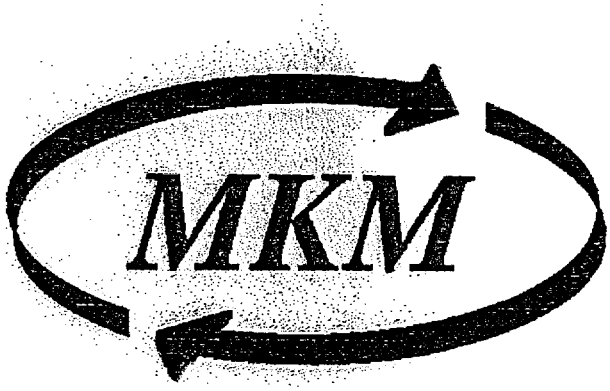


Radiation Safety Procedure

for

Bioassay

MKMP-033

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist Date

MKM Engineers, Inc.

Procedure MKMP 033
Bioassay

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						
6	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

1.0 Purpose and Scope

1.1 To assess inhaled, ingested, or absorbed radioactive materials in order to determine internal dose to workers. To verify that radioactive material controls will maintain internal exposures As Low As Reasonably Achievable, ALARA.

1.2 This procedure will be used to evaluate the need for bioassay, and ensure that evaluation of radioactive materials in the bodies of workers is evaluated prior to and after jobs involving work with radioactive materials when required.

2.0 General

2.1 Definitions

2.1.1 Baseline Bioassay - An initial evaluation of the radioactive material in the body at the start of employment with MKM for personnel who will work with radioactive materials.

2.1.2 Bioassay - Any technique to determine a quantity of radioactive material within the human body or within organs of the body.

2.1.3 Multi-Channel Analyzer (MCA) - A composite of electronic equipment which can detect, identify and quantify gamma ray emitting radioactive material.

2.1.4 Contractor - A company under contract to MKM to conduct analysis of bioassay samples.

2.1.5 NRC - Nuclear Regulatory Commission

2.1.6 NRC Form 4 - The official record of previous exposure history which indicates deep dose, shallow dose, eye dose, the committed dose equivalent (CDE) due to internally deposited radionuclides, and total effective dose equivalent (TEDE).

2.1.7 Derived Air Concentration (DAC) - That concentration of an airborne radionuclide which, if inhaled for 40 hours per week for 50 weeks per year will cause a total effective dose equivalent (TEDE) of 5 rem or a committed dose equivalent (CDE) to an organ of 50 rem.

2.1.8 Gamma Radiation - One of the several kinds of ionizing radiation which is emitted from radioactive material. Gamma radiation is electromagnetic, a single packet of gamma energy is called a photon having no charge or mass. The quantification of gamma emitters in the body can be determined from body counting, urinalysis, or fecal samples.

2.1.9 Beta Radiation - One of several kinds of ionizing radiation which is emitted from radioactive material. Beta particles are electrons having a + or - charge with the mass of an electron. The quantification of beta emitters in the body must be determined from urinalysis or fecal samples.

2.1.10 Alpha Radiation - One of several kinds of ionizing radiation which is emitted from radioactive material. Alpha particles are Helium nuclei and have a +2 charge. The quantification of alpha emitters in the body must be determined from urinalysis or fecal samples.

2.2 Bioassay Policy

Bioassay shall be conducted at the following times for workers who will be exposed to loose surface radioactive materials:

2.2.1 Upon Hire or at the start of a project

a. Determine whether the radiation worker has had previous radiation exposure history using the NRC Form 4 or equivalent.

b. If the worker has a previous history of radiation exposure and does not have documentation of internal exposure, obtain a urine analysis and/or whole body count, as necessary, as described in this procedure.

c. No bioassay or body count is necessary for individuals with no previous radiation exposure history.

NOTE: Baseline bioassay analysis documents previous radioactive material intake to establish a point of reference to the start of employment at MKM.

2.2.2 When airborne activity is found during Routine or Non-Routine Air Samples.

a. Air samples are to be taken and analyzed using facility procedures.

b. Air samples which identify activity concentrations above Radiation Survey Procedure, "Action Levels", may have additional analysis performed.

c. Radionuclide determination using historical information, a MCA or absorption methods and a Radiological Health Handbook, or other documentation of radionuclide emissions is needed to evaluate the intake.

d. Radionuclide quantification using a MCA or other quantification methods..

e. If air sample quantity is less than 0.10 times the DAC value listed in 10 CFR 20, no action is necessary.

f. If an air sample is taken before personnel entry and data is equal to or greater than 0.5 of the DAC value listed in 10 CFR 20, engineering controls or as a last resort, respiratory protection equipment as specified in the Radiation Work Permit (RWP) may be warranted.

g. If an air sample is taken during or after personnel entry into a radioactive airborne contamination area and the air sample data is equal to or greater than 0.5 of the DAC value listed in 10 CFR 20, and no respiratory protection equipment was used, a bioassay sample should be taken if it is likely that 4 DAC hours of exposure occurred. Four DAC hours will lead to a TEDE of (4 DAC-hours * 2.5 mrem/DAC-hour)= 10 mrem.

2.3 Quality Control

2.3.1 Instrumentation used in surveys required by this procedure will be checked with standards daily and verified to have current valid calibration.

2.3.2 This program shall be reviewed annually to verify compliance with license conditions.

2.3.3 Annually, 10% of MKM personnel available who wore respiratory protection shall be body counted to verify the adequacy of respiratory protection equipment and the respiratory protection program.

