a).

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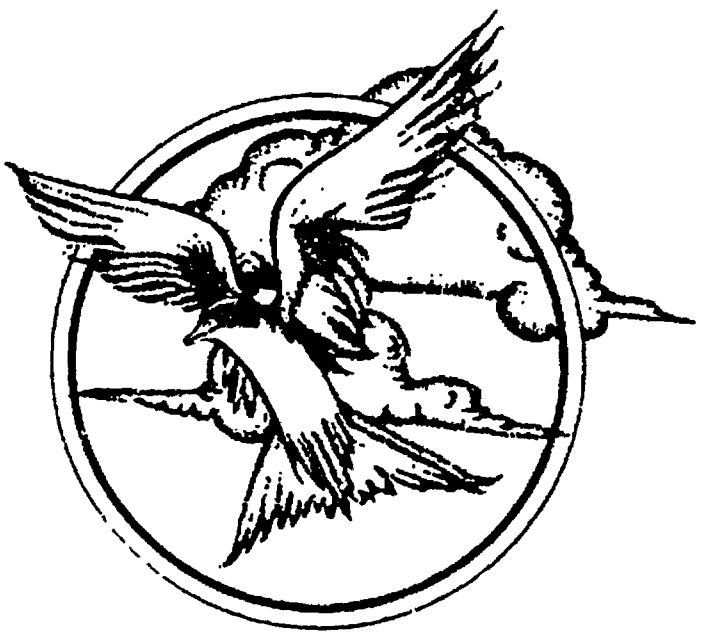
Air Sampling: Air monitoring is performed to determine the concentrations of radioactivity and/or trace metals to which industrial workers are exposed through environmental air or exhaust ventilation systems. Once concentrations are determined, controls may be designed to maintain safe operational exposure levels.

Sample Collection: CEP will handle your field collection or train your personnel in any required program.



AND YOU . . .

In conclusion, we are concerned about your total environment, about creating harmony within our world space so that we may in turn live in harmony with the universe. It is imperative that we maintain the cooperation of industries as well as each and every individual. If we all strive together to solve the problems of pollution today we can avoid tomorrow's complications . . . and live and love in the confidence that we are safe from ourselves

For further specific and/or technical information, please contact CEP

CONTROLS FOR ENVIRONMENTAL POLLUTION, INC.
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Question 17

Controls For Environmental Pollution, Inc. will be the off-site laboratory utilized for environmental sampling. Brochures for this company are attached to the answer for Question 16.

All environmental samples (soil, vegetation, and water) will be analyzed by the above off-site laboratory.

Instrument calibration will also be performed by the same laboratory.

Question 18

Smears will be taken in the truck off-loading area on containers as they are unloaded and the floor will be smeared routinely at the end of each shift. This would be the area most likely to be contaminated if any of the incoming containers were in excess of limits.

Smears of containers are taken by wiping a large area of each package with an absorbent wiping material and surveying with a thin window survey meter. The smear area covered will normally cover several thousand square centimeters.

Floor smears will be taken by attaching absorbent wiping material on a large dry mop head and covering nearly the entire floor area of the operations building. These smears are then surveyed with a thin window survey meter.

All other areas outside the off-loading and transfer areas to the underground storage areas will be surveyed routinely, using the same wiping techniques as described above, as follows:

1. Elevator floors - daily

2. Bottom of shaft - daily

3. Tunnel areas, those being currently used - daily

4. Offices, shops, etc. - weekly

Question 19

You state that if tritium waste is to be accepted, urinalysis bio-assay procedures need to be performed at weekly intervals on all individuals who work in restricted areas of the facility.

Such a schedule for handling uncontained tritium is probably very circumspect. However, since the tritium waste that will be handled at the Lyons Facility will all be packaged and is used on passenger carrying aircraft as placards, and various luminous dials by individuals, with no restrictions or other monitoring, these requirements seem somewhat more restrictive than is necessary.

Another possible source of tritium is that which may be contained in liquid scintillation vials.

In a study lasting one month recently at the University of California, Berkeley, the following results were reported:

> Average activity of a 55 gallon (209 liter) drum containing approximately 4,000 scintillation vials was 20 microcuries of tritium. Each vial contains approximately 10 milliliters of counting fluid for a total of 10.57 gallons of counting fluid in the entire 4,000 vials. Therefore, there is only 0.5 microcuries per liter of tritium in a typical 55 gallon drum of waste containing liquid scintillation vials.

It would seem then, that to receive an amount of tritium equal to or exceeding 10 microcuries per liter concentration in individuals is quite remote.

We would then like to suggest that a monthly urinalysis for tritium be performed on all workers in the restricted area for six (6) months, and if the average concentration of tritium for any single individual during that 6 months is less than 10 microcuries per liter, urine samples will then be taken and analyzed at 6 month intervals.

As further testimony to this schedule of urine sampling, employees at SouthWest Nuclear Company have never exceeded 10 microcuries per liter concentration in four and one-half years of handling large quantities of the same types of waste as will be received at the Lyons Facility. This evidence can

Question 19 Cont'd.

be expanded to all existing low-level burial facilities who have had comparable results over a period at up to 17 years of handling similar materials.

Question 20

EMERGENCY PROCEDURES FOR VENTILATION SYSTEM FAILURE

In the event of a ventilation failure, the mine workers will be notified and evacuated if it is determined to be a health hazard by the supervisor in charge. Air analysis will be made to determine oxygen content. All efforts will be made to locate the problem and corrective action taken as soon as possible.

If the oxygen levels fall below 19.5%, all personnel will be evacuated except those designated by the supervisor in charge, who will put on supplemental breathing apparatus such as (See Question 21) or equivalent to continue to work on the ventilation problem.

If the ventilation failure has been caused or complicated by a fire causing a buildup of carbon monoxide or other poisonous gases, all mine personnel will don their individual respirators and evacuate the mine.

No further entry will be permitted until the problem has been evaluated by management FM, RSO, MSO, and the Lyons Fire Department.

The fire will first be extinguished, the ventilation problem corrected and the mine area purged with fresh air prior to further entry into the mine.

The purge time will depend on the mine exit air. A decision will be made by the supervisor in charge after consultation with Rickano higher management (Facility Manager, FM, Radiation Safety Officer, RSO, and Mine Safety Officer, MSO) and the Lyons Fire Department concerning re-entry into the mine.

A prolonged ventilation shutdown will require an entry by the Mine Safety Officer to measure the oxygen content prior to entry into the mine by the working crew.

These tests will be performed in accordance with the "Federal Mine Safety and Health Act of 1977, Public Law 91-17 as amended by Public Law 95-164, Page 40, Section 303 entitle Ventilation. Subsection (b) All active workings shall be.... fact a minute. Tests for air quality will be performed by a permissible flame safety lamp or other means approved by the secretary; Page 42, sub-item (e)."

Question 21

The types of Anti-C (protective) clothing to be worn is determined on the basis of the potential for personnel contamination in the area, whether wet or dry, the work to be performed and the protective capabilities of the various items of clothing.

The following protective clothing will be on hand for use when required to be worn by the RSO or DRSO.

1. Surgeon's gloves (or similar thin rubber gloves)
2. Canvas shoe covers
3. Rubber footwear
4. Cloth caps
5. Cloth hoods
6. Face shields
7. Coveralls
8. Laboratory coats
9. Cotton gloves
10. Waterproof gauntlet gloves

Types of respiratory equipment to be available in cases of emergency such as an unplanned release of radioactivity into the air or fire will be of several types, half-masks, full-face respirators, self-contained breathing apparatus and air purifying respirators. All respirators will be of the types that are recommended in ANSI 288.2-1969.

Please change the reference on Page 85 covering perscnne decontamination from 9(e) to 9(f).

Question 22

EMERGENCY FIRE FIGHTING PLAN

Preparing plans before the emergency occurs is probably the most important phase of fire fighting operations. Planni ahead reduces the likelihood of a timid response or a foolhar response. The more knowledge personnel on-site, and off-site emergency personnel have about the situation they are facing, the better they can make appropriate decisions.

The first phase in pre-emergency planning is the process of collecting information having a bearing on emergency operations. This information must include a knowledge of the materials that may be involved and what reactions are to be expected. Consequently, all company personnel will be traine to recognize any materials that may be of any concern as bein a fire hazard or contributing to the situation if a fire were to start in the vicinity.

One of the most important aspects of the mine storage concept is to head off problems at the source. In other words, any materials received above ground should be carefull evaluated as to potential for fires before they are moved underground.

Another important step is to fully inform all generators who ship to the site that no pyrophorics or materials that can create hazards will be acceptable.

Therefore, it shall be of the utmost priority in trainin and on-going practice that safety in evaluating and handling radioactive materials may very well preclude the implementati of fire fighting and other emergency plans.

Although a fire at any point in time cannot be completel ruled out, it will be seemly to discuss something about the containers that will be stored in the Lyons Facility to give some idea of their integrity.

Containers for shipping radioactive materials must undergo rigorous tests before they are approved. Table I summarizes the tests for these packages.

Question 22 Cont'd.

Table I. Tests for Packages for Shipment of Radioactive Materials.

Tests	Type A	Type B
Water spray that keeps the package wet for 30 minutes and after 1¼ to 2½ hours, a 4-foot free drop onto an unyielding surface.	X	X
A 1-foot free drop onto each corner. (Applies only to wood or fiberboard packages of 110 pounds gross or less.)	X	X
Impact of the hemispherical end of a 13-pound steel cylinder, 1½-inch diameter, dropped 40 inches onto the vulnerable side of the package.	X	X
A compressive load of either 5 times the weight of the package or 2 lb./in.^{2} times the maximum horizontal cross-section, whichever is greater.	X	X
Direct sunlight at ambient temperature of 130°F. Ambient temperature of -40°F in still air and shade.	X	X
Reduced pressure equal to 0.5 atmospheres.	X	X
Vibration normally incident to transportation.	X	X
A free drop of 30 feet onto a flat unyielding surface so as to cause the most damage.		X
A drop of 40 inches onto the end of a rigidly mounted 6-inch diameter steel shaft.		X
Whole surface thermal exposure at 1475°F for 30 minutes and not cooled artificially until at least 3 hours after the test.		X

Water immersion under 3 feet of water for 8 hours. (For fissile materials packaging only.)	X

There are two classifications of containers: Type A and Type B. (The existing authorization for use of non-specified "strong tight packaging" for LSA materials would be deleted in favor of a specific requirement for Type A packages as will be changed in "Notice of Proposed Rule-making" by the Materials Transportation Bureau, DOT, published in the Federal Register, Volume 44, No. 5 - Monday, January 8, 1979.) Type A containers are designed so that normal transportation conditions will not cause the loss of the radioactive materials nor loss of shielding. Type B containers must withstand both normal transportation conditions and accidents with only limited loss of shielding and no loss of radioactive materials.

The importance of pointing out that shipping containers must pass the test in Table I indicate that the containers are high in integrity and even though they may contain combustible materials, they are not apt to catch fire easily either from within or to be readily ignited if a fire were to reach them from some other source. All containers are tightly closed with heavy bolt ring devices or in the case of Type A or Type B wooden boxes the lids are nailed and sealed. The use of wooden boxes will be very minimal because of the new requirements of meeting Type A testing.

With the foregoing information as background, it should be noted that fires, if any, probably will be those that could occur in electrical equipment, internal combustion engines and such type equipment.

All motive equipment in the tunnel area (see list of fir fighting equipment and locations below) and strategic areas will be equipped with fire extinguishers.

Fire Fighting - Training Employees

All employees (except clerical or office workers) will receive instruction in fire fighting techniques. This training will include use of fire extinguishers, respiratory equipment, emergency procedures, and fire fighting when radio active materials are and are not involved.

Instruction will be from a local fire department or consultant who has adequate expertise in these matters.

Question 22 Cont'd.

Specific Fire Fighting Procedures

Specific procedures for fighting fires will be written and submitted to appropriate agencies of the state before operations are begun at the Lyons Facility. It is very difficult to write procedures until equipment and electrical installations have been finalized.

However, the following list of fire fighting equipment and possible locations will be available and expanded upon as required.

Equipment	Location
CO2	Inspection & Decontamination Area
CO2	Truck Docks
Fire Hose (Water)	Truck Docks
Fire Hose (Water)	Operations Building
CO2	Operations Building
CO2	Hoist House
CO2	Elevator Shaft or Head Frame House
CO2	Bottom of Elevator Shaft
CO2	Mule Barn Office in Mine Tur
CO2	Active Storage Cells Where stacking in taking place (number required will be determined by experts)
CO2	All Transport Vehicles (Tunn Tractors & Forklifts, etc

Question 23

Conservative Analysis Potential Effect Of:

A. Spill or Release of Radioactive Material

1. Accident Response

a) Job-Site

All work will be stopped and workers will be immediately withdrawn from the affected area. The extent and levels of contamination will be determined including airborne by the Radiation Safety Officer or a qualified person(s) of his staff. The area will be carefully controlled until a program has been established to decontaminate the area and restore it to levels that meet applicable regulations and licensing conditions.

b) On-Site

Only the immediate work should be involved unless there has been "tracking" to nearby areas or possibly widespread "tracking" for some distances if the spill or release was unnoticed before work was halted. This then would require surveys of all possible pathways that lead to and from the spill areas and cleanup of all affected areas.

c) Off-Site

None required unless spill or release occurred during transportation. This situation is covered hereinafter.

2. Radiation Dose Rates

a) Job-Site

The maximum worker dose rate would not exceed 10C mRem/hr with a spill or release of a few millicuries over the spill area. Taking into consideration the low concentrations of the bulk of the containers going into the repository, the above dose rate is probably quite high.

Question 23 Cont'd.

b) On-Site

Dose rates a few feet away from the immediate spill area will be considerably lower than 100 mRem/hr and well below 2 mRem/hr at the site boundary.

c) Off-Site

No measurable change in background levels should be evident.

3. Radioactive Material Dispersal Into Air & Water

a) Job-Site

There will be no significant airborne radioactivi in most instances. Grab samples will be taken, however, and analyzed before cleanup operations commence.

Waterborne contamination will also be minimal, but in the event any on-site water is contaminate it can be controlled by curbing, absorbent materials, or wipes. Any water that does become contaminated will be solidified and disposed of as radioactive waste.

b) On-Site

No contamination will leave the underground tunne area or the operations building.

c) Off-Site

No contamination will leave the site.

4. Work Necessary To Recover From Accident

a) Job-Site

Containment, proper surveys, decontamination, and disposal of released material by approved methods with workers equipped with proper anti-C clothing and equipment.

b) On-Site

None

c) Off-Site

None

B. Injury to Personnel (As a result of accidents) Which Do And Do Not Involve Contamination

1. Accident Response

a) Job-Site

There will be an immediate cessation of work and the injury will receive first consideration. All injuries can be evaluated relative to the type of work being done of their likelihood of being contaminated. There are very few instances where a worker will receive an injury that will be contaminated, consequently, giving immediate first aid will entail very little risk to a worker. Any injury that does not need immediate attention will be surveyed before first aid. All injuries will be treated in accordance with procedures covering injuries in Section M, 9, (f).

b) On-Site

Facility Manager and Radiation Safety Officer will be in complete charge of any incident involving injuries.

c) Off-Site

No effects off-site

2. Radiation Dose Rates

a) Job-Site

Insignificant levels except in the case of a spill as per discussion in 23(a).

b) On-Site

None

c) Off-Site

None

Question 23 Cont'd.

3. Radioactive Material Dispersal Into Air & Water

a) Job-Site

None

b) On-Site

No airborne. Waterborne will only be in solutions that are used to decontaminate wounds. Very insignificant.

c) Off-Site

No airborne. If injury occurs off-site, injury will be handled according to established procedures and all materials returned for proper handling.

4. Work Necessary to Recover From Accident

a) Job-Site

Decontaminate as per 23(a).

b) On-Site

None

c) Off-Site

None

**C. Fire Above and Below Ground

**D. Dispersal of Material in Air by Fire Above and Below Ground

**E. Dispersal of Material in Water Above and Below Ground

**NOTE: Assuming radioactive material involved, with no radioactive material involved, normal firefighting techniques will be used.

1. Accident Response

a) Job-Site

Ventilation systems will be shut down and fire extinguished by dry material methods when possible (water will be used only if necessary) by workers nearest to the fire. Workers will be trained in fire fighting techniques. Also, local Fire Departments will be called if deemed necessary.

b) On-Site

By utilizing modern smoke and fire detectors at strategic locations, any fire should be contained in the immediate vicinity of the fire. Most fires that may occur will probably be involved with handling equipment. However, it is possible that an improperly packaged container could also catch fire although they have been transported a considerable distance before being handled at the site and the chances of a container spontaneously igniting is relatively remote. All personnel will be trained and periodic fire drills will be performed.

c) Off-Site

If a fire cannot be handled by company personnel, local fire fighting groups will be called. These groups will also be trained and procedures will be in effect for a coordinated effort between company personnel and off-site groups.

2. Radiation Dose Rates

a) Job-Site

Maximum dose rates at a fire site should never exceed 100 mRem/hr. This would mean that a worker with no previous exposure for the calendar quarter would be able to fight a fire for 12.5 hours before exceeding the quarterly limit of 1.25 Rem.

b) On-Site

Dose rates would not exceed 2 mRem/hr at site boundary.

c) Off-Site

None

3. Radioactive Material Dispersal in Air & Water

a) Job-Site

Potential airborne activity should be less than 3.0×10^{-9} uci/ml averaged over 40 hours for a six minute flame dispersal of 1000 uci into 1000 m^3 of air (100% volubility assumed) and six minutes per individual maximum time in radioactive air.

The only waterborne would be if water were used to fight the fire, and this would be confined to the tunnel or operations building.

b) On-Site

Airborne contamination would be considerably less than 3.0×10^{-9} uci/ml averaged over a 40 hour week. No waterborne outside job-site.

c) Off-Site

Airborne radioactivity would be considerably less than 1.0×10^{-10} uCi/ml averaged over one year. No waterborne activity will leave the site.

4. Work Necessary to Recovery from Accident

a) Job-Site

Decontaminate the area as required and package waste. All work will be done under the supervision of the Radiation Safety Officer and all established procedures will be followed.

b) On-Site

Surveys to be taken around job-site and extent of cleanup operations determined as to other on-site areas affected. Cleanup as required.

c) Off-Site

Surveys of air, water, and surface areas will be accomplished to determine if any radioactivity left the job-site or is outside the site boundary

Question 23 Cont'd.

F. Rupture of Storage Containers Above Ground and Below Ground

NOTE: Rupture of sources would be immediately detectable by portable survey instruments if shielding were breached. This assumption is based upon the use of shielding needed initially.

1. Accident Response

a) Job-Site

Withdraw all workers from the area; notify RSO or one of his staff authorized to cover such situations; survey the area; establish a 5 mRem/hr line; check dosimeters of any workers involved; check for contamination; and plan for remedial action.

b) On-Site

Withdraw any employees who may be in the vicinity of the job-site until the area is restored to normalcy.

c) Off-Site

No effect.

2. Radiation Dose Rates

a) Job-Site

Based on 100 curies cobalt-60 equivalent source, the dose rate would be 229 mRem/hr at 10 feet, and 57 mRem/hr at 20 feet if total shielding were lost.

b) On-Site

Based on 100 curies Cobalt-60 equivalent source, the dose rate at 600 ft. would be approximately 2 mRem/hr.

c) Off-Site

Dose rates would be less than 2 mRem/hr in all locations at distances greater than 600 feet from the operations building if the source were located in the operations building. If the

source were in the shaft or tunnel area, there will be no significant change in levels.

3. Radioactive Material Dispersal in Air & Water

a) Job-Site

If the rupture were caused by fire (most source capsules are doubly encapsulated and double heliarc welded and will withstand fire and shock) the airborne and waterborne would be a potential as described in above sections C, D, & E.

b) On-Site

Same as above with reduced levels based on distan

c) Off-Site

No significant levels.