2.3.4 Annually, 10% of MKM personnel that may have been exposed to loose surface contamination shall be evaluated to verify the adequacy of MKM contamination control techniques. These should not be personnel who wore respiratory protection, if possible.

2.3.5 If the detection level for bioassay samples of 10 % of the Annual Limit of Intake (ALI) is not a practical level for detection, then the RSO and/or the CHP will establish a more appropriate level based on the radionuclide mixture.

3.0 References, Records and Equipment

3.1 References

Reg Guide 8.9	Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program
10 CFR 20	Standards for Protection Against Radiation
RSM	Radiation Safety Manual
MKMP-002	Alpha-Beta Sample Counting Instrumentation
MKMP-008	Radiation and Contamination Surveys

3.2 Records

3.2.1 Documentation initiated using this procedure will be maintained and controlled in accordance with the project work plan and MKM Document Control procedures.

3.2.2 All records of exposure, internal and external are legal and personal and must be controlled as such.

3.2.3 This procedure may cause the generation of reports which should be copied for each of the involved personnel. The reports should be maintained as a part of radiation exposure records for each individual.

3.2.4 All records generated by this procedure may be required to demonstrate compliance with state and federal requirements (10 CFR) and shall be maintained in accordance with these requirements.

3.3 Equipment

As required by testing

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel assigned the task of working with radioactive materials are familiar with this procedure and have access to a copy of this procedure. The director shall ensure that personnel responsible for bioassay actions (scheduling, recording, etc.) are familiar with the requirements of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for quality audits of bioassay records, training of radiation workers, and technical assistants who have actions associated with bioassay. The RSO is responsible to notify personnel of the need for bioassay and the mechanism to get it done.

4.3 Project Manager - The project manager is responsible to ensure all personnel requiring bioassay sampling get their pre-job samples completed before allowing them to work at the site. In addition, the PM is responsible to ensure that personnel leave a bioassay sample upon exit from the site.

5.0 Procedure

5.1 Routine Bioassay Program

5.1.1 Routine whole body counts or urine analysis are conducted on personnel who will work with radioactive materials in order to verify that radiation protection program controls protect individuals working with radioactive materials from inhalation of airborne radioactive material and ingestion or absorption of radioactive materials on surfaces.

5.1.2 Urine analysis shall be required for all radiation workers entering areas controlled due to surface contamination in excess of prescribed limits.

a. Urine samples will normally consist of at least 500 milliliters, but may be changed dependent upon the needs of the testing lab. Samples for the purpose of this procedure shall be taken only for the determination of internal radioactive or hazardous materials.

b. Urine samples shall be labeled on the bottle with as a minimum:

- the name of the project or facility
- indicate an entry or exit sample
- the date of sampling

- the name of the individual providing the sample
- the social security number (SSN) of that person
- the date of birth of that person.

Attach the form to the bottle so that it will not easily become detached.

c. Using the Sample Chain of Custody procedure, MKMP-029, record all information to ensure control of and proper analysis of the sample(s).

5.1.3 Body counts shall be required when working with gamma emitters for which urine analysis is a poor indicator of exposure.

a. Body counts will be conducted with particular concern to the gamma energy range of interest for radionuclides used on the job and at the project site.

b. Documentation of body count results shall include a written review by the MKM Radiation Safety Officer.

5.2 Emergency Bioassay Procedures

5.2.1 Immediate Evaluation

a. If there is radioactive material on or around the face, nose or mouth, take a nasal smear. Count the nasal smear on a portable survey instrument to determine if decontamination is needed.

b. Determine whether the radionuclides are beta, gamma, alpha, or combination emitters using procedures in MKMP-008 and 002..

c. Documentation of bioassay data is critical to ensuring that a complete and proper dose analysis can be made. The information must be as accurate as possible.

i. Time and date of the contaminating event.

ii. A discussion of the events leading to the emergency, the results of initial and current surveys of the personnel involved.

iii. The initial levels of contamination, radiation dose, chemical exposure, and any information concerning decontamination that may be available.

d. If contamination is a pure alpha or beta particle emitter, a urine analysis is necessary. This is because these radiations will not penetrate the body for quantification.

i. Collect the required milliliters of urine, recording the individuals name, collection date, social security number, and collection time on the bottle.

ii. Collect one sample for each effective half-life duration for the radionuclides of interest, for three consecutive effective half-lives. This collection frequency determines radionuclide clearance rate.

iii. Forward urine samples to an analysis laboratory contractor. Forward all information as stipulated in the contract or as necessary for the analysis to be completed.

e. For contaminations involving transuranic compounds, a chest count in the first twelve hours following the event and a subsequent count 24 hours after the initial count will facilitate adequate determination of the intake.

f. If contamination is a gamma emitter, analyze the activity in the body by performing a whole body count. Arranging for a body count at a certified laboratory or contractor.

e. Receive bioassay results from contractor.

f. Include the analysis results, as provided by the laboratory, and the calculated committed dose equivalent and total effective dose equivalent in the worker's exposure file.

g. The project or facility Radiation Safety Officer shall review all documentation associated with the accidental exposure and develop a report for the individual's file to indicate internal and external dose equivalent.

6.0 Attachments

MKMP Form 33-1 Bioassay Label

MKM Engineers, Inc.

Bioassay Label

The label affixed to a bioassay sample should be sized to fit the container in which the sample is stored and shipped. This is an example of an ~1.5" X 3" gummed label which could be used to identify a 100 ml urine sample.

Name: Sample Date:	
SSN/IDN	DOB
Type of Sample:	☐ Entry ☐ Exit ☐ Other* *
Project Name/#	Proj. Mgr. ..... Results To .....

Radiation Safety Procedure

for

Dosimetry

MKMP-034

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist Date

MKM Engineers, Inc.

Procedure MKMP 034
Dosimetry

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						
6	0	8/28/99						
7	0	8/28/99						
8	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

1.0 Purpose and Scope

1.1 This procedure provides instructions for monitoring personnel for exposure to radiation in the workplace.

1.2 Radiation monitoring shall be conducted continuously when it is likely that any individual will exceed;

a. 10% of the annual limit of 5 rem, or 500 millirem.

1.3 Adherence to this procedure will provide assurance that exposures to radiation will be properly monitored enabling exposure to be controlled to As Low As Reasonably Achievable (ALARA).

1.4 This procedure will be used for monitoring of all personnel for exposure to radiation. Monitoring will be provided as described in the site specific work plan for the job to be accomplished.

2.0 General

2.1 Definitions

OSL, etc.

2.1.1 Monitoring - Measurement of radiation exposure to evaluate potential dose equivalent to the individual.

2.1.2 Dosimetry - Devices worn on the body (TLD or DRD) to measure the radiation dose received by the exposed individual.

2.1.3 Dose - The deposition of energy in matter. Dose applies to energy deposited in any material by any type of ionizing radiation.

2.1.4 Dose Equivalent - The deposition of energy in living tissue. Equivalent to the radiation dose times the quality factor for the type of radiation.

2.1.5 Quality Factor - The factor which is radiation dependent and identifies the relative biological effectiveness of a radiation type and energy. The quality factor is multiplied times the Dose to yield the Dose Equivalent.

2.1.6 TEDE - Total Effective Dose Equivalent - The sum of the Deep Dose Equivalent (external dose) and the Committed Effective Dose Equivalent (internal dose).

2.1.7 CDE - Committed Dose Equivalent - The dose equivalent to organs or tissues that will be received from an intake of radioactive material by an individual during the during the 50-year period following the intake.

2.1.8 CEDE - Committed Effective Dose Equivalent -The sum of the products of all organs or tissues with CDE and their respective weighting factors.

2.1.9 SDE - Shallow Dose Equivalent - Also termed Skin Dose, it is used for external radiations which cause their primary energy deposition in the first 0.007 cm of tissue.

2.1.10 EDE - Eye Dose Equivalent - The dose delivered to a thickness of tissue of 300 mg/cm^2 by external radiations.

2.1.11 DDE - Deep Dose Equivalent - The dose equivalent delivered by external radiations to tissues deeper than 1 centimeter.

2.1.12 TLD - Thermoluminescent Dosimeter - A device which provides passive radiation measurement of DDE, SDE, or EDE.

2.1.13 DRD - Pocket Ion Chamber - A self indicating, integrating radiation exposure measuring device.

2.2 Dosimetry Policy

2.2.1 Site Registration Form

All new personnel and visitors required to enter a radiologically controlled area must complete a Site Registration Form (MKMP Form 34-1) prior to starting work at a facility.

Completed Site Registration Forms will be retained with the individual's personnel exposure file. Site Registration Forms for MKM personnel will be updated annually or earlier if existing information is known to be incorrect.

2.2.2 Occupational Radiation Exposure History

An NRC Form 4 or equivalent must be completed by each individual and reviewed by the Project Manager or designee prior to the individual being permitted to work in a radiologically controlled area where a dose of more than 25 mRem could be received.

2.2.3 Dosimetry Assignment

The TLD badge number, name, social security number, whether or not a worker has a completed NRC Form 4 or equivalent, the monitoring period (date from...to) and the individuals date of birth shall be recorded on MKMP Form 34-1, for each individual monitored on a project. The original form will be maintained as a permanent record of the project monitoring. A copy will be maintained in the MKM Las Vegas office.

2.2.4 Occupational Exposure Limits & Administrative Control Levels

a. Nuclear Regulatory Commission limits per calendar year:

Whole Body (TEDE)	5 Rem
Eye Dose Equivalent (EDE)	15 Rem
Shallow Dose Equivalent (SDE)	50 Rem
Organ Dose (CDE)	50 Rem

b. Administrative Control Levels

i MKM Radiation Administrative Control Levels per calendar quarter:

Whole Body (TEDE)	1.25 Rem
Eye Dose Equivalent (EDE)	3.75 Rem
Shallow Dose Equivalent (SDE)	12.5 Rem
Organ Dose (CDE)	12.5 Rem

ii The MKM Radiation Safety Officer (RSO) shall approve exposure above the Quarterly Administrative Control Levels.

2.2.5 Radiologically Controlled Areas

a. A radiologically controlled area (RCA) is considered to be any portion of a facility, plant, vehicle or project for which restrictions apply for purposes of occupational radiation exposure control. Radiation exposures received within the boundary of a restricted area are occupational exposures. As described in the applicable Project Detail Work Procedure, radiologically controlled areas will be established to provide the specific radiological controls necessary for the completion of the work scope and the protection of all project personnel. The following guidelines apply:

b. RCA Location

An RCA is always located within a restricted area as defined by 10 CFR 20. Each radiation area, high radiation area, airborne radioactivity area, and contaminated area shall be contained within a radiologically controlled area.

c. RCA Personnel Monitoring

All personnel and casual visitors within an RCA will be provided with appropriate dosimetry and monitored for radiation exposure.