4. Work Necessary to Recover from Accident

a) Job-Site

Cessation of all work in the area or any areas that may be affected. Temporary shielding will be placed around the source until re-packaging can be safety effected.

b) On-Site

None outside the job-site except for support work of job-site work.

c) Off-Site

None

G. The Elevator Cable Breaking While Transporting Large Sources of Material Down the Mine Shaft, the Shielding of the Sources Rupturing (Integrity Breached), and the Source(s) Rupturing for Situations When Individuals are Involved and Not Involved.

NOTE: The expression "large sources of material" is strictly relative. Due to a weight limitation on the elevator of 3,368 pounds, the activity of any source would therefore be limited to the

shielding that could be afforded by a maximum of 3,368 pounds of lead or other shielding material. A cask of this size is considered quite small in most of the nuclear industry. In addition, the only shielded containers that would be stored in the mine would be those that will be making a "one way trip", in other words, there will be no transfer of material from a shielded container to any other form of containment.

1. Accident Response

a) Job-Site

No personnel will be riding down the elevator with loads of waste. Therefore, personnel involved will be restricted to those who may be in the work area at the bottom of the shaft. If there is a rupture of both the source shield and the encapsulated source, the immediate area and the operations building will be cleared, the ventilation system will be turned off, and the emergency response team will move in to survey the accident. This survey will include radiation and contaminati levels including both surface and airborne activit These activities will, of course, follow an initia check for possible injuries. Injuries will receiv first consideration in all cases. No further work will be resumed until the accident has been cleare and the area returned to proper working conditions The TV camera at the bottom of the shaft will prove very valuable if such an incident were to occur.

b) On-Site

Effects away from job-site could be higher levels of airborne contamination if a source were ruptured and carried away from the job-site before the ventilation system were shut down. Air samples will be taken throughout the area to determine the extent of possible contamination. A complete work stoppage would be in effect until conditions are returned to normal and it is safe to resume work.

c) Off-Site

None likely, including airborne contamination

Question 23 Cont'd.

2. Radiation Dose Rates

a) Job-Site

Same as F.

b) On-Site

Same as F.

c) Off-Site

Same as F.

3. Radioactive Dispersal Into Air & Water

a) Job-Site

With the rupture of a shield and the primary container, there is a potential for airborne contamination to concentrations of 10^{-6} uc/ml (1 mc in 1000 M^3) at immediate accident site assuming the worst case of Radium 226. No workers should be exposed to airborne contamination above permissible levels if evacuation of the area is immediate as will be required in work procedures.

Waterborne activity would only be present if water were used for volatiles.

b) On-Site

Airborne activity will be confined to the shaft area. Airborne levels in the operations building should be negligible if the air ventilation system is turned off immediately.

c) Off-Site

None above permissible levels.

4. Work Necessary to Recover from Accident

a) Job-Site

Anti-C clothing and respiratory devices will be used as tests determine. Shielding (as described on Page 92 of the application) will be placed in

position to reduce radiation exposure to workers and the cleanup crew. Repackaging will be performed before any other work is allowed to proceed in the vicinity of the job-site.

b) On-Site

Repairs to cables, etc. may be started as soon as it can be done safely. This work will be coordinated by the Facility Manager, RSO and MSO.

c) Off-Site

None.

H. Elevator Cable Breaking (And Simultaneous Failure of the Elevator Safety Brake) Causing Multiple Container Rupture.

NOTE: Personnel will not ride the elevator with radioactive material.

1. Accident Response

a) Job Site

Same as G.

b) On-Site

Same as G.

c) Off-Site

Same as G.

2. Radiation Dose Rates

a) Job-Site

Same as F.

b) On-Site

Same as F.

c) Off-Site

Same as F.

Question 23 Cont'd.

3. Radioactive Material Dispersal Into Air & Water

a) Job-Site

Same as G.

b) On-Site

Same as G.

c) Off-Site

Same as G.

4. Work Necessary to Recover From Accident

a) Job-Site

Same as G.

b) On-Site

Same as G.

c) Off-Site

Same as G.

I. Elevator System Malfunction and Becoming Stuck At Some Level in the Mine Shaft While Transporting Sources with Relatively High Dose Rates and with Low Dose Rate Materials When Individuals are (And are not Involved) With and Without Injury

NOTE: No personnel will ride the elevator with radioactive material.

1. Accident Response

a) Job-Site

Radiation levels will already be known since it can be assumed that the containers have not lost integrity since there was no accident that would cause rupturing. The course of action in this case is as described in the application on Page 84, (3).

Question 23 Cont'd.

b) On-Site

Same as above.

c) Off-Site

None.

2. Radiation Dose Rates

a) Job-Site

Maximum dose rates of 1,000 mRem/hr at a distance of 3 feet from the packages. Less than 5 mRem/hr at a distance of 50 ft.

b) On-Site

Same as above.

c) Off-Site

None.

3. Radioactive Material Dispersal Into Air & Water

a) Job-Site

None.

b) On-Site

None.

c) Off-Site

None.

4. Work Necessary to Recover From Accident

a) Job-Site

The RSO and MSO will coordinate plan to lower repairman accompanied by a Health Physics Technician to the vicinity of the stuck cage and determine appropriate action to be taken. This will include the use of shielding to reduce exposures during repair work.

Question 23 Cont'd.

b) On-Site

Coordinate support for job-site work.

c) Off-Site

None.

Question 24

In meetings with the local hospital, they have agreed to treat possibly contaminated injured personnel.

We have performed some research into arrangements made at some other locations and to cite one example, Valley Memorial Hospital in Livermore, California, has an agreement with the Lawrence Livermore Laboratory of Livermore and General Electric's Vallecitos Nuclear Center, Pleasanton, California to treat contaminated injuries in the morgue of the hospital. Both of the nuclear facilities would furnish technical and equipment service to assist for such an incide

It is also interesting to note that the room has only been used once in all the years that the arrangement has bee in effect, and this involved the removal of a splinter from a persons' hand. There are approximately 6,000 employees at the Lawrence Livermore Laboratory and 500 at the Vallecitos Nuclear Center. They also handle many unpackaged radio-isotopes which would probably increase the chances of contaminated injuries much more so than a facility such as ours which will only be handling containerized materials. Therefore, we agree that these services should be available, but do not feel that there is a serious problem in respect to contaminated injuries.

Prior to beginning operations, we would fund a three-st emergency medical training program.

1. The EMT's (Emergency Medical Technicians) who man the local ambulance would be offered the full training progr that will be established for Rickano employees in order acquaint them with radioactive substances and their prop handling.

2. In addition, at least one Rickano staff person would be trained as a qualified EMT with additional specialized training at a metropolitan hospital offering health physics training.

3. Rickano would provide the funding and cooperate with the local medical community in bringing in a competent medic technician, qualified to instruct in the proper procedur for handling contaminated/injured persons, to provide instruction for medical and hospital staff in the handli of contaminated/injured persons.

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Question 24 Cont'd.

NOTE: In addition, the Rickano mine safety officer will provide a course of instruction to the EMT's assigned to the local ambulance service in mine safety and procedures. This will also be valuable to the EMT's in case of accident in the nearby American Salt Mine.

In the unlikely event of an accident resulting in a contaminated injury the following procedures will be followed:

1. The Radiation Safety Officer will be responsible for the evacuation of the injured from the contaminated area, under the supervision of the staff EMT, after the emergenc vehicle is called and is responding.

2. The staff EMT and the Deputy Radiation Safety Officer wil accompany the injured in the emergency vehicle, taking with them, the necessary instrumentation to do all necessary radiation monitoring in the emergency vehicle and at the hospital. Once at the hospital, the Deputy Radiation Safety Officer will serve as Radiation Control Officer until the Emergency Response Team arrives.

3. The Emergency Response Team will complete containment and control procedures at the accident site and then proceed to the Rice County Hospital where they will survey and monitor the ambulance or emergency vehicle used, hospital corridors where the patient was transported, treatment room and treatment equipment and attending medical person completing any decontamination necessary at the medical facility prior to returning to the Rickano site and under taking decontamination of the contained and controlled ar

Question 25

Obviously, the cost of plugging a fracture will depend on the size and extent of that fracture. In the event of a fracture from a water zone, the following procedure will be implemented:

Flexible pipe will be laid down the wall of the shaft and back to the cavity where the fracture has occurred. If the flow rate from the fracture is slow enough that it can be controlled by pumping, we will pump the water out and seal the fracture with cement. Probable cost is $30,000.

If the flow rate is too great to contain by pumping, the entrances to the cavity will be immediately closed with salt and reinforced with cement. A hole will then be drilled from the surface (similar to an oil well drilling operation) into the cavity. This will take about 3 days and cost approximately $30,000 according to estimates by Sterling Drilling. Cement (50/50 Poz A kith saturated salt) will be pumped in, to fill the cavity. According to estimates by Haliburton Corp., this procedure would cost $3.02 per cubic foot of cement plus a $20,000 pump charge. Probable cost $75,000.

If the flow rate from the fracture was high enough to require the sealing of a 30' x 40' cavity, the costs would be:

Cement for sealing the cavity below ground	$1,208
Drilling the hole from surface	30,000
12,000 cubic feet of cement	36,240
Pump charge	20,000
Labor and equipment	50,000
TOTAL.....	$137,448

As a further testimony to the improbability of ever having to face this fracture problem is given in the report by the committee on Radioactive Waste Management by the "National Academy of Sciences - National Research Council", Washington, DC, November 1970, entitled "Disposal of Solid Radioactive Wastes in Bedded Salt Deposits", Pg. 4, Item 8, Fractures.

Question 26

Regarding your inquiry concerning the word "assume" in place of "assure", we apolcgize for the typoyraphical error. We certainly meant the word "assure".

We intend, at least for the present time, to use "Controls For Environmental Pollution, Inc." as contractor performing environmental monitoring. Any changes from this firm would be cleared beforehand with the Bureau.

Question 27

In addition to requirements of Regulations 28-35-229 and 28-35-230, "Notification of Incidents", of the Kansas Radiation Protection Regulations, we propose the following notification procedure.

Should any soil, water, or vegetation sample analysis received from the off-site analytical laboratory exceed twice the average pre-operational levels, the Bureau will be notified within 24 hours of receipt by Rickano of the analysis. Also, another sample will immediately be obtained and sent to the laboratory for anlysis. This sample will be handled on an emergency basis and results will be phoned into Rickano immediately after the analysis has been perform These results will in turn be immediately called into the Bureau. Immediate for these purposes will usually mean on the same day, but no later than the end of the following day

Enclosed are copies of sample results from the initial pre-operational sampling program.

CUSTOMER Southwest Nuclear Co.
ADDRESS 70666-A Commerce Circle
CITY Pleasantville, CA 94566
ATTENTION Jim Harvey
JOB # 811051

REPORT OF ANALYSIS

SAMPLES RECEIVED 10/4/78 | CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Liquid Analysis

	Sample Identification	Date Collected	Analysis		pCi/l
C-	Tap Water	9/28/78 @11:50 am	Gross Alpha		14±6
			Gross Beta		5±2
			Tritium	<	500
			Gamma Spec.		(a)
H-	Holinger Well	9/20/78 @9:42 am	Gross Alpha		*6±16
			Gross Beta		5±2
			Tritium	<	500
			Gamma Spec.		(a)

(a) Gamma spectral analyses were performed and no fission or corrosion products were detected, only naturally occuring radionuclides from the uranium (4n+2) series and/or thorium (4n) series were detected.

*NOTE: Large counting error and detection limit due to dissolved solids.

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11/9/78

Centers for Environmental Pollution Inc

CUSTOMER Southwest Nuclear Co.
ADDRESS 70666-A Commerce Circle
CITY Pleasantville, CA 94566
ATTENTION Jim Harvey
P.O. NO. 811051

REPORT ANALYS

DATE 10/4/78

SUBJECT WATER Liquid Analysis

	Sample Identification	Date Collected	Analysis		pCi/l
M.	Salt Creek	9/21/78 @4:40 pm	Gross Alpha	<	6*
			Gross Beta	<	2
			Tritium	<	500
			Gamma Spec.		(a)
B-	South end of Site on property	9/19/78 @9:10 am	Gross Alpha		5±2
			Gross Beta		7±2
			Tritium	<	500
			Gamma Spec.		(a)

	Sample Identification	Date Collected	Analysis		pCi/l
K-	Alderman Well	9/20/78 @10:00 am	Gross Alpha*		11±11
			Gross Beta	<	2
			Tritium	<	500
			Gamma Spec.		(a)
A-	Mine Shaft	9/18/78 @11:00 am	Gross Alpha*	<	16
			Gross Beta	<	2
			Tritium	<	500
			Gamma Spec.		(a)

* NOTE: Large counting error and detection limit due to dissolved solids

(a) Gamma spectral analyses were performed and no fission or corrosion products were detected, only naturally occuring radionuclides from the uranium (4n+2) series and/or thorium (4n) series were detected.

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Centers for Environmental Pollution, Inc.

CUSTOMER
ADDRESS
CITY
ATTENTION
P.O. #

Southwest Nuclear Co.
70666-A Commerce Circle
Pleasantville, CA 94566
Jim Harvey
811051

REPORT OF ANALYSIS

SAMPLE RECEIVED 10/4/78 | CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS ~~Liquid~~ WATER Analysis

	Sample Identification	Date Collected	Analysis		pCi/l
J -	Bradford Well	9/20/78 @10:30 am	Gross Alpha		16±7
			Gross Beta		15±2
			Tritium	<	500
			Gamma Spec.		(a)
H -	Sell Well	9/22/78 @11:55 am	Gross Alpha*	<	6
			Gross Beta		2±2
			Tritium	<	500
			Gamma Spec.		(a)

	Sample Identification	Date Collected	Analysis		pCi/l
L -	Mixix Well	9/25/78 @10:55 am	Gross Alpha*	<	5
			Gross Beta	<	2
			Tritium	<	500
			Gamma Spec.		(a)
G -	Salt Creek	9/21/78 @4:30 pm	Gross Alpha		4±2
			Gross Beta		5±2
			Tritium	<	500
			Gamma Spec.		(a)

(a) Gamma spectral analyses were performed and no fission or corrosion products were detected, only naturally occuring radionuclides from the uranium (4n+2) series and/or thorium (4n) series were detected.

*NOTE: Large counting error and detection limit due to dissolved solids.

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11/9/78 PAGE 1 OF 1 PAGE

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Southwest Nuclear Co.
70666 A Commerce Circle
Pleasantville, CA 94566
Jim Harvey
811107

REPORT O
ANALYSI

10/12/78 | CUSTOMER ORDER NUMBER

Soil Analysis

	Sample Identification	Date Collected	Analysis	pCi/g (wet)	pCi/g (dry)
A-	Mine Shaft pump outlet. Center of Site on North Side of Shaft % Moisture=26.8	10/4/78 @13:35 pm	Gross Alpha		5.8±0.7
			Gross Beta		1.5±0.1
			Tritium	0.21±0.12	
			Gamma Spec. Cesium-137		* 0.40±0.06
E-	#6 North end of Site % Moisture=10.4	10/4/78 @13:45	Gross Alpha		4.0±0.6
			Gross Beta		1.3±0.1
			Tritium	0.03±0.04	
			Gamma Spec. Cesium-137		* 0.54±0.08
D-	#1 West of Site next to Terry Rd. % Moisture=5.5	10/4/78 @12:57 pm	Gross Alpha		7.2±0.8
			Gross Beta		1.9±0.1
			Tritium	< 0.02	
			Gamma Spec. Cesium-137		0.91±0.07
B-	Southeast end of Site. Under Santa Fe Bridge % Moisture=1.1	10/4/78 @13:20 pm	Gross Alpha		5.6±0.7
			Gross Beta		1.3±0.1
			Tritium	< 0.01	
			Gamma Spec. Cesium-137		0.14±0.04
F-	#4 East Side of Site. East of Shaft & Hoist House on East Side of M.O.P. % Moisture=4.5	10/4/78 @13:26 pm	Gross Alpha		7.0±0.8
			Gross Beta		1.7±0.1
			Tritium	< 0.01	
			Gamma Spec. Cesium-137		* 0.31±0.05
M-	#8 South of Lyons American Rd. Bridge % Moisture=11.6	10/4/78 @14:10 pm	Gross Alpha		3.2±0.4
			Gross Beta		1.3±0.1
			Tritium	< 0.04	
			Gamma Spec. Cesium-137		* 0.21±0.05

NOTE: Gamma Spectroscopy also identified Natural Radionuclides from the Uranium (4n+2) and/or Thorium (4n) Series

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11/15/78

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P. Box 5351 • 1925 Rosina • Santa Fe, New Mexico 87502
Telephone 505/982-9841

CUSTOMER: Southwest Nuclear Co.
ADDRESS: 70666 A Commerce Circle
Pleasantville, CA 94566
ATTENTION: Jim Harvey
811107

REPORT OF ANALYSIS

SAMPLES RECEIVED 10/12/78 | CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS: Vegetation Analysis

	Sample Identification	Date Collected	Analysis	pCi/g (wet)	pCi/g (dry)
A-	Mine Shaft pump out let. Center of Site on North Side of Shaft % Moisture=45.9	10/4/78 @13:35 pm	Gross Alpha		0.5±0.2
			Gross Beta		3.1±0.1
			Tritium	0.44±0.19	
			Gamma Spec.		*
E-	#6 North end of Site % Moisture=19.1	10/4/78 @13:45	Gross Alpha		0.4±0.1
			Gross Beta		2.7±0.1
			Tritium	< 0.05	
			Gamma Spec.		
			Cesium-137		0.41±0.23
D-	#1 West of Site Next to Terry Rd. % Moisture=17.7	10/4/78 @12:57 pm	Gross Alpha		1.0±0.3
			Gross Beta		2.2±0.2
			Tritium	0.04±0.06	
			Gamma Spec.		
			Cesium-137		0.23±0.09
B-	Southeast end of Site. Under Santa Fe Bridge % Moisture=34.9	10/4/78 @13:20 pm	Gross Alpha		0.6±0.1
			Gross Beta		2.8±0.1
			Tritium	0.04±0.12	
			Gamma Spec.		*
			Beryllium-7		1.4±0.9
F-	#4 East Side of Site East of Shaft & Hoist House on East Side of M.O.P. % Moisture=33.8	10/4/78 @13:26 pm	Gross Alpha		1.1±0.3
			Gross Beta		2.2±0.1
			Tritium	0.15±0.13	
			Gamma Spec.		*
M-	#8 South of Lyons American Rd. Bridge % Moisture=56.4	10/4/78 @14:10 pm	Gross Alpha		0.6±0.1
			Gross Beta		3.7±0.1
			Tritium	< 0.19	
			Gamma Spec.		*
			Cesium-137		0.15±0.17

* NOTE: Gamma Spectroscopy also identified Natural Radionuclides from the Uranium (4n+2) and/or Thorium (4n) Series.

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REPORT
ANALYS

10/12/78 | CUSTOMER ORDER NUMBER

ANALYSIS Vegetation Analysis

Sample Identification	Date Collected	Analysis	pCi/g (wet)	pCi/g (dry)
#7 2nd St.		Gross Alpha		3.5±0.9
G - Bridge City of Lyons		Gross Beta		4.2±0.2
% Moisture=43.3		Tritium	0.08±0.15	
		Gamma Spec.		*
		Beryllium-7		2.6±0.6
Southend of Site.	10/4/78	Gross Alpha		6.4±0.2
C - Next to Santa Fe	@13:07 pm	Gross Beta		2.8±0.1
R.R. Tracks #2		Tritium	< 0.01	
% Moisture=22.6		Gamma Spec.		*
		Cesium-137		0.37±0.20

* NOTE: Gamma Spectroscopy also identified Natural Radionuclides from the Uranium (4n+2) and/or Thorium (4n) Series.