2.2.6 Radiation Work Permits

a. All personnel working in a radiologically controlled area must be assigned to a specific Radiation Work Permit (RWP), (MKMP 6-1) applicable to the job being performed. A Radiation Work Permit Access Log, (MKMP 6-2) will be attached to each RWP.

b. All personnel assigned to a job requiring an RWP shall sign the Access Log prior to starting work, indicating time in and starting DRD dose. Upon completion of the work or at the end of the shift, personnel shall sign out on the Access Log, indicating time out and the current DRD dose.

2.2.7 A weekly accumulated estimated exposure report will be maintained and posted for employee review at the start of each work week. This report will reflect a running total of exposure available for the current calendar quarter. The beginning quarterly available exposure will be 1250 mRem for those individuals with a completed and signed Occupational Exposure History Form.

2.2.8 Occupational Radiation Exposure History Request

a. An Occupational Radiation Exposure History Request, (MKMP Form 34-5) will be completed for all personnel for whom permanent exposure results have been obtained. Copies of this letter and the NRC Form 4 or equivalent will be sent to the individual, and maintained in the individual's personnel exposure file by the MKM Radiation Safety Office, Las Vegas. For current employees, this letter will be completed annually. For former employees, this letter will be completed and mailed within thirty working days after results have been obtained.

b. Any time MKM is required to report an individual's exposure to the Nuclear Regulatory Commission or other Regulatory Agency, a copy of that report will be sent to the individual.

2.2.9 Project Records/Documentation

Upon completion of the project, it will be the responsibility of the Project Manager or designee to forward all project records, logs, and communications regarding personnel exposure, exposure records, dosimetry records, and all other pertinent information about personnel dosimetry and individual radiation protection for RSO review, and filing in anticipation of NRC review.

2.3 Quality Control

Pocket Ion Chambers (DRD's) shall be calibrated by a certified laboratory or validated procedure every six months when in use.

3.0 References, Records and Equipment

3.1 References

Reg Guide 8.7	Instructions for Recording and Reporting Occupational Radiation Exposure Data
RSM	Radiation Safety Manual
RSTM	Radiation Safety Training Manual
MKMP-006	Radiation Work Permits
MKMP-008	Radiation and Contamination Surveys
MKMP-036	Training

3.2 Records

The following records are completed by this procedure and shall be maintained as specified in the project Quality Assurance Plan.

MKMP Form 34-1	Site Registration Form
MKMP Form 34-2	Lost, Damaged or Questionable Dosimetry Report
MKMP Form 34-3	Dosimetry Issue Log
MKMP Form 34-4	Radiation Exposure Record
MKMP Form 34-5	Occupational Exposure History Request
MKMP Form 6-1	Radiation Work Permits
NRC Form 4	
Weekly Available Exposure Report	

3.3 Equipment

None required

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel assigned tasks using radioactive or hazardous materials are properly trained in their use and the necessity that they be monitored for exposure to radiations and hazardous materials as described in the site specific work plan.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for training of personnel in the use of personal monitoring devices for radiation and for hazardous materials.

4.3 Project Manager - The Project Manager is responsible for ensuring that personnel at the work site understand the proper use of monitoring and recording exposure to radiations and hazardous materials.

4.4 Health Physics Technicians - Health Physics Technicians are responsible for performing the surveys described in the site specific work plan and ensuring the proper use of monitoring devices by workers.

4.5 Workers - All personnel are required to wear their dosimetry as required by the Radiation Work Permit and to maintain their exposure to radiation ALARA.

5.0 Procedure

5.1 Radiation Dosimetry - TLD

All personnel who could potentially receive 10% or more of the permissible legal limit for external radiation exposure are required by 10 CFR 20 to be furnished with personnel monitors. In the interests of ALARA, all personnel who work with radioactive material are required to wear appropriate radiation exposure monitors. Personnel working within a Radiologically Controlled Area will receive, at a minimum, a TLD. Personnel working in areas with dose rates above 5 mrem/hour, will wear a TLD and a low range Pocket Ion Chamber (DRD).

TLDs are the permanent record of an individual's occupational radiation exposure. Upon receipt of Project dosimetry, TLDs and TLD finger rings shall be stored in a low background area inside the project main office or in other designated storage locations when not in use. A (TLD) control badge shall be kept where the assigned badges are stored when they are not in use. All MKM personnel entering a Radiological Control Area (RCA) where 25 mRem could be received will be issued a TLD.

The individual's name, social security number, issue date, and date of return will be recorded on the Monthly Dosimetry Issue Log, (MKMP Form 34-3).

5.1.1 At a minimum, personnel exposed to radiation in areas posted for protection of personnel, shall wear a thermoluminescent dosimeter (TLD) provided by a NVLAP certified vendor for the exposure period.

The TLD which monitors total body DDE shall be worn on the front torso in the region of the torso expected to receive the highest dose. In cases where other areas of the body may receive a higher dose, the HP technician shall evaluate and formally require (by specification on the RWP) that the total body dosimetry be worn at that body location.