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Jim Harvey
811107

REPORT
ANALYS

CUSTOMER ORDER NUMBER

Soil Analysis

Sample Identification	Date Collected	Analysis	pCi/g (wet)	pCi/g (dry)
2nd St. Bridge City of Lyons #7	10/4/78 @13:58	Gross Alpha		6.9±0.8
		Gross Beta		1.8±0.1
		Tritium	**	
		Gamma Spec. Cesium-137		* 0.30±0.04
South end of Site next to Santa Fe R.R. Tracks #2 % Moisture=18.6	10/4/78 @13:07 pm	Gross Alpha		7.1±0.8
		Gross Beta		2.1±0.1
		Tritium	0.02±0.06	
		Gamma Spec. Cesium-137		* 0.63±0.06

** NOTE: Sample lost in Lab accident

* NOTE: Gamma Spectroscopy also identified Natural Radionuclides from the Uranium (4n+2) and/or Thorium (4n) Series.

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Southwest Nuclear, Co.
9066 A Commerce Circle
Pleasanton, CA 94511
Jim Harvey
812131

REPORT OF ANALYSIS

DATE REPORTED 11/27/78 | CUSTOMER ORDER NUMBER

TYPE OF ANALYSIS Soil Analysis - Collected 11/11/78; @4:30 pm

	Sample Identification	Analysis		pCi/g (Dry)
G	2nd St. Bridge Salt Creek	Gross Alpha		6.5±0.8
		Gross Beta		1.7±0.1
		Tritium	<	0.1
		Cesium-137		0.45±0.04
		Gamma Spec.:		
		Radium-226		2.43±0.26
		Lead-214		1.26±0.09
		Bismuth-214		1.07±0.11
		Lead-212		1.59±0.06
		Thallium-208		0.52±0.05
		Actinium-228		1.44±0.23
		Zirconium-95		0.02±0.02
		Niobium-95		0.06±0.02
		K-40		27.5±2.7

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JAN 11 1979

APPROVED BY Bud Summers

Bud Summers, Environmental Sciences Mgr.
12/29/78 PAGE 1 OF 1 PAGE

Controls for Environmental Pollution, Inc.

Question 28

Effluent monitoring will be accomplished by work-day operations of beta-gamma radioactive air monitoring system (Eberline AMS-2 with RAP-1 air pump or equivalent) equipped with a pancake GM detector with less than 2 mg/cm^2 window. Filters will be mechanical such as HV-70 and charcoal effluent filters. Air sampling location will be in the air stream adjacent to the exhaust duct (either at main shaft or escape shaft).

Air sampling rate will be at one CFM or greater. Alarm trip point will be set at 10 times equilibrium background countrate or 1000 cpm whichever is smaller. Eberline reports a background equilibrium countrate of 500 cpm in Santa Fe, New Mexico with a 30 cpm background countrate without the air pump operating. They also report a countrate increase of from 200 to 300 cpm each minute of air pump operation at one CFM in an air concentration of 10^{-8} uCi/ml particulate. (See attached spec sheet).

AMS-2 filters will be routinely exchanged (probably daily). Used filters will be assayed for gross beta-gamma activity and for tritium by the Eberline Tritium Probe TP-1 operated with an Eberline PAC-4G or equivalent assay system. (We are also investigating the Whitlock Tritium Meter as per attached brochure.)

In case of "true" airborne contamination as witnessed by the recorder record and/or alarm, filters will be immediately exchanged and air concentrations determined by assay. If the air activity proves to be transient, the source of activity will be determined and corrections made if possible. If the air activity appears to be chronic and the concentration exceeds 1000 times limits of Appendix A, Table II, air ventilation to the tunnels will be stopped, source of air activity will be determined and corrections made before restarting ventilation air pumps. "Grab" air samplers such as the Eberline RAS-1 or equivalent will be used to determine local air activity and "tract" sources of air activity.

SECTION I
GENERAL

A. PURPOSE AND DESCRIPTION

The Model AMS-3 is a versatile instrument designed for the detection and measurement of beta emitting airborne particulate matter. It consists of a lead shielded filter paper and detector, and a four decade count rate meter and recorder. An alarm indication is given by a red rotating beacon and a bell. Relay contacts are provided for remote alarm indication. A second detector provides for subtraction of gamma background.

B. SPECIFICATIONS

1. Detectors: Pancake-type geiger tube, 1-3/4 inch (4.44 cm) diameter, 1.4-2.0 mg/cm^2 thick mica window.
2. Shield: Equivalent to 2 inches (5.1 cm) of lead.
3. Filter Paper: 47mm diameter. A box of 50 Hollingsworth & Vose Type LB5211 is supplied. Other types are equally suitable.
4. Readout: Combination meter and strip-chart recorder. Chart width 60mm.
5. Range: Four decade logarithmic scale; 10-100k CPM.
6. Counting Efficiency: Approximate efficiencies for 47mm diameter standard plated sources listed below.
   ^{99}Tc - 25% of 2π
   ^{90}Sr-^{90}Y - 50% of 2π
7. Ambient Gamma Response: Approximately 200 CPM per mR hr of ^{60}Co. The subtraction circuit can compensate for ambient gamma under normal conditions.
8. Natural Background Response: The natural background is caused by radon and/or thoron daughters which vary considerably with location and weather conditions. In Santa Fe, New Mexico the equilibrium background does not normally exceed 500 CPM with 60 LPM air flow. With air flow off and a clean filter in place, the background is approximately 30 CPM.
9. Linearity: Within ±10% of reading.
10. Response Time: Varies with count rate to provide constant statistical fluctuation.
11. Alarm Point: Adjustable over full instrument range.
12. Alarm Indication: Red rotating beacon and bell plus SPDT relay contacts for remote indicators. Relay contacts are rated for 3A at 30 VDC or 115 VAC.
13. Air Flow Meter: 10-100 liters per minute.
14. Temperature: The instrument is operational from 20°F to 120°F (-7°C to 49°C). See Figure 1-2.
15. Recorder and Meter: Simpson strip chart with internal on-off switch for paper drive. 2 cm per hour or 12 cm per hour selectable chart speed.
16. Power: 115/230 VAC ±10%, 60 Hz at approximately 0.3 A.
17. Weight: Approximately 160 pounds (72.6 kg).
18. Dimensions: 11 inches high x 25-1/2 inches wide x 18-1/4 inches deep (28 x 65 x 46.4 cm). Dimensions given are maximum overall, including beacon and handles.

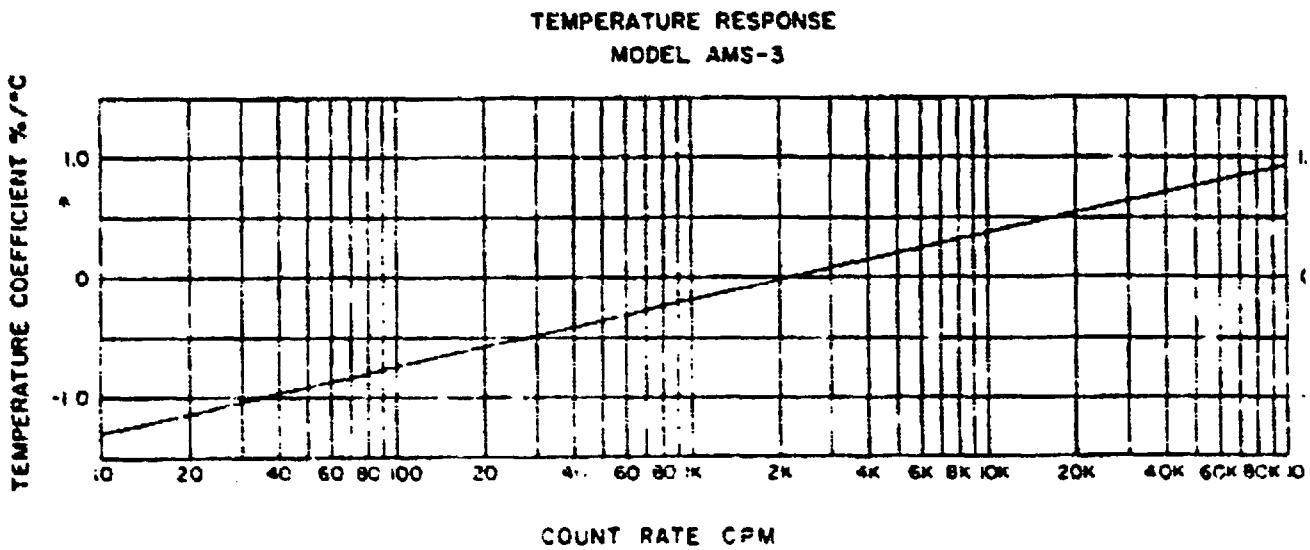
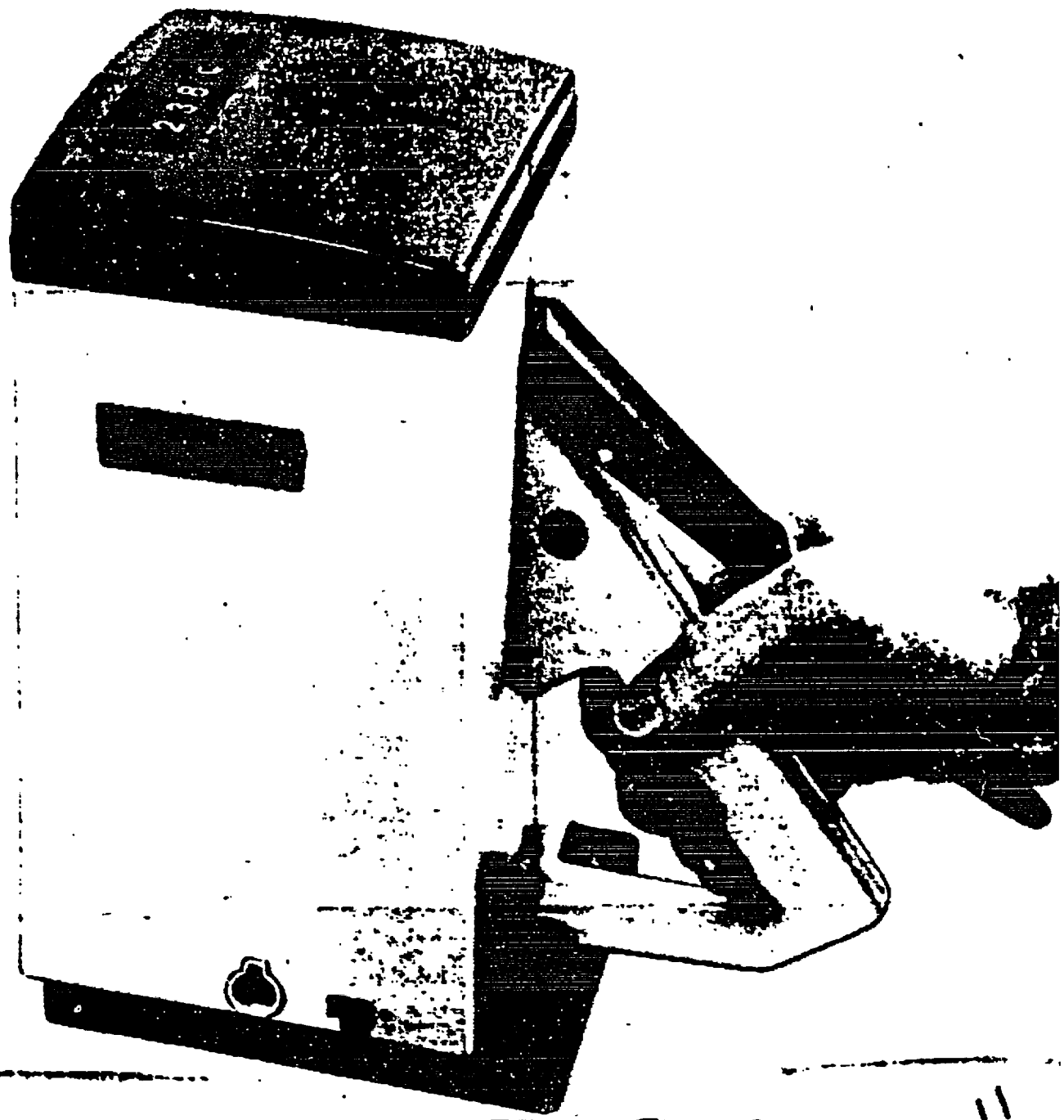


Figure 1-2 Temperature Characteristics, AMS-3



POOR ORIGINAL

WHITLOCK TRITIUM METER

16

THE WHITLOCK TRITIUM METER FOR RADIOLOGICAL PROTECTION

MEASURES

- Under controlled conditions of area, pressure, distance, time and detector efficiency for scientific assessment by the operator or his peers
- Tritium surface contamination of 10^{-4} µCi cm^{-2} in 10 seconds over 100 cm^2
- Other radioisotopes, e.g. ^{14}C, ^{35}S, ^{32}P at 10^{-4} µCi cm^{-2} in 1 second over 100 cm^2
- Smears of walls, floors, ceilings or glassware
  - in the laboratory
  - or on site
- Planchets
- Paper and activated charcoal air filter discs. With greater sensitivity than [illegible] detector
- Potentially volatile tritium fractions

FEATURES

- Large area detector of 100cm^2 (15.5 ins^2)
- Digital display of count
- Pushbutton discriminators

2 keV	–	20 keV	(isolates ^3H)
2 keV	–	infinity	(^{14}C, ^{32}P)
20 keV	–	infinity	(^{14}C, ^{32}P)
200 keV	–	infinity	(^{32}P)

- Pushbutton selection of 1 second, 10 seconds, or 100 seconds counting time
- Portable
- Easily decontaminated
- Rechargeable batteries
- Unaffected by scintillation fluorescence or chemiluminescence
- No wires or gas supply lines
- Not affected by dust particles

PRINCIPLES OF OPERATION

The instrument is placed on the surface to be measured and a [illegible] vacuum is created in the measuring chamber by releasing the lever of a simple action manually operated [illegible] pump incorporated in the instrument. External light is excluded and light photons generated by [illegible] plastic scintillator are collected by total internal reflection and viewed by two photomultipliers. [illegible] are discriminated, amplified, counted for a preset time and digitally displayed. [illegible] the vacuum and the instrument is moved to a new position on the surface. The measurement [illegible]

Only the disposable vacuum seal is in contact [illegible]

EVALUATED, PROVED AND ACCEPTED BY

Government Establishments

International Radiological Protection Organisations

Medical Research

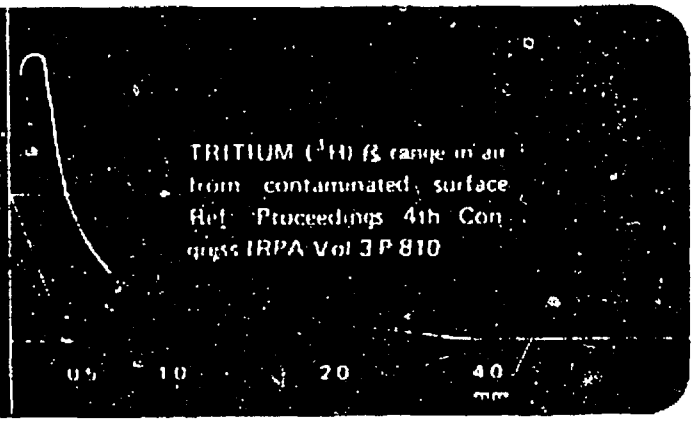
Nuclear Power

THE WHITLOCK TRITIUM METER

THE UNIQUE ANSWER TO THE TRITIUM MEASUREMENT PROBLEM (AND THE MEASUREMENT OF OTHER ISOTOPES NOT SO MUCH OF A PROBLEM) MAKES A SAMPLE OF THE BENCH PART OF THE MEASURING CHAMBER

TRITIUM SURFACE CONTAMINATION CHARACTERISTICS

1. Mean Range $^3H\beta$ in air 0.5 mm
2. Max. range $^3H\beta$ in material of unit density 8 microns
3. Volatile?



TRITIUM (^3H) β range in air from contaminated surface
Ref: Proceedings 4th Congress IRPA Vol 3 P 810

1. The mean range in air of beta particles emitted from tritium surface contamination on a smooth laboratory bench is 0.5 mm (20 thou. inch)

   Variations in distance of ± 0.025 mm (1 thou. inch) about the mean, cause a ± 5% variation in the number of particles available for detection

   Control of distance to this accuracy can only be accomplished by contact with the surface resulting in the transfer of contamination

   The design of the Whitlock Tritium Meter ensures that the detector is within the range of a significant number of particles.

   The Whitlock Tritium Meter is equipped to gauge the distance of its detector from the surface to an accuracy of ± 0.025 mm (1 thou. inch)

   The distance gauge protects the Whitlock Tritium Meter from contamination and is disposable.

2. B_R is the maximum range of ^3H betas in a material of unit density so sub-visual scratches are potentially infinitely thick sources

   Smears and wipes can miss even deep scratches and lead to false negative measurements

   Smooth surfaces become [illegible]

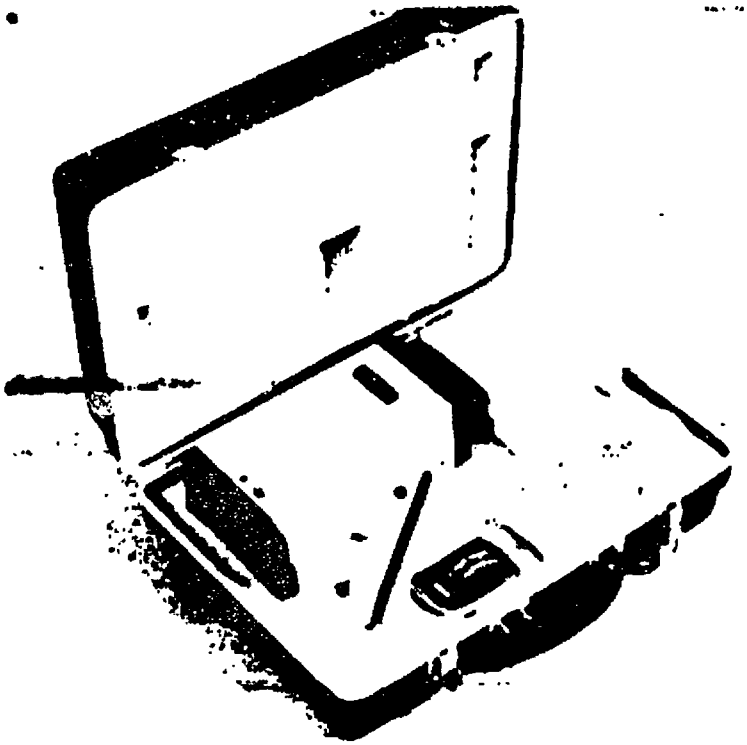
   Sophisticated detail incorporate in the disposable gauge of the Whitlock Tritium Meter enable it to accommodate scratches up to 0.125 mm (5 thou. inch) deep

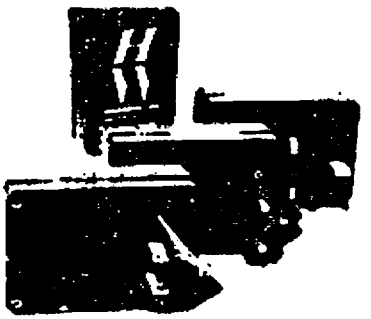
   Direct measurements made with the Whitlock Tritium Meter [illegible] the presence of contamination

   Direct measurements after decontamination [illegible] the integration of the bench surface and [illegible] for the continued dispensing of [illegible]

3. The presence of [illegible] should be established [illegible] consideration [illegible]

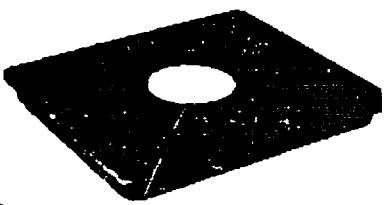
   Chemically volatile fractions will be retained under the influence of the half atmosphere pressure applied by the Whitlock Tritium Meter. Repeat measurements provide information on which estimates of the volatile fraction can be [illegible]





Chargers to suit laboratories in world wide locations

Lens Cap with smear test recess Cat. No. 4012



Transit Case embodying advanced principles of packing technology to withstand the rigours of Air Cargo shipment motor vehicle transport and 'on site' handling.

Smears and Record Sheets

SPECIFICATION

SENSITIVITY
10^{-4} μ Ci per cm^2 of TRITIUM. Surface contamination, integrated over an area of 100 cm^2, can be measured on a smooth, impervious and opaque working surface = Maximum permissable level. (1 MPL approximately equivalent to 3.7 disintegrations/sec/cm^2, 222 DPM/cm^2)

DISPLAY SCALER
4 Decades digital display with 8 mm high easily read numerals. Leading zeros suppressed.

FUNCTION
1. Numerical display of counts accumulated in the selected measurement time. Displayed for a further 3 seconds after the end of measurement time.
2. Display of MINUS SIGNS—if scaler overflows or the measurement is erroneous, on loss of vacuum and H.V.
3. Flashing display of MINUS SIGNS if batteries need re-charging.
4. Decimal points flashing when instrument switched "ON" Continuously illuminated at end of Experiment.

SWITCH MODEL 4000
POSITION
1. Charge batteries. Instrument switched OFF.
2. "ON" 1 sec. count: automatic.
3. "ON" 10 secs. count: automatic.

SWITCH MODEL 5000
POSITION
1. Charge batteries. Instrument switched OFF.
2. "ON".

PUSH BUTTON
Count recall. Display contents of scaler for as long as button depressed and for 3 secs. after release.

RESET/START
Automatic operations on squeeze and release of vacuum lever.

SAFEGUARDS
1. Automatically switches off High Voltage on loss of vacuum.
2. Automatically switches off High Voltage when measuring chamber exposed to unacceptable light level for measurement.

POWER SUPPLY
Rechargeable Nickel Cadmium batteries with a duty cycle rating of 5 hours.
Recharge time 24 hours from a fully discharged state.

BATTERY CHARGER type
Suitable for use on 120/240 Volts + 15% — 20% 50-60 Hz supply by switch selection. Using this charger the instrument can be left on charge indefinitely without serious risk of damage. Fitted with plug to suit U.S.A., Europe or U.K. as specified.

DISPOSABLE VACUUM SEAL
Fitted to the base of the instrument before each area survey and disposed of as active waste at the end of the survey.

DIMENSIONS
240 mm High x 138 mm Wide x 126 mm Deep (excluding the handle and vacuum lever which extend 96 mm from the front of the case).

WEIGHT
3.2 Kilogrammes (7 lbs. approx.)

SERVICE
The design rating of the instrument is 100,000 operations per annum. Should the instrument fail to operate it should be returned to this office in its specially designed transit case. Service during the guarantee period will be carried out free of charge for labour and materials.

ADDITIONAL FEATURES in Model 5000
1. Cat. 4050.
   Low level discriminator with switched settings of zero, K.e.V. and 200 K.e.V. nominal.
2. Cat. 4067.
   Additional preset experimental time of 100 seconds.

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
This publication does not imply any authority or licence for utilisation of any patented feature.

MARKETING GROUP
TLX

Hughes Whitlock Lt
Wells House, Pixiefields Este
Cradley Malvern
Worcs WR13 5ND England

Question 29

Regarding procedures for assurance of materials that have salt dissolving capabilities.

As each shipment of radioactive material is received, each container will be checked for radioactivity and the physical state of the waste material noted.

Containers discovered to contain other than solid wastes (Liquid) will be rejected and placed to one side and the shipper/customer contacted to determine disposition of the material.

No liquids known to have salt dissolving capabilities or have container corrosive properties will be accepted for storage.

Volatile materials will not be accepted for storage.

Question 30

The abandoned Carey Mine at Lyons, Kansas is a well isolated area. There is some scattered housing directly to the west of the mine entrance; however, this is limited. To the east and north is farmland with the closest dwellings well over a mile away. The dearth of occupied dwellings in the north and east of the mine took on added significance when we found, by checking with the local airport, that the prevailing wind direction in this area is from south or southwest to north, northeast. If an accident involving an air release of radioactivity were to occur, the prevailing wind currents would carry the release away from any of the populated areas.

The area directly southwest of the mine mouth is owned by the Rice County Economic Development Corp. It is a 17 acre proposed industrial park. However, the entire 17 acre tract is vacant at this time. Directly south of the proposed storage site is another 17 acre tract owned by the Lyons Chamber of Commerce. This piece of property is very rolling and is even unsuitable for farming. There are neither roads nor utilities into the tract and the chance of any development occurring is negligible.

The portion of the city lying directly southeast of the site -- the northern portion of the Grandview addition -- is undeveloped. For example, there are no homes or businesses in about a 20 acre area southeast of the proposed Rickano property immediately across the railroad tracks. In fact, this area is also not served by streets or utilities. Once again, the possibility of development occurring in this area at some later date is remote as this area is surrounded by deteriorating residential property.

There are no occupied dwellings or business places within a 1,000 foot radius of the mine entrance. In an area of 1,000 to 1,500 radius of the mine mouth, there are six dwelling units, one church and a pallet mill, employing four people... all directly west of the mine site. If the radius from the mine entrance is extended to a 2,000 foot radius, three additional dwellings are encompassed -- two to the west of the site and one to the southeast.

Question 31

There are a variety of safeguards that can be established to insure that drilling activities do not breach the integrity of the mine. Prior to commencing storage in the mine, Rickano will negotiate leases of the salt strata in perpetuity with the surface owners. These leases will be duly recorded with the Registrar of Deeds in Rice County to insure that they will be included in any title searches undertaken by drillers in the future. Permission of the salt strata leaseholder will have to be obtained before that strata can be breached. When the leases are obtained, the leasehold will include a buffer zone of unmined area in addition to the area directly over the cavity. Copies of these leases and an accompanying surface map with said leases plotted will be forwarded to the Department of Health and Environment for their files.

In addition, Rickano will subscribe to the Daily Intents of Drill Service (sample attached) and keep a record of all Intents to Drill titled in sections 13 through 36, inclusive, in Harrison Township, Rice County, Kansas, and sections 1 through 18, inclusive, in Atlanta Township, Rice County, Kansas. Rickano will have prior notice and a record of any drilling plans within approximately three miles of the existing mine.

If Intent to Drill is filed in an area of the mine that Rickano has been unable to lease or within the buffer zone around the mine, the following action will be taken:

A request for a hearing will be filed with the proper regulatory agency with a request for drilling regulations. If the drilling were to be undertaken over an area of the mine Rickano had been unable to lease, we would insist that the driller position his drilling effort so as to pass through a pillar instead of a cavity. In addition, whether drilling through the pillar or in the buffer zone, we would request that the conductor string be extended past the water zone and that the salt strata be air drilled with a secondary string put in place.

We would also request that any slant drilling taking place within the area be limited to a 3% deviation and that deviation shall by-pass the mine by a distance of not less than 100 feet.

There is legal precedent for prescribing specific drilling procedures in Rice County as a result of drilling

operations undertaken adjacent to and on American Salt leases.

According to our consulting geologists, current sophisticated drilling techniques and existing regulatory bodies can assure that the Rickano storage area would not be breached by oil and gas exploration or water well drilling.

Question 31 requests Rickano to indicate the land owners in the mine area. Enclosed are tract ownership reports, compiled by the Rice County Abstract & Title Company, Inc., providing data on those properties comprising the surface area of approximately 94% of the total mine area. When lease negotiations are undertaken, this same definitive data will be accumulated on the small miscellaneous owners that make up the balance of the surface ownership. At the present time, we are using tax roll data to determine surface ownership.

Charles Hughes - 3.7 acres south of main and east of AT&SF right of way

Charles Alderman - Remainder of southeast quarter, Section 3, Atlanta Township except for 35 acres owned by the City of Lyons

AT&SF - Lots 1 & 2, Block 1, Grandview addition and lots 2,3, & 4, Block 11, Grandview addition

Rosa Belote - Lots 3,4, & 5, Block 1, Grandview addition

Eugene Hunter - Lots 6 & 7, Block 1, Grandview addition

Benjamin Belote - Lots 8 through 15, inclusive, Block 1, Grandview addition

Ray Vaugh - Lots 16, 17, 18, 19, 20, Block 1, Grandview addition

Walter Sehl - Lots 21, 22, 23, Block 1, Grandview addition

Alvin Pross - Lots 5,6,7,8, Block 10, Grandview addition

Alfred Welch - Lots 13, 14, 15, Block 10, Grandview addition

Question 31 Cont'd.

C.D. Wagoner d/b/a Wagoner Nursery - Lots 1 through 16 and Lots 28 through 45, Block 16, Grandview Extension and Lots 1 through 18 and Lots 23 through 45, Block 19, Grandview Extension

As to mineral rights, Carey Salt, through its preuessor owns the salt rights to the entire mine and a substantial buffer zone surrounding the mined out area. These leases were executed in 1890 for 90 years.....expiring in 1989. Rickano's purchase agreement with Carey includes all of these existing leases; which we will convert to storage leases in perpetuity.

STATE CORPORATION COMMISSION

STATE OF KANSAS

CONSERVATION DIVISION

(OIL, GAS & WATER)

KANSAS

PRODUCTIVITY & NOTICE OF INTENT TO DRILL

August 1979

J. LEWIS BROCK - ADMINISTRATOR

August, 1979 — PRODUCTIVITY

BARTON COUNTY
C & Drlg. Co., #4 [illegible], [illegible], Sec. 30-20S-14W, [illegible] Field, pipe set 3533', perfs. open hole, pumped 24 hrs., prody. 40 bbls., no water, Gr. 35, Arb.

Graham-Michaelis, #1-4 [illegible], 300'FNL 330'FEL NE, Sec. 4-17S-13W, [illegible] Field, pipe set 3300', perfs. 3472-77', pumped 24 hrs., prody. 8 bbls., no water, Gr. 34, L.C.

Petroleum Energy, Inc., #1 [illegible], C [illegible], Sec. 24-16S-11W, [illegible] Field, pipe set 3220', perfs. 3128-34', pumped 24 hrs., prody. 83 bbls., trace water, Gr. 42.4, Lansing

CLARK COUNTY
Imperial Oil Co., #2-13 [illegible], C [illegible], Sec. 13-34S-21W, [illegible] Field, pipe set 5254', perfs. 5150-60', pumped 24 hrs., prody. 7 bbls., 30% water, Gr. 36, Cherokee

Imperial Oil Co., #1-17 [illegible], C [illegible], Sec. 17-31S-21W, Lexington Field, pipe set 5390', perfs. 5327-38', pumped 8 hrs., prody. 293 bbls., 10% water, Gr. 38.8, Morrow

DECATUR COUNTY
Marlin Drlg. Co., #1 [illegible], 150'S of [illegible], Sec. 30-3S-30W, Pool (Unnamed), pipe set 4000', perfs. 3837-40', pumped 24 hrs., prody. 73 bbls., 1% water, Gr. 36, K.C.

[illegible] Drlg. Co., #2 [illegible], C [illegible], Sec. 14-2S-30W, [illegible] Field, pipe set 3800', perfs. 3676.5-80.5', pumped 24 hrs., prody. 10 bbls., 17% water, Gr. 36, K.C.

[illegible] COUNTY
Imperial Oil Co., #1-27 [illegible], C [illegible], Sec. 27-28S-17W, Pool (Unnamed), pipe set 4425', perfs. 4308-09', pumped 8 hrs., prody. 125 bbls., no water, Gr. 38, K.C.

ELLIS COUNTY
Graham-Michaelis, #1-19 [illegible], [illegible], Sec. 19-14S-19W, [illegible] Field, pipe set 3879', perfs. 3690-98', pumped 24 hrs., prody. 5 bbls., 80% water, Gr. 34, K.C.

GOVE COUNTY
Chief Drlg. Co., #2 R. [illegible], [illegible], Sec. 21-13S-30W, [illegible] Field, pipe set 4290', perfs. open hole, pumped 24 hrs., prody. 23 bbls., 17% water, Gr. 36, Miss.

GRAHAM COUNTY
Graham-Michaelis, #1 [illegible], C [illegible], Sec. 5-8S-24W, [illegible] Springs East Field, pipe set 3900', perfs. 3836-38', 3823-25' and 3704-06', pumped 24 hrs., prody. 78 bbls., 34% water, Gr. 34, Kansas City

KIOWA COUNTY
[illegible] Drlg. Inc., #1-4 [illegible], C [illegible], Sec. 28-30S-20W, [illegible] Field, pipe set 5300', perfs. 5180-70', pumped 24 hrs., prody. 85 bbls., no water, Gr. 38, Cherokee

Imperial Oil Co., #1-17 [illegible], C [illegible], Sec. 17-30S-20W, [illegible] Field, pipe set 5300', perfs. 5171-73', pumped 24 hrs., prody. 18 bbls., no water, Gr. 37.4, Cherokee

Imperial Oil Co., #1-16 [illegible], C [illegible], Sec. 16-30S-20W, [illegible] Field, pipe set 5361', perfs. 5101-05', pumped 24 hrs., prody. 13 bbls., no water, Gr. 38, Cherokee

Imperial Oil Co., #1-10 [illegible], C [illegible], Sec. 10-30S-20W, [illegible] Field, pipe set 5309', perfs. 5170-12' and 5104-08', pumped 8 hrs., prody. 108 bbls., no water, Gr. not given, Cherokee

Imperial Oil Co., #1 10 [illegible], C [illegible], Sec. 10-30S-20W, [illegible] Field, pipe set 5190', perfs. 5131-38', pumped 8 hrs., prody. 96 bbls., no water, Gr. 38, Cherokee

Imperial Oil Co., #1-19 [illegible], C [illegible], Sec. 19-30S-19W, [illegible] Field, pipe set 5178', perfs. 5100-12', pumped 8 hrs., prody. 144 bbls., no water, Gr. 38, Cherokee

Imperial Oil Co., [illegible], 330'FNL 1375'FEL NE, Sec. 13-24S-19W, Pool (Unnamed), pipe set 4800', perfs. 4558-80', pumped 24 hrs., prody. 8 bbls., 40% water, Gr. 36, Kansas City

LANE COUNTY
[illegible] Enterprises, #3 [illegible], 990'FNL 1650'FEL, S/2, Sec. 22-17S-27W, [illegible] East Field, pipe set 4524', perfs. 4198-4202' and 4400-04', pumped 24 hrs., prody. 5 bbls., 75% water, Gr. 40, Lans.-K.C.

[illegible] Corp., #1 [illegible], [illegible], Sec. 13-19S-29W, Pool (Unnamed), pipe set 4420', perfs. 4327-31', pumped 24 hrs., prody. 130 bbls., no water, Gr. 38.4, Kansas City

[illegible] Drlg. Co., #1 [illegible] "A", 330'FNL 430'FEL NE, Sec. 30-16S-30W, [illegible] East Field, pipe set 4632', perfs. 4303-08', 4400-10', 4419-27' and 4498-50', 4530-41', pumped 24 hrs., prody. 73 bbls., no water, Gr. 34, Marmaton

[illegible] Drlg. Co., #2 [illegible], 330'FNL 990'FEL NE, Sec. 4-17S-30W, [illegible] East Field, pipe set 4600', perfs. 4101-22' and 4241-44', pumped 24 hrs., prody. 7 bbls., 70% water, Gr. 35, Lans.-K.C.

[illegible] COUNTY
[illegible] Corp., #7 L. D. [illegible], 1000'FNL 2217'FEL, Sec. 30-13S-4E, [illegible] Creek Field, pipe set 3022', perfs. open hole, pumped 24 hrs., prody. 43 bbls., no water, Gr. 34, Viola

[illegible] Corp., #8 L. D. [illegible], Location (Not Given), Sec. 30-13S-4E, [illegible] Creek Field, pipe set 3000', perfs. open hole, pumped 24 hrs., prody. 125 bbls., no water, Gr. 34, Viola

[illegible] COUNTY
[illegible] Petroleum, #1 [illegible], C [illegible], Sec. 9-[illegible], [illegible] Field, pipe set 4400', perfs. 4000-15', pumped 24 hrs., prody. 30 bbls., 90% water, Gr. 37, Miss. ([illegible])

Chief Drlg. Co., #7 [illegible], C [illegible], Sec. 20-10S-23W, Arnold Southwest Field, pipe set 4000', perfs. open hole, pumped 24 hrs., prody. 70 bbls., 10% water, Gr. 37, Miss.

Chief Drlg. Co., #8 [illegible], [illegible], Sec. 20-10S-23W, Arnold Southwest Field, pipe set 4000', perfs. 4207-09' and 4000-07', pumped 24 hrs., prody. 40 bbls., 30% water, Gr. 30, Ft. Scott

[illegible] COUNTY
Graham-Michaelis, #6 [illegible], [illegible], Sec. 19-10S-15W, [illegible] East Field, pipe set 3620', perfs. 3567-70', pumped 24 hrs., prody. 49 bbls., 30% water, Gr. 30, Conglomerate Sand

PHILLIPS COUNTY
American Petroleum Co., #4-4 [illegible], 1100'FNL 1050'FEL NE, Sec. 2-4S-19W, [illegible] East Field, pipe set 3444', perfs. 3190-3204', pumped 24 hrs., prody. 12 bbls., 61% water, Gr. 34, Kansas City

American Petroleum Co., #4-5 [illegible], [illegible], Sec. 2-4S-19W, [illegible] East Field, pipe set 3400', perfs. 3301-3377', pumped 24 hrs., prody. 12 bbls., 30% water, Gr. 30, Kansas City

American Petroleum Co., #4-1 [illegible], [illegible], Sec. 35-3S-19W, [illegible] East Field, pipe set 3432', perfs. 3364-3365', pumped 24 hrs., prody. 10 bbls., 90% water, Gr. 30, Kansas City

American Petroleum Co., #4-2 [illegible], [illegible], Sec. 35-3S-19W, [illegible] East Field, pipe set 3322', perfs. open hole, pumped 24 hrs., prody. 4 bbls., no water, Gr. 34, Kansas City

RAWLINS COUNTY
[illegible] Drlg. Co., #1 Location, C [illegible], Sec. 31-3S-34W, [illegible] Field, pipe set 4720', perfs. 4490-96', pumped 24 hrs., prody. 120 bbls., trace water, Gr. 30, [illegible]

ROOKS COUNTY
[illegible], #3 [illegible], [illegible], Sec. 20-8S-17W, [illegible] North Field, pipe set 3400', perfs. 3100-7[illegible], 3177-80' and 3223-27', pumped 24 hrs., prody. 40 bbls., trace water, Gr. 40, Kansas City

[illegible] COUNTY
Chief Drlg. Co., #1 [illegible], [illegible], Sec. 3-20S-2W, [illegible] Field, pipe set 3000', perfs. [illegible]

STAFFORD COUNTY
[illegible]

TREGO COUNTY
[illegible]

WABAUNSEE COUNTY
[illegible]

1687 048

POOR ORIGINAL

[illegible] NOTICE OF INTENTION TO DRILL Monday

[illegible]

N & A Ent. & Reed Oil Co., Box 48, Chanute, KS, E/2 NE/4, (J.R. Burris Drlg.) Rotary, [illegible], Alt. 2, on the following wells:
[illegible]-22,21[illegible] 6 George Nelson, 600' FEL 2130' FNL Sec. 3-26S-21E, S.P. 50', 4-4-79
[illegible]-22,218 2 [illegible], 165' FNL 500' FEL Sec. 32-26S-21E, S.P. 60', 4-6-79

[illegible] Oil Co., [illegible], Iola, KS, 220' WEL 1100' SNL SE 4 NW/4 Sec. 24-[illegible], Tools Rotary, Oil, T.D. 950', S.P. 50', Alt. 2, on the following wells:
[illegible]-22,219 R-[illegible] Wille, 8-[illegible]-79
[illegible]-22,220 R-60 Wille, 8-10-79