5.1.2 Extremity monitoring shall be provided when necessary as described by the specific site work plan.

5.2 Direct Reading Dosimeters

All personnel working in a radiologically controlled area may be issued/monitored by a Direct Reading Dosimeter (DRD). DRD's may either be issued for an individual or group depending on the type and duration of work to be performed. The Project Manager or designee will determine if it will be necessary to issue individual or group DRD's. The DRDs used for general radiation work will have a range of response of 0 to 200 millirem. DRDs will be set to zero (0) at the start of each work shift.

5.3 Visitors/Group Monitoring

Casual visitors are any persons touring or visiting the RCA on an infrequent basis, are escorted while in the restricted area and do not perform or supervise hands-on work.

Routine visitors will be issued a TLD on a case by case basis depending on the type and duration of the job. The Project Manager or designee shall determine if a TLD is to be issued to a visitor based on the visitor's expected function.

TLDs will always be issued to occupational workers expected to exceed 25 mrem. A visitor expected to receive in excess of 25 mrem shall be trained as, and considered an occupational worker.

5.3.1 Visitor RCA Conditions

A visitor may be escorted into a posted RCA provided that:

- No entries into high radiation areas, surface contamination areas, or airborne contamination areas shall be allowed,
- External radiation exposure is limited to less than 25 mrem per year, or less than 10 mrem per entry.

5.3.2 Visitor Dosimetry

Visitors within a posted RCA shall receive, as a minimum, a TLD and may be issued a low range 0-200 mR Direct Reading Dosimeter (DRD).

Visitor TLD results are recorded on the Site Registration Form, MKMP 34-1, which is maintained at the facility. When a visitor is issued a TLD, the individual's name, social security number, issue date, and date of return will also be recorded on the Monthly Dosimetry Issue Log.

5.4 Lost, Damaged or Questionable Dosimetry

In the event of a Lost, Damaged or Questionable TLD or DRD, the Project Manager or designee shall be notified immediately. A Lost, Damaged or Questionable Dosimetry Report, (MKMP Form 34-2) will be completed and filed in the individual's exposure file. The dose estimated from all exposure received while the individual was in an exposure situation must be determined and recorded in the individuals' dose record.

In the event of multiple occurrences, the RSO shall be notified immediately.

5.5 Dropped or Off-Scale Personal Ion Chambers

If a DRD is dropped or if it's hairline is no longer visible (off-scale), the response of this device may no longer be valid and an estimate of the dose received by an individual must be made based on; dose rates and time in the work area, typical dose received on that type of job, or the dose received by another person doing the same type of work in the same area. A Lost, Damaged or Questionable Dosimetry Report, MKMP 34-2, shall be used to document this type of situation. The dose determined shall be added to the dose record at the discretion of the Radiation Safety Officer. The Radiation Safety Officer shall review, approve, and maintain all completed dose estimates.

5.6 Project Dosimetry Issuance/Control

5.6.1 Prior to project commencement, the Project Manager and RSO will determine the appropriate radiation monitoring dosimetry required based on the radionuclides and activity present at the work area.. The Project Manager or designee will contact the MKM RSO provide the following information:

- MKM Project Name and Account Number
- Project start date and projected duration
- Appropriate dosimetry required for project
- Number of dosimetry requested
- Name, address, social security, birth date of project personnel to be monitored.
- Address dosimetry is to be shipped to.

5.6.2 Personnel assigned to projects will wear the appropriate dosimetry for no more than one month or the duration of the project, whichever is shortest.

It will be the responsibility of the Project Manager or designee to return dosimetry to the vendor for processing at the end of each monthly monitoring period.

If the original projected project duration is extended, the Project Manager or designee shall inform the RSO so that the proper arrangements can be made to supply additional dosimetry from the vendor.

The monthly issue period may be extended at the discretion of the RSO. Extensions shall be 'with cause' actions and documented by memo, at a minimum.

5.6.3 Dosimetry Processor (Vendor)

The dosimetry vendor must be NVLAP certified in accordance with the project Health and Safety Plan.

Upon receiving project dosimetry, the Project Manager or designee shall verify that the dosimetry received meets the requirements of the project. Any problems should be reported to the MKM RSO for immediate attention and resolution. All documentation received with dosimetry will be filled out completely. When all required preliminary training and documentation has been completed as described in the project Detail Work Procedure, dosimetry will be issued to project personnel.

It is the responsibility of the Project Manager or designee to ensure that MKMP Form 34-3, Dosimetry Issue Log is completed at the time of dosimetry issuance and a copy is sent to the MKM Office, Las Vegas, Nevada.

6.0 Attachments

MKMP Form 34-1	Site Registration Form
MKMP Form 34-2	Lost, Damaged or Questionable Dosimetry Report
MKMP Form 34-3	Dosimetry Issue Log
MKMP Form 34-4	Radiation Exposure Record
MKMP Form 34-5	Occupational Exposure History Request
NRC Form 4	