[illegible] Oil & Gas, Inc., PO Box 62, Chanute, KS, (Jerry L. Phillips) Rotary, [illegible], Alt. 2, on the following wells:
[illegible]-22,22[illegible] [illegible], 165' FEL 500' FSL Sec. [illegible]-24S-21E NE/4, T.D. 900', 8-[illegible]
[illegible]-22,22[illegible] [illegible]nnon, 660' FNL 660' [illegible] SE/4 Sec. 22-26S-18E, T.D. [illegible]', [illegible]
[illegible]-22,22[illegible] [illegible]nnon, 990' FWL 990' FNL [illegible] SE/4 Sec. 22-26S-18E, T.D. 950', [illegible]
[illegible]-22,[illegible] [illegible] Roberts, [illegible]' FNL [illegible]' FWL Sec. 23-26S-19E, T.D. [illegible]', [illegible]
[illegible]-22,2[illegible] [illegible] Roberts, 180' FWL 880' FNL NW/4 NE/4 Sec. 23-26S-19E, T.D. 800', [illegible]
[illegible] [illegible] Roberts, 680' FNL [illegible]' FWL Sec. 23-26S-19E, T.D. 800', [illegible]

[illegible], PO Box 481, Chanute, KS, NE/4 Sec. 28-26S-21E (Plains Drlg.) Rotary, [illegible], Alt. 2, 8-6-79, on the following wells:
[illegible]-22,22[illegible] 1-W H.A. Williams, 1200' FSL 1360' FEL, Input
[illegible]-22,22[illegible] 2-W H.A. Williams, 480' FSL 1360' FEL, Input
[illegible]-22,229 5 H.A. Williams, 125' FSL 1040' FEL, Oil
[illegible]-22,2[illegible] [illegible] H.A. Williams, 575' FSL 1040' FEL, Oil
[illegible]-22,2[illegible] [illegible] H.A. Williams, 925' FSL 1040' FEL, Oil
[illegible] [illegible] H.A. Williams, 800' FSL [illegible]' [illegible], Oil

[illegible] A. Hoffman, PO Box 481, Chanute, KS, NW/4 Sec. [illegible]-26S-[illegible] Rotary, Oil, T.D. [illegible]', [illegible] 35', Alt. 2, 8-6-79, on the following wells:
[illegible]-22,2[illegible] [illegible] Nelson, 40' FSL [illegible]40' FEL
[illegible] [illegible] Nelson, 40' FSL [illegible]' FEL
[illegible] [illegible]-24 Nelson, 40' FSL 440' FEL
[illegible]-22,2[illegible] [illegible]-29 Nelson, 400' FNL 1320' FEL
[illegible]-22,237 H-30 Nelson, 400' FNL 880' FEL
[illegible]-22,238 H-31 Nelson, 400' FNL 500' FEL

BARTON COUNTY
[illegible] L.D. Davis, PO Box 32[illegible], Great Bend, KS, 1 Steinert, NW SW SW Sec. 2-[illegible] Rotary, Oil, T.D. 3500', S.P. 275', Alt. 2, 8-20-79

[illegible]
[illegible], Wichita, KS, 7A Glasscock, SE/4 NE/4 [illegible] Rotary, Oil, T.D. 2250', S.P. 60', Alt. 2, 8-[illegible]-79

[illegible] Charley Bowen, Rt. 1, Sedan, KS, 1 Casement Farm, 165' FSL 165' FEL N/2 [illegible] (Caney Valley Drlg.) Rotary, Oil, T.D. 1250', S.P. 50', Alt. 2, [illegible]

[illegible], Rt. 1, Box 261, Caney, KS, NE/4 SE/4 Sec. 12-34S-12E (Church Drlg.) Rotary, [illegible], S.P. 50', Alt. 2, on the following wells:
[illegible]-21,[illegible] 10 Thorne, 550' FEL 2000' FNL, 8-1-79
[illegible]-21,[illegible] 11 Thorne, 450' FEL 2000' FSL, 8-2-79

[illegible], PO Box [illegible], Independence, KS, NE/4 Sec. 6-32S-12E (Walter [illegible]) Rotary, Oil, T.D. [illegible]', S.P. 55', Alt. 2, 8-8-79, on the following wells:
[illegible] 1 Briggs, [illegible]' FWL 330' NSL
[illegible] 2 Briggs, 990' FWL 330' NSL
[illegible] 3 Briggs, [illegible]' FWL 630' NSL
[illegible] 4 Briggs, [illegible]' FWL [illegible]20' NSL
[illegible] 5 Briggs, [illegible]' FWL [illegible]25' NSL

[illegible]
[illegible], 205 Litwin Bldg., Wichita, KS, C-1 Weikal, C NE SE [illegible] Rotary, Oil & Gas, T.D. 5450', S.P. 400', Alt. 1, 8-[illegible]-79

[illegible] COUNTY
[illegible] Rock Rd., Wichita, KS, Se. 19-33S-7E (Edco Drlg.) Rotary, [illegible], Alt. 2, on the following wells:
[illegible], [illegible], 8-2-79
[illegible], [illegible] SE NW, 8-7-79

16~~DX~~ 11 049

...Co., Inc., 10 Box 18122, Wichita, KS, 1 Shubert, SE SE SE Sec. 12-14S-20E (Drilling Oil) Rotary, Oil, T.D. 3826', S.P. 153', Alt. 2, 8-3-79

...COUNTY
...Raine & Williamson Oil Co., Inc., 515 Page Ct., 220 W Douglas, Wichita, ... Hunter, C SW SW Sec. 28-14S-9W (Co. tools) Rotary, Oil & Gas, T.D. 3200', S.P. 240', Alt. 2, 8-4-79

...Russell Oil Co., Box 158, Wilson, KS, 5 Marie Mattas, SW SE NW Sec. 9-... (Ragan Drlg.) Rotary, Oil, T.D. 2900', S.P. 200', Alt. 2, 8-5-79

...COUNTY
...Exploration Co., Box 1723, Victoria, KS, (R-30, Inc.) Rotary, Oil & Gas, S.P. ...', Alt. 1, on the following wells:
...-20,... 1-3 S. MacKenney, SE SE Sec. 16-28S-16W, T.D. ...', 8-6-79
...-20,... 1-28 L.M. Stevens, NE NW Sec. 8-28S-19W, T.D. 4350', 8-14-79

...COUNTY
...Petroleum Co., 1128 Main, Parsons, KS, (T-J Drlg.) Rotary, Oil, T.D. ...', S.P. ...', Alt. 2, on the following wells:
...-20,... 1 J. McMillan, NW SE Sec. 1-31S-21E, 7-30-79
...-20,... 3 R. Gumsley, SW NE Sec. 16-31S-21E, 8-1-79

...COUNTY
...Oil, Inc., Mound City, KS, K-2 Mullins, 165' SNL 165' EWL NW SW/4 Sec. ... (Energy Explrtn) Rotary, Oil, T.D. 900', S.P. 70', Alt. 2, 8-6-79

...
... Natural Mineral Group, Inc., 555 ...th St., Ste. 1200, Denver, ... (... Drlg.) Rotary, Gas, T.D. ...', S.P. ..., 8-24-79

...Power Explrtn., Inc., 6611 ... Pl., Dallas, OK, #A Rash, 660' FNL ... (Power Valley Drlg.) Rotary, Oil, T.D. 700', S.P. 50', Alt. 2, ...

...COUNTY
...Hickory Creek Oil Co., 1128 Main, Parsons, KS, 1 P. Flaharty, SE SE Sec. ...-30S-21E (T-J Drlg.) Rotary, Oil, T.D. 300', S.P. 47', Alt. 2, 7-31-79

...Ramco Well Servicing, Inc., Rt. 4, Box 67, Chanute, KS, WS-1 Steeman, ... FWL 330' SNL N/2 NE/4 Sec. 2-29S-20E (J & J Drlg.) Rotary, Water, T.D. 1100', S.P. ..., Alt. 2, 8-11-79

...Co., PO Box 782, Chanute, KS, Rotary, Oil & Gas, S.P. 40', Alt. 2, on the following wells:
...-79 SWI 2 R. Greves, 320' FSL 720' FWL NE/4 Sec. 29-27S-19E (Jerry Phillips) T.D. 900', 8-14-79
...-79 1 M. Greve, 480' FNL 165' FWL NW/4 Sec. 8-27S-19E (Coffeyville ... T.D. 1000', 8-20-79
... 2 Orr, 1155' FSL 615' FEL SW/4 Sec. 20-27S-19E (Jerry Phillips) ..., 8-17-79
...-79 WSW 1 C. Watts, 100' FNL 100' FWL NE/4 Sec. 29-27S-19E (Coffeyville ... 1150', 8-1-79, Water supply
...-79 SWI 6 C. Watts, 350' FWL 760' FSL NE/4 NW/4 Sec. 29-27S-19E (F & P Drlg.) T.D. 800', 8-2-79, Water supply
...-79 SWI 7 C. Watts, 990' FWL 990' FSL NE/4 NW/4 Sec. 29-27S-19E (Jerry Phillips) T.D. 900', 8-3-79

...COUNTY
...-79 Price-Dombaugh Pet. & Martin Explrtn., 502 Union Ctr., Wichita, KS, 1 Coleman-Krune, NW SE NW Sec. 7-9S-17W (Pioneer Drlg.) Rotary, Oil, T.D. 3550', S.P. 200', Alt. 2, 8-10-79

RUSSELL COUNTY
...-79 Aylward Drlg. Co., 909 1st Nat'l Bank Bldg., Wichita, KS, 4 Krug, SE NW NW Sec. 26-14S-14W (Unknown) Rotary, Oil, T.D. 3200', S.P. 750', Alt. 1, 8-6-79

... & J Oil Co., Steckel, 609 E 2nd, Russell, KS, 1(Washdown) Steckel, NE SW Sec. 18-12S-14W (Raine & Williamson) Rotary, Oil & Gas, T.D. 2968', S.P. 641', Alt. 2, 8-3-79

[illegible] County
Mobil Oil Corp., Box 5444, Denver, CO, (Earl F. Wakefield, Inc.) Rotary, Gas, T.D. 3100', Alt. 1, on the following wells:
15-189-20,468 [illegible] Unit, C SW/4 Sec. 29-34S-37W, S.P. 745', 8-17-79
15-189-20,469 1 [illegible] Burrows Unit, C SE/4 Sec. 1-35S-38W, S.P. 720', 8-24-79
15-189-20,470 2 Hamilton #1 Farm, C NW/4 Sec. 15-35S-38W, S.P. 695', 8-[illegible]-79

WILSON COUNTY
15-205-20,608 James L. Cheever, Rt. 1, Severy, KS, 13 Keith, 990' SNL 300' WEL Sec. 1--28S-15E (Caney Valley Drlg.) Rotary, Oil, T.D. 1100', S.P. 25', Alt. 2, 8-7-79

WOODSON COUNTY
15-207-21,629 John & David W. Evans, Lebo, KS, 4 Merritt, 880' FEL 900' FSL Sec. 22-21S-14E (Kilby Drlg.) Rotary, Oil, T.D. 1750', S.P. 40', Alt. 2, 8-1-79

WYANDOTTE COUNTY
15-209-20,014 Alan C. Hancock, 10111 Leavenworth Rd., Kansas City, KS, 1 Hancock, SW/4 NW/4 SE/4 Sec. 35-10S-23E (A.G. Glaze Drlg.) Cable Tool, Gas, T.D. 600', S.P. 200', Alt. 2, 8-6-79

CORRECTIONS

CHASE COUNTY - Township
15-017-20,138 Cascade Oil Co., 1022 N Main, El Dorado, KS, 1 Menno Harder, 990' FWL 330' FSL SE 4 Sec. 6-19S-6E (Zinn Drlg.) Rotary, Oil & Gas, T.D. 500', S.P. 120', Alt. 2, [illegible]-79

SUMNER COUNTY - Section
15-191-20,941 Rains & Williamson Oil Co., Inc., 435 Page Ct., 220 W Douglas, Wichita, KS, 1 Heaty, NE NW NE Sec. 22-32S-2W (Co. Tools) Rotary, Oil & Gas, T.D. 4300', S.P. 200', Alt. 2, 7-31-79

Question 32

We propose to accumulate sufficient funds to accomplish the above by paying into the State of Kansas perpetual care fund $.25/cu.ft. payable annually for thos materials placed in the mine. This would amount to $6,250,000 for the 25,000,000 cu.ft. previously estimated would fill the mine.

End Of	Estimated Waste Rec. In Cu.Ft.	Annual Payment	Accumulated Total
1st Year	200,000	50,000	50,000
2nd Year	200,000	50,000	100,000
3rd Year	200,000	50,000	150,000
4th Year	200,000	50,000	200,000
5th Year	200,000	50,000	250,000
6th Year	200,000	50,000	300,000
7th Year	200,000	50,000	350,000
8th Year	200,000	50,000	400,000
9th Year	200,000	50,000	450,000
10th Year	200,000	50,000	500,000
20th Year	3,000,000	750,000	1,250,000
30th Year	4,000,000	1,000,000	2,250,000
40th Year	6,000,000	1,500,000	3,750,000
50th Year	10,000,000	2,500,000	6,250,000

Question 33

Concerning your notation regarding Chromium 151 in our retrievable storage report, we acknowledge the typographical error and have changed our copy to now read Chromium 51. Thank you for noting this typo.

Question 34

Concerning the storage of scintillation vials, Rickano has developed a system whereby these vials are processed at other locations in such a way as to separate the absorbent material into one drum, the tuolene into another drum, and the crushed empty vials and caps into a third drum.

The absorbent material and the empty crushed vials and caps will be stored in the mine, but the tuolene will be sent elsewhere for processing and/or disposal. Although the crushed vials and caps may contain some residual amount of tuolene, it is expected to be quite minimal and not create a hazardous aromatic hydrocarbon toxicity condition.

We therefore contend that this storage will be compatible with other long-term storage of the other radioactive material.

We will therefore ask that the section concerning storage of vials containing tuolene be omitted or removed in our report entitled GEOTECHNICAL STUDIES & RADIOACTIVE WASTE MANAGEMENT PLAN FOR LOW LEVEL RETRIEVABLE STORAGE FACILITY, LYONS, KANSAS, pp. 65, under subtitle G, description of wastes to be received and stored; physical state of wastes.

Question 35

In the truck decontamination area and loading dock area, drain and trap systems will be installed such as is used in the gasoline service stations. The material in these traps will be sampled and surveyed for contamination on a daily basis. If the liquid is contaminated, it will be solidified and handled as hazardous waste. Otherwise, we will contract with a licensed waste oil handler that services the traps at the local gas stations and car washes to collect and dispose of the trap material.

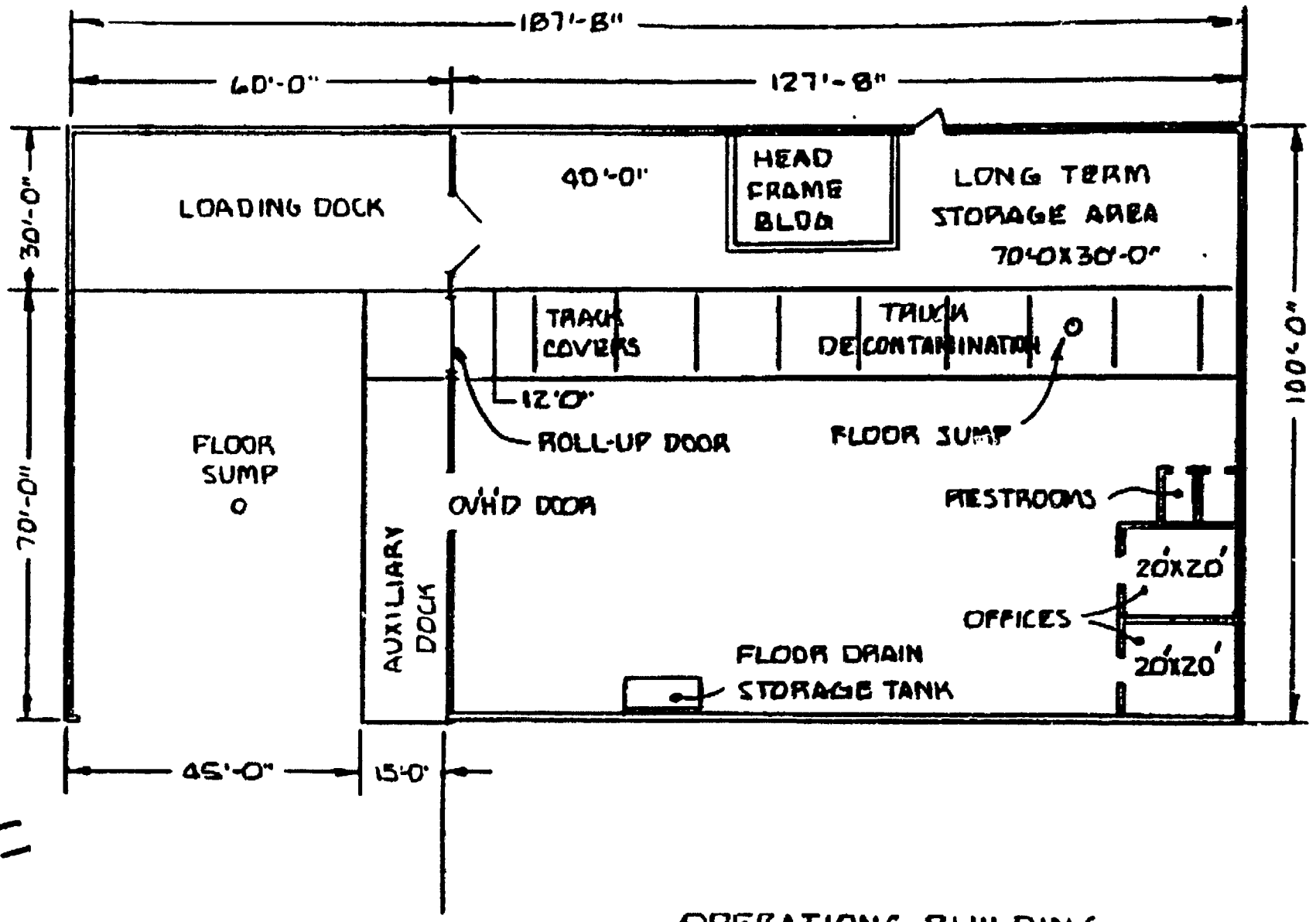
Question 36

Regarding the above ground long term storage area wherein we previously asked for a 6 month storage permit for radioactive waste materials, we would like to submit the following:

1. We would like to reduce the time to 90 days and redesignate this as temporary rather than long term storage area. We feel this should be adequate time to trans-ship radioactive waste containers not destined for mine storage.

2. We have designated an area in the Operations Building (see attached sketch) as the temporary 90 day storage area. This area will be approximately 500 sq. ft. in area.

3. In the unlikely event of dose rate problems, supplemental shielding will be provided in the form of concrete blocks or metal sheets.



OPERATIONS BUILDING

Question 37

In addition to the closed circuit TV, a voice communications system will be installed. When the phone service is installed, there will be two telephones in the mine; one at the bottom of the shaft and one in the office area in the mine. These will be standard telephone equipment providing voice communication with the above ground facility and access to outside line. The Hutchinson office assures us that installation of this underground service is no problem as their service department has installed and services telephone communications in the Carey Mine in Hutchinson.

In addition, intercom services will be installed in the mine, with stationary units at the bottom of the shaft and the underground offices and mobile units on each mini-truck and at the storage cavern.

The above to be done just prior to issuance of the license.

Question 38

It is our desire to store the waste containers in as safe of a configuration as possible and have chosen not to use pallets for the following reasons:

1. Sisalcraft paper placed on the floor and walls will provide an effective barrier between the containers and the salt formation although we are convinced that very little corrosion would result if they did come in contact.

2. Storage considerations hold a high priority and we felt that the pallets would take up considerable space considering the large amount required that could better be utilized as storage space for waste containers.

We have omitted shelving due to added increased costs and consumption of extra space. We further are of the opinion that little would be gained since paper containers that may crush if heavier containers were placed on top are being phased out as D.O.T. approved containers.