MKM Engineers, Inc.
Las Vegas, Nevada

Site Registration Form

ADMINISTRATIVE INFORMATION	
NAME:	DATE:
SOCIAL SECURITY NUMBER:	DATE OF BIRTH:
PERMANENT ADDRESS:	
EMPLOYER'S NAME:	
EMPLOYER'S ADDRESS:	
MKM PROJECT NAME/NUMBER:	
PROJECT CONTACT:	
SIGNATURE:	**DATE:**
MEDICAL HISTORY	
LIST ANY CONDITION OR AILMENT THAT MAY AFFECT YOUR ABILITY TO PERFORM YOUR JOB:	
INDICATE IF YOU ARE EPILEPTIC OR DIABETIC:	
LIST ANY ALLERGIES YOU HAVE:	
LIST ANY MEDICATIONS YOU ARE NOW TAKING:	
LAST TETANUS SHOT DATE:	
DATE OF LAST PHYSICAL:	
SIGNATURE:	**DATE:**
DOSIMETRY USE ONLY	
PIC NO:	PIC READING:_____ MILLIREM.
TLD BADGE NO:	TLD BADGE RESULTS:_____ MILLIREM.
Radiation Safety Officer Approval	
This person has met the requirements for radiation work as specified in the MKM Radiation Safety Manual: Yes ☐ No ☐ This person has a medical or radiological condition which indicates they should not work with radiation: Yes ☐ No ☐ This person meets the requirements for radiation work with consideration of the notes below: Yes ☐ No ☐	
Notes:	
MKM RSO Signature:	

MKM Engineers, Inc.
Las Vegas, Nevada

Lost Damaged or Questionable Dosimetry Report

ADMINISTRATIVE
REPORT DATE/TIME:
PROJECT NAME/NUMBER:
PROJECT MANAGER/CONTACT:
INDIVIDUAL'S NAME/SSN:
BADGE NUMBER:
DATE/TIME OF INCIDENT:
LOCATION IF KNOWN:
APPLICABLE RWP NO.:
DATE BADGE WAS ISSUED:
DOSE CALCULATION
1. Dose from dosimeter readings (Total from date issued) thru _____ (Date) = ___ mrem
2. Current dosimeter reading: (If more than one dosimeter, use highest) = ___ mrem
3. If individual was not wearing a dosimeter, or lost his dosimeter, assign highest exposure received by workers in the same area. If none, use dose rate x time in area for the same period. Dose Rate_____ (mrem/hour) x Time _____ (hours) = ___ mrem
4. Total estimated exposure to be assigned: = ___ mrem
THE METHOD USED TO ESTIMATE MY EXPOSURE HAS BEEN EXPLAINED TO ME, AND THE ESTIMATED DOSE ASSIGNED TO MY RECORD IS ACCEPTABLE FOR THIS EVENT.   *EMPLOYEE'S SIGNATURE:* ..... *DATE:* ___/___/___
DOSE RECORD AUTHORIZATION
DOSE ESTIMATE CALCULATIONS BY: .....DATE: ___/___/___
DOSE ESTIMATE REVIEWED BY: (RSO) .....DATE: ___/___/___
DOSE ESTIMATE POSTED BY: .....DATE: ___/___/___

MKM Engineers, Inc.
Las Vegas, Nevada

Radiation Dosimetry Issue Log

Project/Location: _____ Badge Series No: _____

TLD #	NAME	SSN	FORM 4 (Y/N)	DATES (From/To)	DOB

Page ___ of ___

MKM Engineers, Inc.
Las Vegas, Nevada

Radiation Exposure Record

NAME: **SOCIAL SECURITY NUMBER:**

BIRTH DATE:

TLD BADGE NO: **DRD NO:**

QUARTERLY WHOLE BODY DOSE: 1ST _____ 2ND _____ 3RD _____ 4TH _____

LIFETIME WHOLE BODY DOSE EQUIVALENT: _____ **(REM)** **MONITORING YEAR:** _____

Monitoring Period	Whole Body (DDE)	Shallow Dose (SDE)	Extremity Dose (SDE)	Eye Dose (EDE)	Organ Dose (CDE)	Internal Effective Dose (CEDE)	Total Effective Dose Equivalent - REM (DDE+CEDE) TEDE/CUMULATIVE	
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								
Yearly Totals								

Notes

N/M = Not Monitored

(Current Date)

OCCUPATIONAL RADIATION EXPOSURE HISTORY

NAME:	SSN:
ADDRESS:	
DATE OF BIRTH:	

THE ABOVE INDIVIDUAL WAS MONITORED BY: TLD: ☐ POCKET ION CHAMBER: ☐

THIS IS A/AN: RECORD: ☐ ESTIMATE: ☐

MONITORING BADGE NUMBER:_____

THE MONITORING PERIOD WAS:

FROM:_____ TO:_____

THE OCCUPATIONAL RADIATION EXPOSURE WAS RECEIVED DURING HIS/HER

ASSIGNMENT FOR: MKM Engineers, Inc.

ADDRESS: 6461 Plumcrest Road

CITY/STATE/ZIP: Las Vegas, NV 89108-5309

TELEPHONE: 702-395-9238

RADIATION EXPOSURE RESULTS

DEEP DOSE EQUIVALENT FOR THE PERIOD STATED ABOVE: _____ REMS (DDE)

SHALLOW DOSE (Skin) FOR THE PERIOD STATED ABOVE: _____ REMS (SDE)

EXTREMITY DOSE FOR THE PERIOD STATED ABOVE: _____ REMS

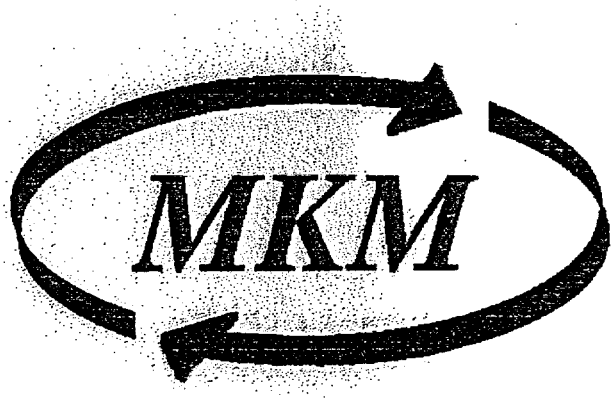
EYE DOSE EQUIVALENT FOR THE PERIOD STATED ABOVE: _____ REMS (EDE)

COMMITTED EFFECTIVE DOSE EQUIVALENT (INTERNAL) : _____ REMS (CEDE)

TOTAL EFFECTIVE DOSE EQUIVALENT (DDE + CEDE): _____ REMS

THIS REPORT IS FURNISHED TO YOU UNDER THE PROVISIONS OF NUCLEAR REGULATORY COMMISSION REGULATION 10 CFR PART 20 TITLED "STANDARDS FOR PROTECTION AGAINST RADIATION". YOU SHOULD PRESERVE THIS REPORT FOR FURTHER REFERENCE.

RADIATION SAFETY OFFICER:_____ DATE:_____



Radiation Safety Procedure

for

Emergency Response

MKMP-035

Revision 0

Reviewed By: _____ 6/28/99

D.J. Wells, RRPT, Radiation Safety Officer — Date

Approved By: _____ 8/20/99

T.J. O'Dou, CHP, MKM Health Physicist — Date

MKM Engineers, Inc.

Procedure MKMP 035
Emergency Response

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-035
Emergency Response

1.0 Purpose and Scope

1.1 This procedure provides instructions for internal MKM notification to emergency personnel.

1.2 This procedure will be used by all MKM personnel to ensure communication of emergency conditions and actions taken in the immediate phase of an emergency.

2.0 General

2.1 Policy

It is the policy of MKM, Inc to provide whatever response is necessary in order to protect the health of our workers and all others at or in the immediate area of a MKM work site. It is important for all MKM employees to recognize that response to emergency situations must be prompt and accurate in order to maximize our efficiency to deal with potential insults to the working population or members of the general public.

2.2 Quality Control

Periodic drills of emergency response actions will be held to ensure proper training of personnel.

3.0 References, Records and Equipment

3.1 References

RSM Radiation Safety Manual

3.2 Records

Results of emergency response and notification shall be kept to ensure recreation of the time and date of emergency actions and when personnel were notified.

3.3 Equipment

None required

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for insuring that all personnel assigned the tasks at a MKM work site are familiar with this procedure, adequately trained in the use of this procedure, and have access to a copy of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for coordinating the response of the emergency response team. The RSO ensures the all members of the emergency response team are qualified by training and experience to perform the requirements of this procedure.

4.3 Project Manager - The Project Manager is responsible for all aspects of response to the emergency until relieved by the customer's emergency team or a representative of government.

4.4 ALL MKM Personnel at the work site shall be familiar with this plan so that participation in an emergency response would ensure minimal chance of expansion of the emergency conditions at the site.

5.0 Emergency Response/contingency Plan and Procedures

This section describes contingencies and emergency planning procedures, and personnel who must be notified. This procedure is to be implemented at each MKM work site. This plan is compatible with local, state and federal disaster and emergency management plans as appropriate.

5.1 Pre-Emergency Planning

During the site briefings held periodically, all employees will be trained in and reminded of provisions of the emergency response plan, communication plan, and evacuation routes.

5.2 Personnel Roles and Lines of Authority

The Project Manager has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The HSO/RCS may be called upon to act on behalf of the Project Manager, and will direct response to any medical emergency.

The Project Manager will notify MKM management personnel of emergencies involving chemicals or radioactive material as soon as practical after the occurrence or after the situation is stable.

5.3 Emergency Recognition/Prevention

The site Health and Safety plan provides a listing of the physical hazards on-site. Personnel will be familiar with techniques of hazard recognition from pre-assignment training and site specific briefings. The HSO/RCS is responsible for ensuring that prevention devices or equipment is available to personnel.

5.4 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented: Three Horn Blasts.

Personnel will be expected to proceed to the closest exit with their buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until an authorized individual provides further instructions.

The Site Health and Safety Plan provides a map depicting evacuation routes for the site and immediate area.

5.5 Emergency Contact/Notification System

The Site Health and Safety Plan provides names and telephone numbers for common emergency contact personnel for the work site. In the event of a medical emergency, personnel will take direction from the HSO and notify the appropriate site emergency organization. In the event of a fire or spill, the Site Supervisor will notify the appropriate facility, local, state, and federal agencies.

5.6 Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the Restricted Zone must be "frisked" to the maximum extent possible without causing further injury or causing delay of any medical function. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious (or may become serious), decontamination may be delayed, but emergency response personnel must be appraised of the situation. First aid should be administered while awaiting an ambulance or paramedics. All injuries must be immediately reported to the Project Manager.

Any person being transported to a clinic or hospital for treatment should take with them information on the materials they may have been exposed to at the site. The HSO/RCS or a senior MKM RCT will accompany an injured person to the clinic or hospital.

Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

5.7 Fire or Explosion

In the event of a fire or explosion, the base fire department should be summoned immediately. Upon their arrival, the Project Manager or designated alternate will advise the Fire Marshall of the location, nature, and identification of the hazardous materials on site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on site to extinguish incipient stage fires; and,
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

NOTE: Extinguishing media available on site: Class A, B, C extinguisher for all fires.