Also, our operational procedures prohibit placing the fragile containers on the bottom of the stack, but require that they be placed on the top of the stack to prohibit crushing or damage.

Since the shelving would most likely be constructed of wood as would also the pallets, we further felt that in the unlikely event of a mine fire the less exposed combustible material we have the better.

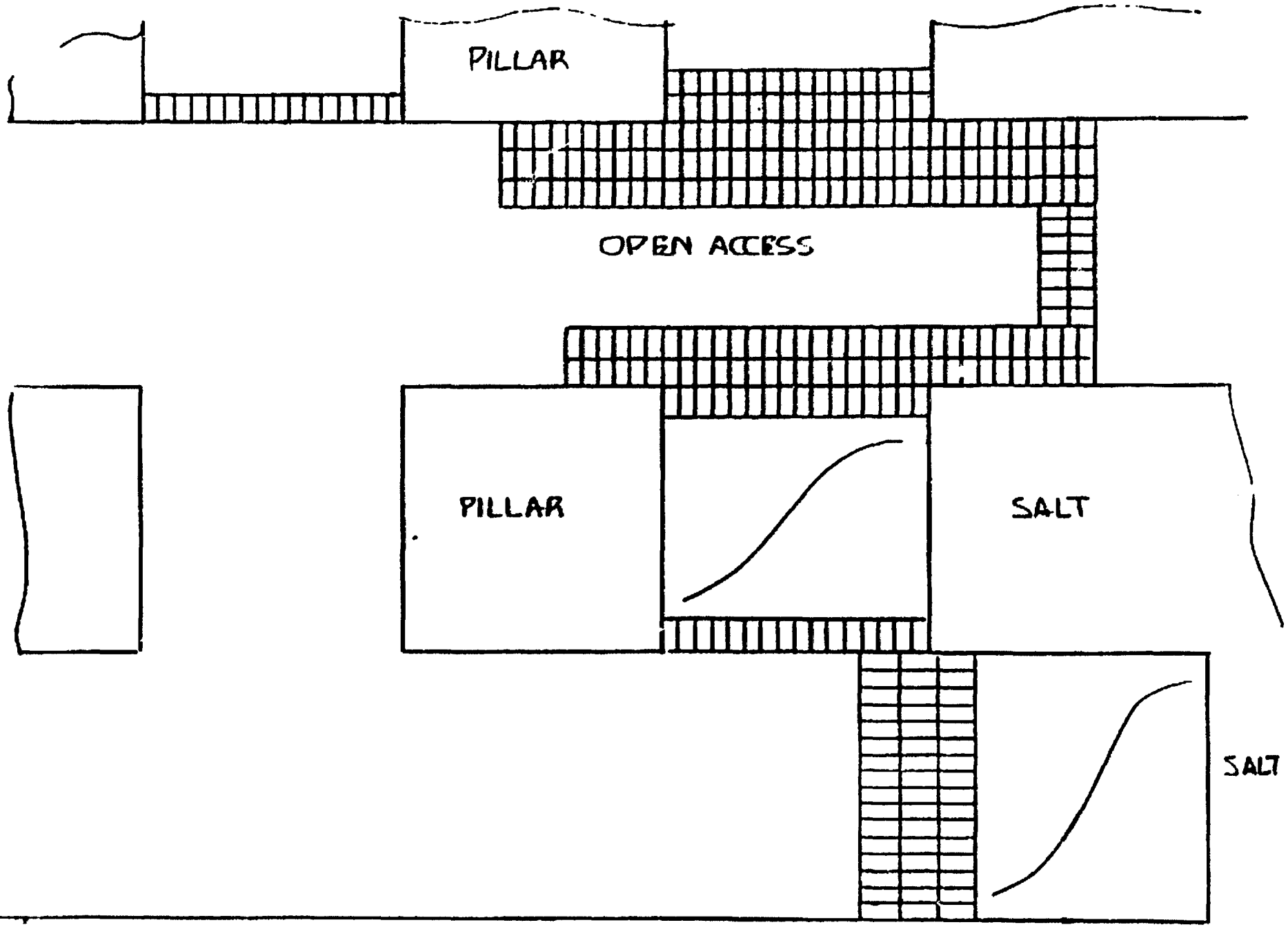
It is our desire to stack the drums in a horizontal position using the side walls of the cells or pillars as end barriers, with either the top or bottoms of the drums facing out.

This type of stacking is more secure and steady. Also, not all drums are the same height, due to the use of properly reconditioned drums by many generators of radioactive waste in the industry. This would cause uneven stacking.

In the unlikely event that a waste container ruptured during stacking and spilled onto the floor or onto other drums and then on the floor, we felt that cleanup and decontamination operations would be enhanced by already having the area covered.

Question 39

Concerning the incorporation of an access to the filled storage cells, we have re-evaluated our procedures and have decided to treat the whole mine as one large storage cell. We will stack the containers in such a manner that, for the most part, they will be available for visual inspection. This will be accomplished by providing access passageways between the containers as required for inspection of monitoring and data collection. (See attached sketch)



Question 40

Portable equipment used for tritium monitoring will consist of the Eberline PAC-4G with TP-1 tritium probe or equivalent. As we mentioned in our answer to Question 28, we are looking at a Whitlock Tritium Meter for these purposes. A brochure of the Whitlock Tritium Meter is attached to Question 28. Your comments on this instrument as relates to the work at the Lyons Facility will be appreciated.

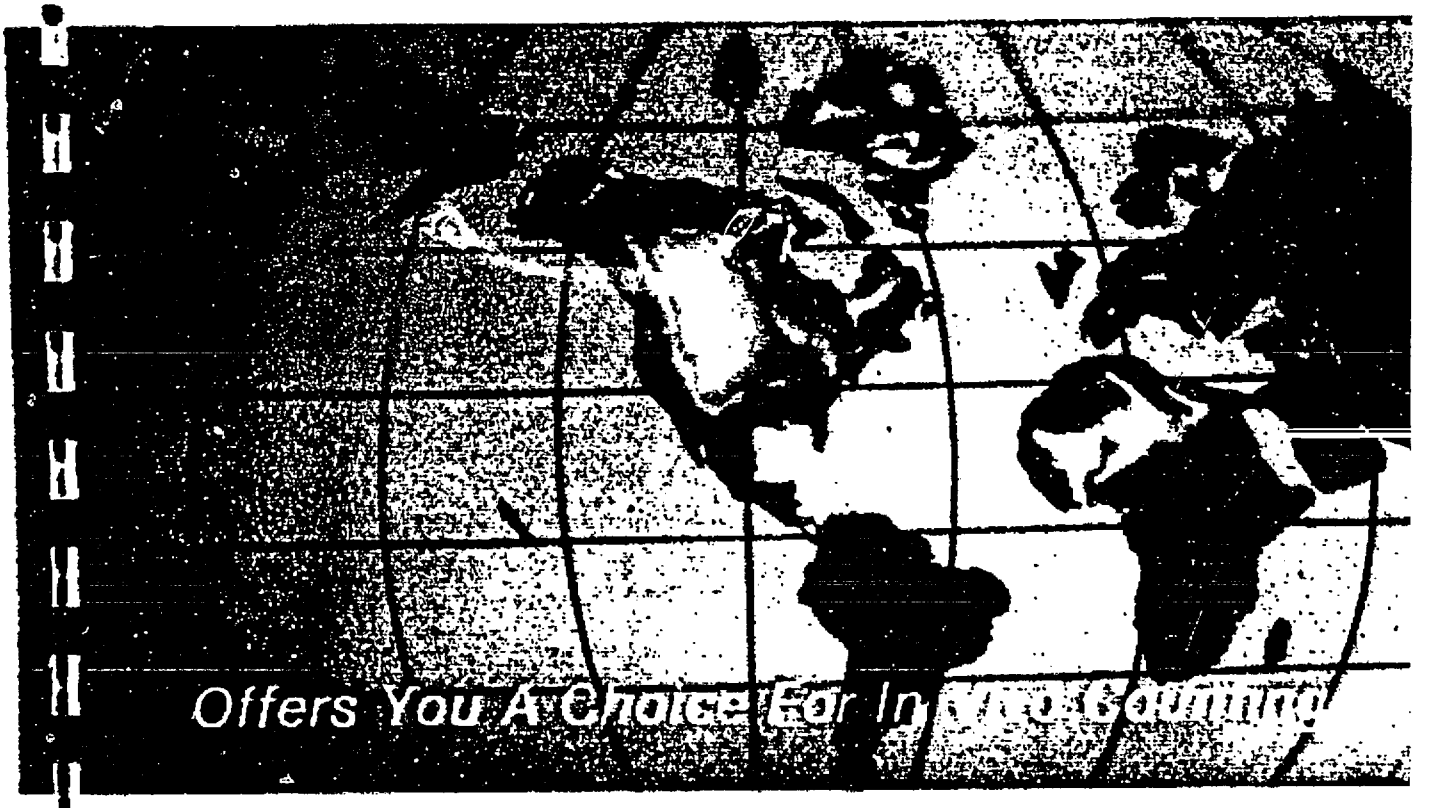
Question 41

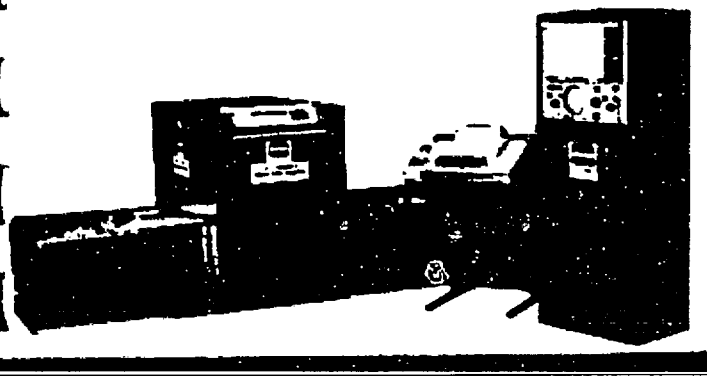
The organization who will perform the whole body counting services is Helgeson Nuclear Services, Inc. They are a very reputable service company and have performed whole body counting service all across the United States, Canada, and in areas throughout the free nations of the world.

Their brochure is attached.

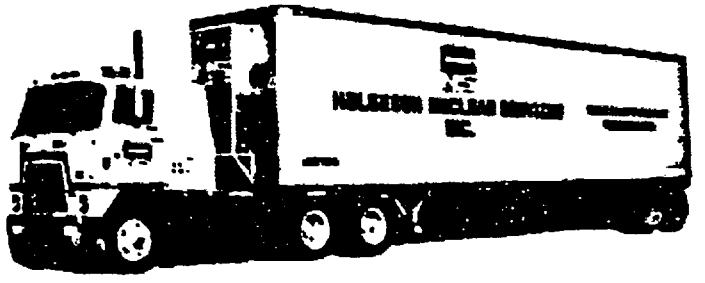
HELGESON NUCLEAR SERVICES

WORLDWIDE





"Do-It-Yourself Wh
Body Counting



Mobile Whole B
Counting

POOR ORIGINAL

YOU Select The Mode Of Serv
That Fits YOUR Nee

160 064

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The Pioneer And Still The Leader In Automated Personnel Monitoring

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At Helgeson, more than 300 man-years of research, development, systems production and management have produced what is today the finest, fastest, most dependable and most widely accepted whole body counting service available throughout the world.

Whole body counting has long been recognized by all elements of the nuclear industry — including regulatory agencies — as the prime, practical method for determining minute levels of internal depositions in plant workers. These are normally people who work with, in, and around nuclear installations. This method has been brought to maximum efficiency and accuracy by Helgeson.

There are sound reasons behind the Helgeson superiority. The prime factor is a group of highly-qualified individuals who:

- understand the problems involved;
- are thoroughly familiar with the tools and techniques available to solve the problems;
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It has become the hallmark of Helgeson Nuclear Services, Inc. to consistently offer the most current state of the art instrumentation and electronic peripherals. Where merited, the Helgeson System has been steadily up-graded to assure continuing refinement of perfo-mance.

Demands for whole body counting vary widely in terms of nuclides measured, frequency and volume. That is why Helgeson offers this service in a choice of Modes: "Do-It-Yourself" or Mobile. You select the Mode that best accommodates *your* requirements.

Helgeson whole body counters accurately measure — without discomfort or embarrassment to the subject — the TOTAL body burden of gamma emitters. It also approximates the location within the body where they are deposited. And it will — in most cases — eliminate the need for "indirect bioassay" of urine or feces.

Whatever Helgeson Mode you select, you ca be sure that you have specified the finest Every Helgeson System is produced to th highest standards of quality by carefull selected, technically qualified personnel.

Depending on the analysis, up to 50 individual can be counted in a single 8-hour day.

In all Helgeson Systems, fast accurate quai titive measurement is done with high-quality low-background crystals. Typical Minimur Detectable Activities shown here underscor the sensitivity of the System.

TYPICAL MINIMUM DETECTABLE ACTIVITIES

RADIONUCLIDE (Mixed Fission, Activation and Corrosion Products)	MINIMUM DETECTABLE ACTIVITY* (nCi)	MAXIMUM PERMISSIBLE BODY/ORGAN BURDEN
Sb 124	2.0	900L**
Sb 125	6.0	3200L
Ba La 140	2.0	600L
Ce 141	18.0	800L
Cs 134	2.0	20000TB**
Cs 137	2.0	30000TB
Cr 51	23.0	6000000L
Co 58	2.0	2900L
Co 60	2.0	1100L
Au 198	2.0	1900L
I 131	2.0	700T**
I 133	3.0	300T
Ir 192	2.0	1400L
Mn 54	2.0	3600L
Hg 203	4.0	4000K**
Ru 106	10.0	600L
Se 75	4.0	9000L
Ag 110m	2.0	1000L
Sr 85	2.0	5200L
Ta 182	2.0	1500L
Tc 99m	1.0	20000TB
Sn 113	2.0	3500L
Zn 65	4.0	60000TB
Zr Nb 95	2.0	1600L
OTHER RADIONUCLIDES		
U (Natural & Depleted)	10mg	45L
U 235	50mg	250L
Ra 226	10nCi	100B**
Th (Natural)	6mg	30L
K	22g	— —TB ***

* The "Minimum Dectectable Activity" is defined as three times the standard deviation of the background divided by the calibration factor.

** Abbreviations used above: "L" = "Lung" "TB" = "Total Body" "T" = "Thyroid" "K" = "Kidney" "B" = "Bone"

*** Natural potassium has no "Maximum Permissible Body/Organ Burden"

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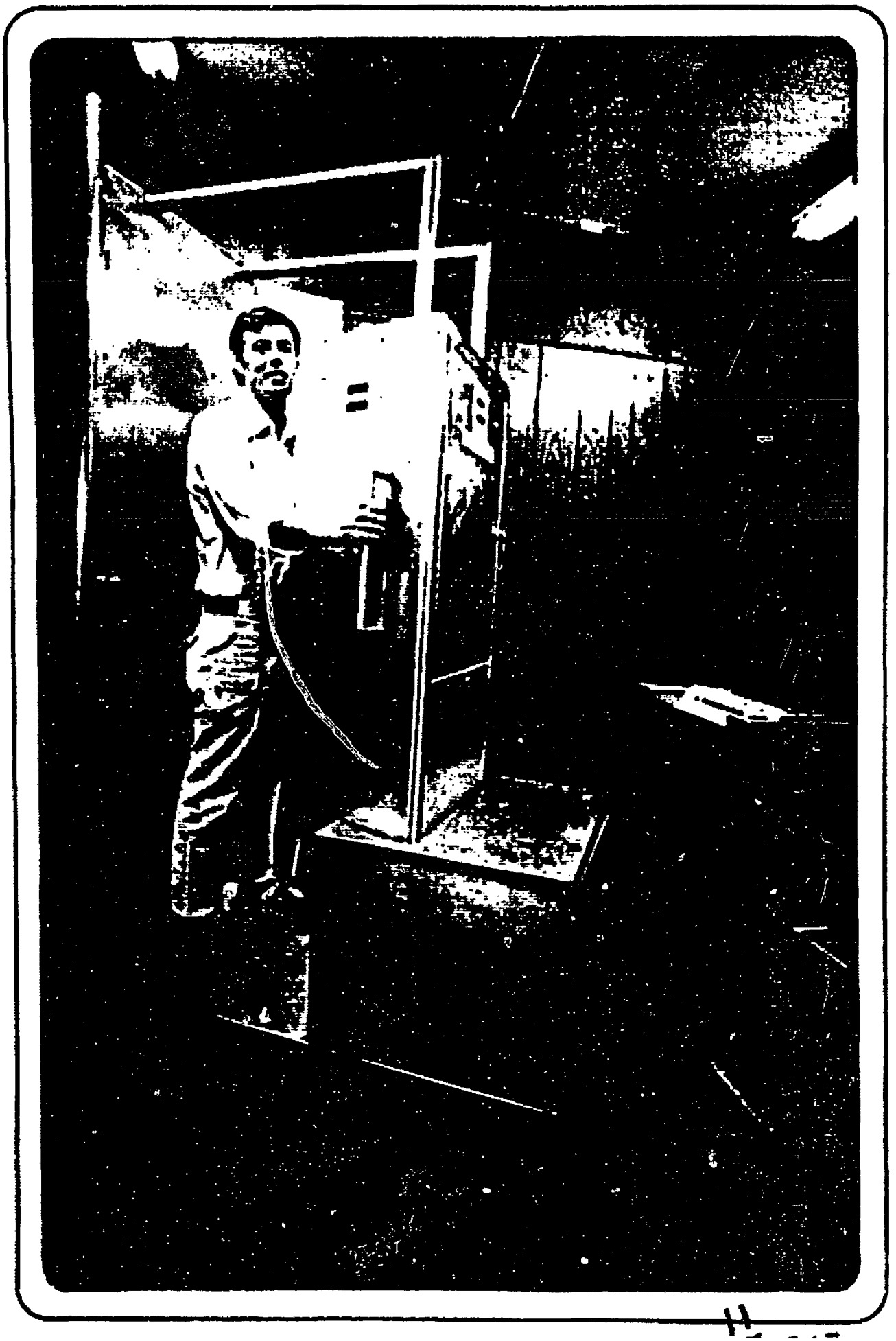
The standup "Quickie Counter" is designed to supplement your whole body counting program--available for your use 24-hours a day, 365-days a year. No operator is necessary. Your people count themselves in a clean, attractive, open and dependable instrument. Purchase, lease, and rental plans include Helgeson Nuclear Services' well known 24-hour service response. Purchase prices start as low as $65,000 and include a one year warranty. The "Quickie Counter" can be delivered to your site within 90 days of order. Call for demonstration.

* 2 minutes or less per count with Helgeson Nuclear Services' software.
* "Go" or "No Go" to your present whole body counter.
* Qualitative and semi-quantitative analysis.
* Easy operation with Helgeson Nuclear Services' reliability.
* Contemporary open design minimizes claustrophobic reactions.
* Portable.
* Easy Decontamination.
* Interface with your MCA or optionally with Helgeson Nuclear Services' hardware and exposure records programs.
* Hand and foot contamination will <u>not</u> affect results.
* No moving parts.
* Linear detector/subject geometry minimizes counting geometry errors.
* Hand and foot counter option for <u>complete</u> entry/exit surveys.

November 1, 1979

POOR ORIGINAL

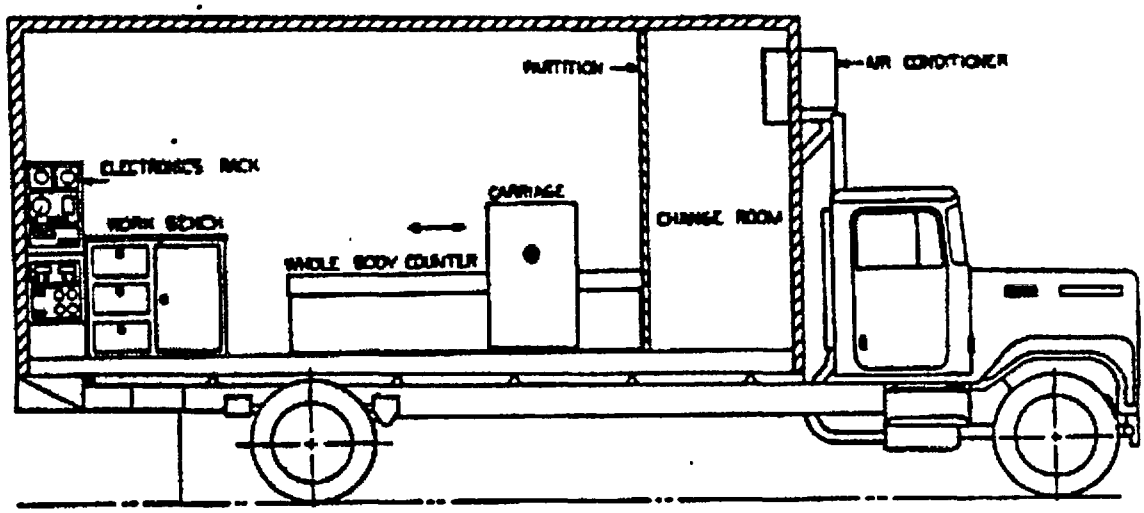


HELGESON NUCLEAR SERVICES, IN

5587 SUNOL BOULEVARD • PLEASANTON, CALIFORNIA 94
(415) 846-3453 • TWX: 910 482 6460 • Cable Address: HELGE

MINI-MOBILE UNIT

A Mobile "Do-It-Yourself Whole Body Counter"*



These units are available for demonstrations, rent, short/long te leases.

ASK US ABOUT:

** Free On-site Demonstrations: Helgeson Nuclear Services, Inc. believes that you should be able to judge the performance of a whole body counter before commiting yourself. We will count a representative sample of your personnel, free, train your personnel on the operation of the DIYS counter, and provide you with a report of the results.

** Free On-site Comparison Tests: We can arrange to have a Mini-Mobile unit at your site for a side-by-side comparison with your present unit or service.

***Additional WBC Capacity: The Mini-Mobile unit can be rented for use during peak counting periods such as major outages.

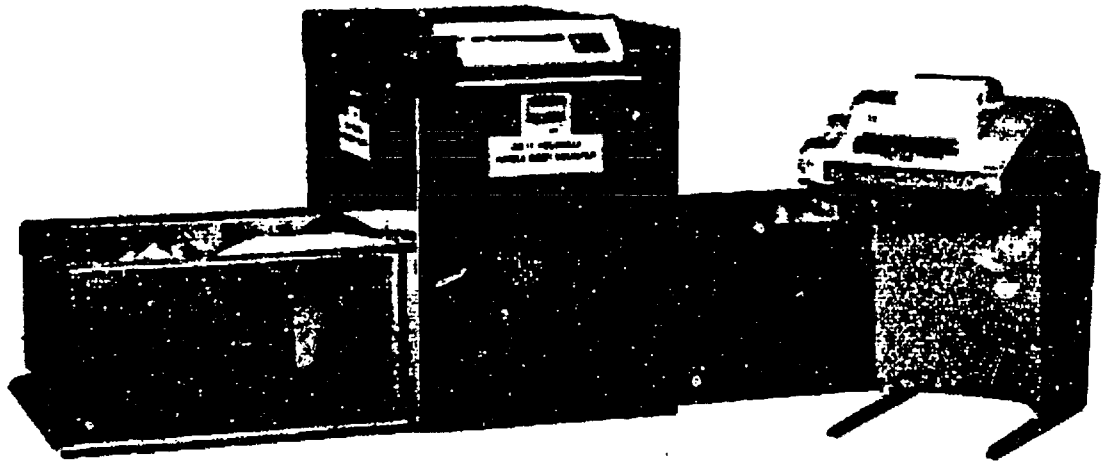
Rent a Mini-Mobile unit: When your present unit is out of service, call Helgeson for short term rental of the Mini-Mobile.

Compare the Reliability of our System. The DIYS units instal around the US averaged less than 0.5 days downtime during 1977; on-line availability averaged 364.5 days, 24 hours a day.

* Registered Trade Mark
** Phone charges, local power not included
***Current DIYS users charges: $250 set-up fee, current lease ra for 25 counts/week usage

11
16[illegible] 068

--- Recognized, Worldwide, As The State Of The Art System For In Vivo Counting



The Helgeson BASIC UNIT

The Helgeson "Do-It-Yourself Whole Body Counting" concept offers a positive answer to the problems involved in obtaining accurate and current on-site determination of internal depositions of radioactive materials.

The Helgeson System accommodates the full spectrum of service requirements, from the most elementary to the most exotic -- and it delivers results with optimum cost-effectiveness.

To span the wide range of demands and still stay within budgetary parameters, the Helgeson System is available in a variety of configurations, each of which represents an expansion of functional performance. Costs, in general, increase on a progressive, incremental basis.

Starting with the Helgeson BASIC System, various OPTIONS are offered that either reinforce the fail-safe factors of performance; lessen the time required for counting; or increase the efficiency of the System.

Overall, the flexibility provided by the many Helgeson System Options that are available make it possible to select the one configuration of the BASIC System/Penpherals/Add-Ons that fits both your requirements and your budget.

We present here The Helgeson BASIC System, "Do-It-Yourself Whole Body Counting™" Equipment:

A - Shielding. (Std.: 10cm of lead on five sides of th Detector; 5cm of lead on five sides the Chamber. Both Detector Shieldi and Chamber Shielding are encas in stainless steel.)

B - Detector (Std.: 20cm. dia. X 10cm. thick.. tha lium activated sodium iodide crystal. I addition, there is a 2.5cm thick. quar light pipe which is optically coupled t a 13cm. dia., photomultiplier tube wit a low-background tube base.)

C - Detector Electronics. High Voltage Power Supp Pre-Amplifier; ADC and Interface.

D - Minicomputer with Accessones.

E - 8cm X 10cm Display Scope.

F - 22cm X 28cm X-Y Recorder.

G - Model 33-ASR Teletype ® Terminal. Plus software for data reduction.

FUNCTION/PERFORMANCE FACTORS:

While The Helgeson BASIC System is offered a lowest cost compatible with your critical perform requirements, final results are identical with t achieved with the more expensive Helgeson OPTI(when — for purposes of comparison — the tim counting an individual remains fixed at eight minu

All data-output will be delivered as a 2.54cm (1") wide punched paper tape; AND as a teletyped copy. Input to another computer is via the paper tape or by punched cards. Total processing time per person is about 22 minutes. This is made up of about 2 minutes for subject identification; 8 minutes of counting; 12 minutes of data-output. Allowing approximately 8 minutes of each hour of operation for background reading, the BASIC System will count about 2 persons per hour.

Timely and critical evaluation of the In Vivo data output from The Helgeson BASIC System requires that the reduction computer be equipped with graphic devices, such as a Tektronix display terminal and hard copy unit; or a Calcomp or Houston incremental plotter.

Experience has shown that the one element of The Helgeson BASIC System that will require the most careful supervision and maintenance is the Model 33-ASR. As a protective move, a complete stand-by Teletype® has been quoted as a necessary item in the "Minimum Spare Parts" recommendation, below.

RECOMMENDED MINIMUM SPARE PARTS.
HELGESON BASIC SYSTEM

- Detector drive motor
- Drive motor power supply
- High voltage power supply
- Signal amplifier
- Low voltage power supply
- Analog-to-digital converter (ADC)
- ADC-to-computer interface
- Display interface
- Teletype Model 33-ASR

Recommended Minimum Spare Parts for The Hel
OPTION #1 are the same as for the BASIC S
(including a Model 33-ASR to provide service c
rare occasion that the Model 35-ASR is down for
tenance).

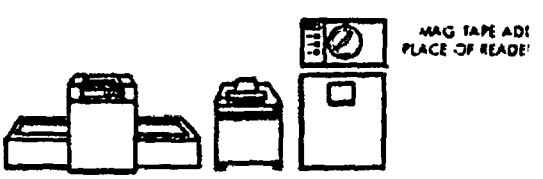
Helgeson Basic Unit Plus Option No. 2

The Helgeson OPTION #2 provides for the addit
a high-speed reader and punch. This accelerates
output from about 12 minutes to about 2.5 minute
the time required to count one person is redu
approximately 12 minutes. Allowing for one backg
count per hour, it is possible to make 4 counts pe
If backgrounds are constant, this rises to 5 per
OPTION #2 imposes the same hardware require
on the user's computer as does the BASIC System
the user's computer has the required peripherals. O
#2 is the best possible System for the price.

Recommended Minimum Spare Parts for The He
OPTION #2 is the same as for the BASIC Systen
the addition of a high-speed reader punch.

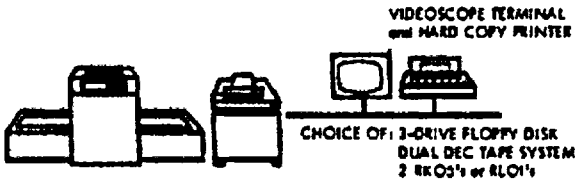
Helgeson Basic Unit Plus Option No. 1

Helgeson OPTION #1 offers the user an opportunity to strengthen the dependability of the BASIC System at a minimum increase in cost. OPTION #1 provides a Model 35-ASR Teletype® in place of the Model 33-ASR. This measurably increases the overall reliability of the System. Output speed remains at 12 minutes, and all other Function/Performance Factors are the same as with BASIC SYSTEM.



Helgeson Basic Unit Plus Option No. 3

The Helgeson OPTION #3 calls for the use of in
standard 7- or 9-track magnetic tape equipment i
of the high-speed reader/punch used in OPTIC
for the transfer of count data to the computer. Co
time is approximately the same as with OPTION
12 minutes per person; 4/5 counts per hr. Recomm
Minimum Spare Parts for The Helgeson OPTIO
the same as for the BASIC System.



Helgeson Basic Unit Plus Option No. 4

The Helgeson OPTION #4 represents a major step up to a more sophisticated level of equipment, where the judicious selection of available components can result in overall System performance that is matched very closely to your needs for capacity and speed.

Of particular significance under OPTION #4 is the wide range of on-line Mass Storage devices offered.

It is important to recognize that these more advanced configurations will demand a higher level or degree of competence and ability on the part of operating personnel.

HELGESON OPTION #4 EQUIPMENT

- A - Shielding (same as BASIC)
- B - Detector (same as BASIC)
- C - Detector Electronics (same as BASIC)
- D - 32K Minicomputer with Accessories
- E - Mass Storage Devices. Choice of:
  1. - Three-Drive Floppy Disk with Control. Capacity, 160,000 bytes per disk.
  2 - Dual DECtape System. Capacity, 240,000 bytes per tape.
  3. - Two RK 05 Hard Disks with Control. Capacity, 2,500,000 bytes per disk.
  4. - Two RL01 Hard Disks with Control. Capacity, 5,000,000 bytes per disk.
- F - Tektronix Videoscope or similar Terminal.
- G - Tektronix, Printronics or similar Hard Copy Unit
- H - DEC Operating System Plus software for data reduction.

The Helgeson OPTION #4 provides additional memory to the minicomputer. As indicated above, selection of the Mass Storage device provides a range of on-line data or program storage capacities from 480,000 bytes to 10,000,000 bytes. This results in a completely self-sufficient system that is independent of the user's computer. Because OPTION #4 provides display and high-speed hard copy output, these capabilities need not be duplicated on the user's computer; nor is time lost in the physical transfer of data from the Whole Body Counter to the user's computer and the ensuing wait for data to be processed.

Instead, because the unprocessed, raw data may be stored locally, the Site Health Physicist (or his technician) may choose his own time to come to the Whole Body Counter and process the data. Or he may elect to process the data immediately after counting an individual. If he is knowledgeable in the field of internal dosimetry, he may wish to relay to the person who has just been counted any significant information obtained from the count.

The time required to process the data also varies with the Mass Storage device selected. With DECtape, this is less than 15 minutes per person; with Floppy Disks, less than 12 minutes per person; with either the RK 05 or the RL01 Hard Disks, less than 10 minutes per person.

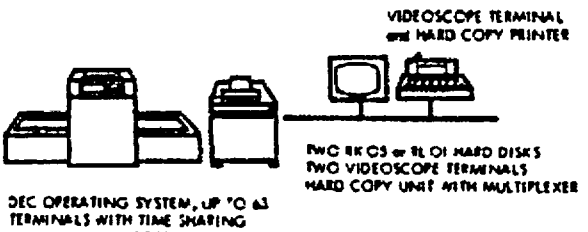
Finally, the entire computer power of the DEC Operating System is available, full time. When not being used for Whole Body Counting, it is there – ready to do other jobs. For example, a "Dose Calculation" Program is provided which allows the Health Physicist to input one or more sets of Whole Body Counting results; calculate half-lives, dose commitments, etc. Other possible uses are limitless.

The amount of Mass Storage, regardless of the device chosen, is limited only by the number of reels or disks on hand. The cost-per-word of on-line data storage ranges from "low" to "minimal".

The Helgeson OPTION #4 provides the same high level of results as The Helgeson BASIC System, at one end of the spectrum, or The Helgeson OPTION #5, at the top of the line. Validity remains uncompromised throughout the full range of OPTIONS. Only the capacity and speed of the Systems vary as the BASIC System is expanded.

RECOMMENDED MINIMUM SPARE PARTS
HELGESON OPTION #4

- Detector drive motor
- Drive motor power supply
- High voltage power supply
- Signal amplifier
- Low voltage power supply
- Analog-to-digital converter (ADC)
- ADC-to-computer interface
- Tektronix or similar display tube



Helgeson Basic Unit Plus Option No. 5

The Helgeson OPTION #5 System provides all the advantages of OPTION #4, plus the ability to do time sharing with the two supplied terminals. (Although the time sharing system can accommodate up to 63 terminals, only two are furnished as part of OPTION #5.) These two terminals — or the number of terminals best suited to your needs — would allow Whole Body Counting to be done simultaneously with other work at the other terminals. The full-performance features of the DEC software are available at every terminal.

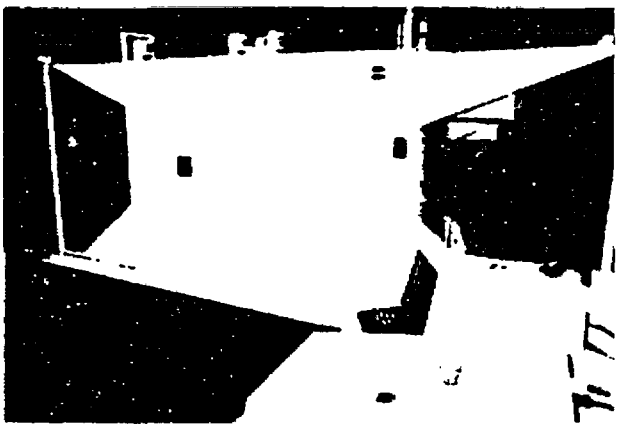
HELGESON OPTION #5 EQUIPMENT

A · Shielding (same as BASIC)
B · Detector (same as BASIC)
C · Detector Electronics (same as BASIC)
D · 32K Minicomputer for all data processing
8K Minicomputer devoted to data collection
E · Hardware, multiply/divide
F · Two RK 05 or RL01 Hard Disks with Control
G · Two Tektronix, Videoscope or similar Terminals
H · One Tektronix, Printronix or similar Hard Copy unit with Multiplexer
I · DEC Operating System
J · Up to 63 terminals with Time Sharing Hardware and Software.

RECOMMENDED MINIMUM SPARE PARTS

HELGESON OPTION #5 is the same as for OPTION #4.

Helgeson Mobile Whole Body Counting Unit



Large shielded chamber with expanded counting functions, c tom built by Helgeson to special order. (This chamber forms basic containment for the Helgeson "UCOUNTER").

HELGESON IN VIVO COUNTING EQUIPMENT GIVES YOU A CHOICE . . .

That's the whole story behind the high level of acceptanc now enjoyed worldwide, for the products and services Helgeson Nuclear Services, Inc.

In addition to the "Do-It-Yourself Whole Body Coun ing" ™ equipment described in this brochure, Helgeso offers Mobile Whole Body Counting equipment in mo ern trailer vans; and also produces equipment designe to meet the specialized needs of the industry.

Of special note is the Helgeson "UCOUNTER" Syste of Whole Body Counting Equipment — a specialize configuration of shielded chamber/detection arrays th provide the latitude necessary for total Whole Boc Counting service under non-standard, on-site condition The "UCOUNTER" counts/measures uranium, amer cium, plutonium, mixed fission, activation and corrosic products. Ask for our BULLETIN #EU-7

Whatever your needs in Whole Body Counting, w invite you to discuss them with us.

SHIPPING DATA: The Helgeson BASIC system and all options will be shipped 150 days following receipt of order.

INSTALLATION DATA: The Helgeson BASIC System all options will be installed within 60 days of notification t that the equipment has arrived at the installation site.

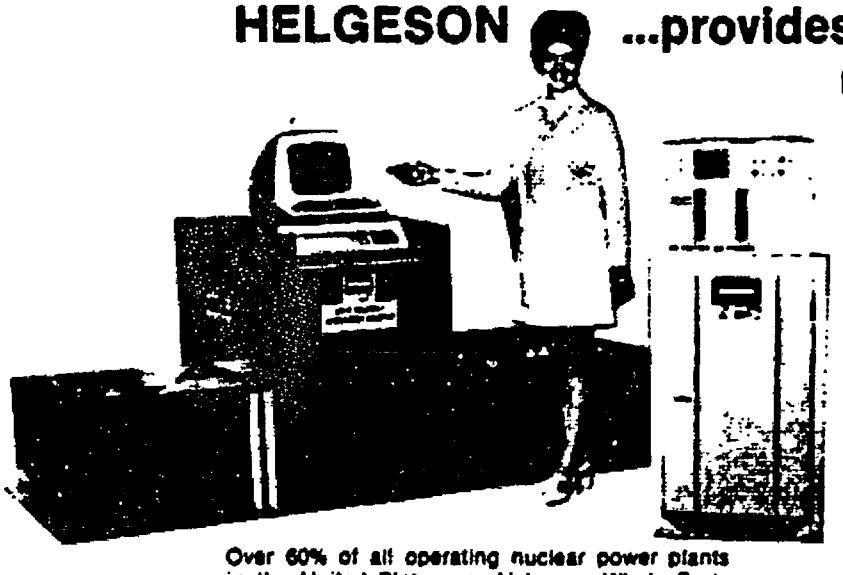
IN TAIWAN: Sea & Liang Co., Ltd 8 G FL Jen Ai Mansion No 37 Jen Ai Rd Sec 4 P O Box 1396, Taipei Taiwan Phones 721 2117 721 2118 Cable "SEELIANG" Telex 11570
IN JAPAN Japan Tech Services Corporation Shiroura Building 1-4 10 Shiba Daimon Minato Ku Tokyo 105 Japan Cable "JATECHCORP" Tokyo Telex 242 5060 Jatech
IN SWITZERLAND Nuclear Exchange Corporation Europe 8700 Kusnacht ZH Zurichstrasse 135 Switzerland · Phone 01 910 8977 Telex 58877 COMAG CH
IN PAKISTAN: Packard Corporation Central Commercial Area P E C H Society Karachi 29 Pakistan Phones 437315 438084 Cable PAKLAND KARACHI
IN AUSTRALIA Australian engineering laboratories pty ltd Box Hill 3128 Australia Phone 03 89 8900 Telex 32595
IN CHILE: Tecnologia Industrial Arturo Rodrigues Casilla 16037 Santiago 9 Chile Phone 292029 Telex SGO 260 TIAR
IN GREECE N Karvonis 23 24 Eptherias Square Athens 113 Greece Phone 32 51 333 Telex 21 6145 CRCO
IN ITALY Tecnologia Avanzate Via San Carmine 9 31 10100 Torino Italy Phone 537 389 Telex 22967 ADN
IN MEXICO ALVA Nuclear POB 12626 Mexico 12 D F Phone 305 516 7231 Telex 773197
IN SPAIN TISA Almansa 110 Madrid 3 Phone 253 8620 Telex 831 43224

5587 Sunol Boulevard, Pleasanton, California 94566 (415) 846-1453 TWX 910-482-6480 Cable HELGENUC

WHOLE BODY COUNTING

by HELGESON, the pioneer in Commercial Whole Body Counting

HELGESON ...provides the service to meet your needs.



The HELGESON
"DO-IT-YOURSELF WHOLE BODY COUNTER"©

ON SITE 24 HOURS A DAY
FAST, ACCURATE RESULTS
LOW COST
STATE OF THE ART TECHNIQUES
ATTRACTIVE
PROVEN IN THE FIELD

Over 60% of all operating nuclear power plants in the United States use Helgeson Whole Body Counting Services.

OTHER SERVICES AVAILABLE

Underwater Sediment Surveys
Consulting
Software Development
Quality Assurance Programs

[redacted]

[redacted]

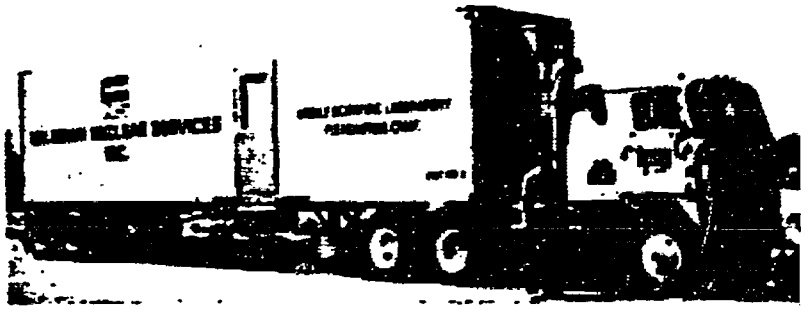
OTHER HELGESON PRODUCTS

Low Level Counting Chambers or Rooms
Shadow Shield Whole Body Counters

Nationwide *MOBILE* Whole Body Counting Services

Providing Services for Eleven Years to:

Power Generating Stations
Fuel Fabricating Facilities
Fuel Reprocessing Facilities
Uranium Mining Industry
Hospitals
Shipyards
Pharmaceutical Laboratories
Universities



The Helgeson Mobile Unit has the capabilities for complete in vivo analyses, lung burden analyses; wound counting; whole body analyses.

Helgeson services are available worldwide...

IN JAPAN
JAPAN TECH SERVICES CORPORATION
OHKURA BUILDING, 1-4-10 SHIBA DAIMON
MINATO-KU TOKYO 105, JAPAN
Cable: "JATECHCORP", Tokyo
Telex: 242-5686 JATECH J

IN PAKISTAN
PAKLAND CORPORATION
CENTRAL COMMERCIAL AREA
P. E. C. H. SOCIETY
KARACHI-29 (PAKISTAN)
Phones: 437315 436084
Cable: PAKLAND KARACHI

Reprinted from NUCLEAR NEWS BUYERS GUIDE MID-FEBRUARY 1977

Do-It-Yourself Whole Body Counter

In recognition of the growth and development that has brought certain elements of the nuclear industry to current high levels of maturity, Helgeson offers on-site "Do-It-Yourself" whole body counting for mixed fission, activation, corrosion products, etc

This calls for placement of the "Do-It-Yourself Whole Body Counter"™ in any convenient location at your facility, ready for use 24 hours a day, 365 days a year. Automated to the fullest practical extent, operation of the system requires only the ability to follow simple, step-by-step instructions

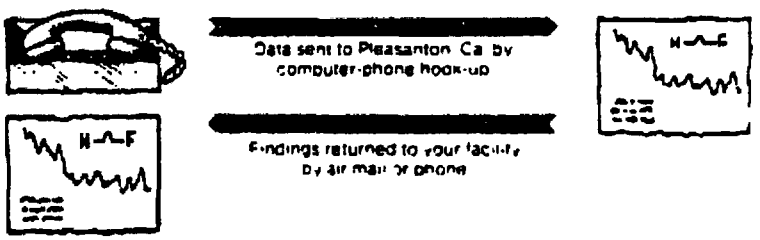
In vivo data from the counter are instantly transmitted via a telemetric link to Helgeson headquarters. There they are promptly reviewed and evaluated under the direction of a Certified Health Physicist. Any result which exceeds the client's pre-determined action points brings an immediate telephone response. All results are sent to the client in a formal report via airmail. This "Third Party Reporting" reinforces the credibility of every count.

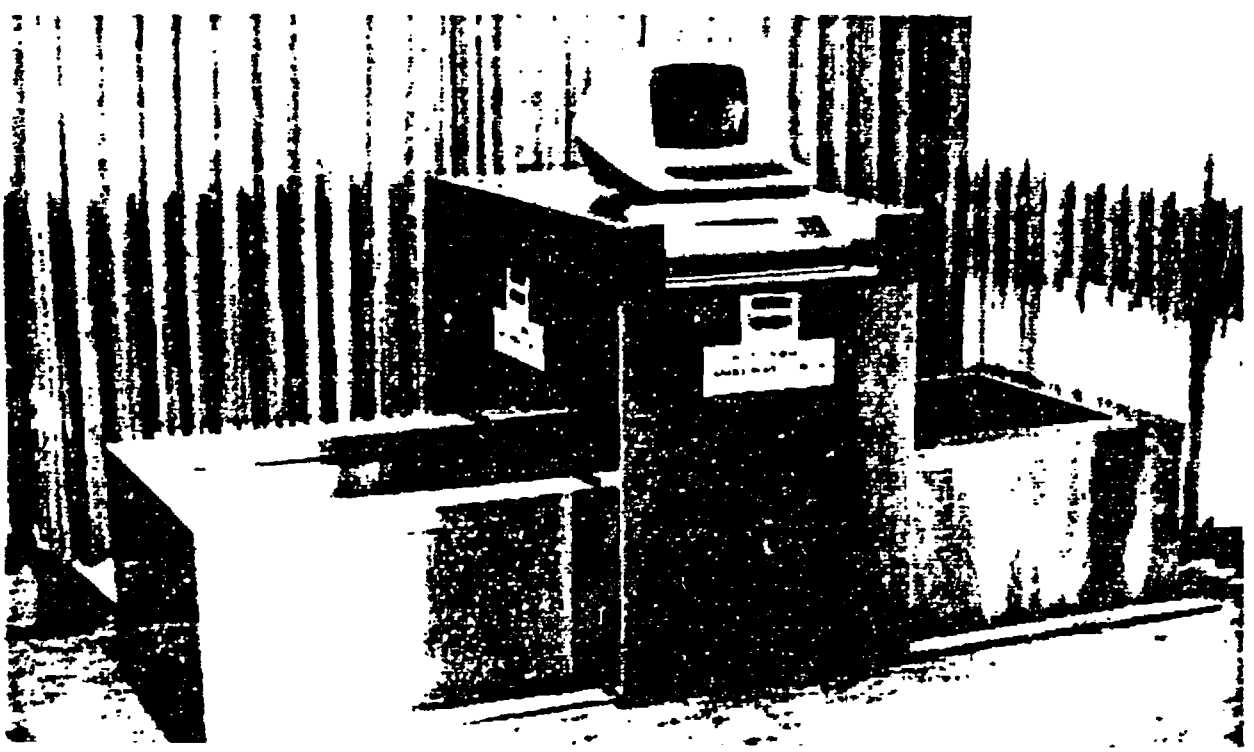
The "Do-It-Yourself" counter permits easy compliance to routine counting schedules at low cost. It also accommodates counting of new or temporary employees, inspection personnel and other visitors as required by the various regulatory agencies.

Having a Helgeson "Do-It-Yourself Whole Body Counter"™ at your site all the time allows you to schedule required counting at your convenience. Time away from the job for most employees is normally less than the average coffee break.

Finally, there is the assurance for all concerned — employees, management, Health Physicists, and regulatory agencies — that accurate *in vivo* monitoring is available any time, around the clock, backed up by the thoroughly professional staff of Helgeson Nuclear Services, Inc.

HELGESON NUCLEAR SERVICES, INC.
5587 Sunol Boulevard
Pleasanton, California
(415) 846-3453
TWX 910 482 6460





HELGESON
Mobile Whole Body Countin

Providing Services for Twelve Years to:

- Power Generating Stations
- Fuel Fabricating Facilities
- Fuel Reprocessing Facilities
- Uranium Mining Industry
- Hospitals
- Shipyards
- Pharmaceutical Laboratories
- Universities

Responding, at the time, to the r
of a relatively new and rapidl
panding nuclear industry, M
Whole Body Counting was the
service offered by Helgeson for
years.

Today, the Helgeson Mobile Se
continues to offer state of th
measurement of mixed fission, a
tion and corrosion products, as well as measurement of natural, enrich
depleted uranium, 241-americium, 239-plutonium, etc.

As in every aspect of its service to the nuclear industry, Helgeson has
sistently made the required investment of time and effort required to
Helgeson Mobile Whole Body Counting the leader in the field of
mated monitoring of personnel. We continue to provide the only M
Whole Body Counting capability for uranium, americium, plutoniun
other low-energy gamma emitters.

HELGESON NUCLEAR
SERVICES, INC.
5587 Sunol Boulevard
Pleasanton, California
(415) 846-3453
TWX: 910 482 6460

Modern trailer vans, equipped with the latest instrumentation, to give you on-the-spot results, are available — at any time, anywhere — manned by well-qualified Helgeson staff personnel.

HELGESON NUCLEAR SERVICES, IN
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(415) 846-3453 • TWX: 910 482 6460 • Cable Address: HELGE

PRICING SCHEDULE*

Uranium-235 and Depleted Uranium

Uranium-235 and depleted uranium are usually measured by a 20-minute count, although a 40-minute count may be used. Prices are governed by the annual frequency of counting and by the number of counts made per placement of the trailer. The following table gives the price schedule for 20-minute counts. 40-minute counts are 1.3 times the amounts listed.

NO. OF COUNTS PER PLACEMENT OF TRAILER	ANNUAL COUNTING FREQUENCY 1	2	3	4
1 - 20	$ 66.00	65.00	64.00	63.00
21 - 50	56.50	55.50	54.50	53.50
51 - 100	53.00	52.00	51.00	50.00
101 And Up	48.00	47.00	46.00	45.00

Radium-226, and Natural Thorium

Radium-226, and natural thorium are measured by a 40-minute count (or longer in some instances). The following table applies to these two radionuclides only.

NUMBER OF COUNTS PER PLACEMENT OF TRAILER	COST PER 40 MINUTE COUNT
1 - 20	$ 90.00
21 - 50	80.00
51 - 100	75.00
101 And Up	70.00

Plutonium-238 and 239

Plutonium-238 and 239 measurements require simultaneous measurement of americium-241 to account for the 17-KeV x-rays from americium-241 interfering with the 17-KeV x-rays from the plutoniums. The counting time is a minimum of 40-minutes over the thigh area for "background," and another 40-minutes over the chest. Chest wall thickness measurements are made with an echoencephaeloscope and 10 to 20 minutes should be allotted per subject. Americium-241 measurements are made in the same manner except no evaluation is done of the 17-KeV region.

Charges are $160.00 per plutonium analysis and $125.00 for an americium-241 analysis. If the subject has had a potential exposure to other radionuclides such as uranium-235, mixed fission, corrosion or activation products, it will be necessary to count him for those materials also at the appropriate unit charge.

Wound Counts

Prices for wound counts, counts of specific organs of the body or special samples are based on the time it takes to prepare the equipment and the difficulty in processing the information. Those interested in these services should contact Helgeson Nuclear Services, Inc. for quotations on your particular needs.

*1. *All prices given above are based on the Consumer Price Index for March 1973, which was 129.8. Actual invoice prices will be multiplied by the CPI for the month during which the work was performed and divided by 129.8.*

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(415) 846-3453 • TWX: 910 482 6460 • Cable Address: HELGEN

FEATURES OF THE "
DO-IT-YOURSELF WHOLE BODY COUNTER

1. The system is normally in a background counting mode when no one is using it A new background is started every 16 minutes and the previous background is stored in "upper core," a storage location used for the last background.
2. When a person wishes to do a whole body count, he types the "Alt Mode" or "ESC" key on the teletype If the current background counting time is less than eight minutes, that background is aborted and the previous background will be used for the subject.
3. The subject will be asked to type his name, social security or payroll number, age, height, weight and sex and will then be instructed to lie down in the counter and push the "START" button. He is also instructed on actions to take at the end of the count.
4. When the count is completed an audible alarm is given, signifying that the subject is to get up and leave the counter
5. On completion of a count, the system dials the telephone connected to it, calling our computer in Pleasanton, California. The data is transmitted at 120 characters per second, checked for errors, and upon successful transmission, the system returns to a background counting mode The data transmitted are:
    a. Identification of User
    b. Identification of Subject and his physical characteristics
    c. Length of count in seconds
    d. 255 channels of subject gamma spectral data
    e. 96 channels of gross counting rate (over energy range given above) versus time (which is essentially equivalent to counting rate versus distance)
    f. Background counting time in seconds
    g. 255 channels of background gamma spectral data
    h. 96 channels of background gross counting rate versus time.
6. Since a small 241 americium source is physically attached to the outside of the detector, a photopeak of 60 KeV is always present, even in the background. Since there is a small amount of potassium in the detector system, a K-40 photopeak will always be present at 1460 KeV. Thus, one always has the ability to determine the gain and zero intercept of the system If the spectrum of the subject contains a photopeak which masks K-40, such as Co-60, we would use the masking photopeak for the same energy and gain determination Thus, each analysis, whether it be subject or background, will contain its own quality control data.
7. Upon receiving the data in Pleasanton, our technician analyzes it immediately If the findings show that the subject has levels of activity which exceed the action point as defined by the customer, a responsible person at the customer's facility will be notified by return telephone call. All results, including those which are greater than the action point, will be reported in a formal report at intervals which are also specified by the customer

8. Since the equipment is always located at the customer's site and is available for use 365 days per year, the User will be able to do special counting which has not previously been possible with the mobile system. For example, all new employees, all terminating employees, and those persons who may have been involved in an unusual circumstance may be counted at the discretion of the site health physicist.

9. The "Do-It-Yourself Whole Body Counter"® employs a scanning geometry; thus the calibration errors are small (15 - 20% at most), as contrasted with, for example, the chair counter which can have errors of as high as 240%, depending upon the geometry of the source and detector. The scanning geometry also allows semi-qualitative localization of the major depositions of radioactivity. External contamination can frequently be determined, which is not possible with a chair counter. Lastly, the scanning geometry allows counting of the *whole* body and thus is truly a "whole body counter," as contrasted with a chair counter. This point is important because of its legal implications.

10. By using a Helgeson Nuclear Services "Do-It-Yourself Whole Body Counter,"® you also obtain the full maintenance, backup, and record-keeping services of our company. For example, every piece of calibration data, as well as every piece of subject counting and background data, are microfilmed. After being checked for quality, the rolls of microfilm are reproduced: one copy stays at our office, while the other copy is stored in a bank vault 10 miles away. Additionally, we have a full scale Quality Assurance program which has been reviewed by many of our customers.

In recognition of the growth and development that has brought certain elements of the nuclear industry to current high levels of maturity, Helgeson offers on-site "Do-It-Yourself" whole body counting for mixed fission, activation, corrosion products, etc.

This Mode calls for placement of the "Do-It-Yourself Whole Body Counter"™ in any convenient location at your facility, ready for use 24 hours a day, 365 days a year. Automated to the fullest practical extent, operation of the system requires only the ability to follow simple, step-by-step instructions.

In vivo data from the counter are instantly transmitted via a telemetric link to Helgeson headquarters. There they are promptly reviewed and evaluated under the direction of a Certified Health Physicist. Any result which exceeds the client's pre-determined "action points" brings an immediate telephone response. All results are sent to the client in a formal report via airmail. This "Third Party Reporting" reinforces the credibility of every count.

The "Do-It-Yourself" counter permits easy compliance to routine counting schedules at low cost. It also accommodates counting of new or temporary employees, inspection personnel and other visitors as required by the various regulatory agencies.

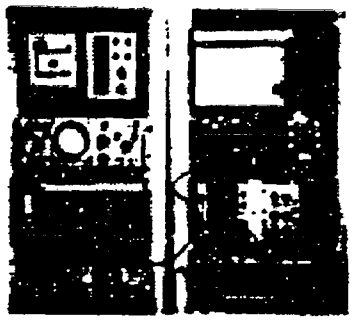
Having a Helgeson "Do-It-Yourself Whole Body Counter"™ at your site all the time allows you to schedule required counting at your convenience. Time away from the job for most employees is normally less than the average coffee break.

Finally, there is the assurance for all concerned — employees, management, Health Physicists, and regulatory agencies — that accurate in vivo monitoring is available anytime, around the clock, backed up by the thoroughly professional staff of Helgeson Nuclear Services, Inc.

Responding, at the time, to the needs of a relatively new and rapidly expanding nuclear industry, Mobile Whole Body Counting was the only service offered by Helgeson for many years.

Today, the Helgeson Mobile Service continues to offer state of the art measurement of mixed fission, activation and corrosion products, as well as measurement of natural, enriched or depleted uranium, 241-americium, 239-plutonium, etc.

As in every aspect of its service to the nuclear industry, Helgeson has consistently made the required investment of time and effort required to keep Helgeson Mobile Whole Body Counting the leader in the field of automated monitoring of personnel. We continue to provide the only Mobile Whole Body Counting capability for uranium, americium, plutonium and other low-energy gamma emitters.



Modern trailer vans, equipped with the latest instrumentation, are available—at any time, anywhere — manned by well-qualified Helgeson staff personnel.

The Helgeson Mobile Counter for low-energy counting.

PHONE 415-846-3453

GEO. LEWIS HELGESON
PRESIDENT

Certified Health Physicist

[illegible]
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HELGESON
NUCLEAR SERVICES, INC.

DATA PROCESSING BY HELGESON

Vital to any successful program of whole body counting is a practical, efficient method of processing the data acquired by the counter.

In all Helgeson counting — either Mode One or Mode Two — primary attention is given to any data calling for immediate action. All data receives a rigid and thorough series of analyses. These data are processed in full compliance with the requirements of all regulatory agencies and industry standards.

RECORD KEEPING

Duplicate microfilm records of all in vivo measurements, as well as all calibration and quality control data generated by Helgeson, are prepared and stored in accordance with ANSI N45.2.9 and other applicable Standards. Full detailed information on the requirements of these Standards is available from any of the nuclear regulatory bodies; or — on request — from Helgeson Nuclear Services, Inc.

An Invitation —

We will welcome an opportunity to outline for you the many ways in which Helgeson Nuclear Services, Inc., not only meets but *exceeds* the specific procedures required by regulatory agencies. We provide you with the control, safety maintenance and reassurance that only fast, accurate and dependable whole body counting can deliver. We invite you to call us — collect — for a discussion of your specific needs.

Underwater Sediment Surveys
Consulting Assignments
Software Development
Quality Assurance Programs

Low Level Counting
Chambers or Rooms
Shadow Shield
Whole Body Counters

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Question 42

The radiation workers will wear protective clothing as required by the RSO or the DRSO. See answer to Question 21.

The company will supply coveralls and gloves to all personnel as necessary. However protective clothing does not necessarily mean anti-"C" clothing since handling of waste containers that are uncontaminated on the outside surface do not require anti-"C".

Question 43

Concerning evaluation and approval of mine safety by the Mine Safety and Health Administration (MSHA). We have discussed this question with Mr. James R. McGee, Supervisory Mine Inspector of the Topeka MSHA office, and he informed us that unless we are actually mining and bringing salt to the surface, OSHA would have jurisdiction, not MSHA. However, he would be happy to inspect the facility and give us a complimentary inspection report.