5.8 Spill or Leaks

In the event of a spill or a leak, site personnel will:

- Inform their supervisor immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and,
- Begin contamination and recovery of the spilled materials.

TABLE 10.1

EMERGENCY RECOGNITION/CONTROL MEASURES		
Hazard	Specific Condition/Location	Prevention/Control
Fire/Explosion	Site	A, B, C, D, extinguishers
Spill	Processing Area	Berms
	All other areas	Absorbent materials
Air Release Radioactive Materials	Site	Enclosures, coverings, containment of water spray. Assess extent of contamination dispersal from fire.

Radiation Safety Procedure

for

Training

MKMP-036

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RKPT, Radiation Safety Officer Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist Date

MKM Engineers, Inc.

Procedure MKMP 036
Training

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

1.0 Purpose and Scope

1.1 This procedure provides MKM requirements for training of personnel to work at project sites involving radioactive materials.

1.2 Adherence to this procedure will provide reasonable assurance that personnel will be aware of their surroundings and the hazards associated with the type of materials in the work area, and the type of work conducted.

1.3 This procedure will be used for all MKM project work involving hazardous materials or radioactive materials.

2.0 General

2.1 Description of procedures

		Group
2.1	Contamination Survey Meters	A
2.2	Alpha-Beta Sample Counters	A
2.3	Micro-R Survey Meters	A
2.4	Ionization Chambers	A
2.5	Direct Self-Reading Pocket Dosimeters	A
2.6	Radiation Work Permits	B
2.7	Air Sampling and Sample Analysis	A
2.8	Radiation and Contamination Surveys	A
2.9	Routine Radiological Surveys	B
2.10	Containment Devices	B
2.11	Portable HEPA Systems and Vacuum Cleaners	C
2.12	Step-Off Pads	D
213	Radiologically Restrained Areas	C
2.14	Personnel Protective Equipment (PPE)	D
2.15	Radioactive Materials Brokering	D
2.16	Empty Transport Vehicle Radiological Surveys	E

2.17	Classifying Radioactive Waste	E
2.18	Radioactive Material Tracking	E
2.19	Radioactive Check Source Use and Control	F
2.20	Solidification of Radioactive Liquids and Sludges	B
2.21	Packaging Radioactive Material	B
2.22	Opening Radioactive Material Containers	B
2.23	Decontamination of Equipment and Tools	A
2.24	Unrestricted Release of Materials from Radiological Controls	G
2.25	Soil and Sediment Sampling	G
2.26	Water Sampling	B
2.27	Material Sampling	H
2.28	Sample Chain of Custody	H
2.29	Document Control	H
230	Project Control	H
2.32	Respiratory Protection	B
2.33	Bioassay	B
2.34	Dosimetry	B
2.35	Emergency Response	B
2.36	Training	B
2.37	Radiological Compliance Audits	C
2.38	Procurement and Receipt of Radioactive Material	C

2.2 Definitions

2.2.1 Procedure - A logical, concise document describing the general requirements and methods to be used regarding a specific topic.

2.2.2 Training - The transfer of information by instruction to ensure knowledgeable personnel.

2.3 Quality Control

Personnel will be tested by examination for each instruction received. A grade of 75% shall indicate passing or at the discretion of the instructor, courses may be given pass/fail with no numeric grade assigned.

3.0 References, Records, and Equipment

3.1 References

MKM	Safety and Radiation Safety Procedures
RSM	Radiation Safety Manual
RSTM	Radiation Safety Training Manual
10 CFR	Part 20

3.2 Records

Results of instruction shall be maintained for all personnel assigned to work functions at MKM radiological material work sites. As a minimum, these records will contain the information requested on forms MKMP 36-1 and MKMP 36-2.

3.3 Equipment

None required

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel are trained in all aspects of radiation protection and safety associated with their job functions.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for training of personnel in the aspects of radiation protection associated with their jobs. The RSO ensures Health Physics Technicians are qualified by training and experience to provide radiation protection at job sites.

4.3 Project Manager - The Project Manager is responsible for identifying training needs.

4.4 Health Physics Technicians - Health Physics Technicians are responsible for radiation and general safety protection and counseling workers in the right way to protect themselves.

4.5 All Other Personnel - All MKM personnel are responsible to ensure their training needs are met to ensure safe and efficient completion of projects

5.0 Procedure

5.1 Training shall be conducted for all personnel based on their assignment at a work site as indicated in Table 36-1.

5.2 Procedures for operation of instruments, methods of job completion, information important to emergency response, and methods of personnel protection shall be discussed with all personnel prior to their job assignments which involve these activities.

5.3 The Individual Training Record, Form MKMP 36-1, shall be maintained for each individual assigned to work at MKM work sites.

5.4 The Course Attendance Record, Form MKMP 36-2, shall be prepared by the instructor for each class given.

5.5 A Review of Personnel Qualifications, Form MKMP 36-3, shall be completed by the individual and reviewed by the project manager for each individual hired to perform a specific job function at the project site.

5.6 On-The-Job training is as important as other types of training and should be documented when it occurs. An instructor shall validate on-the job training, using the course attendance record (Form MKMP 36-2), as it occurs. The project manager may provide this validation in the absence of an instructor.

5.7 Casual visitors to a job-site will be escorted. Routine or job related visitor personnel may receive training as noted and those records will be filed and maintained as all other training records.

Table 36-1

Job Function	Job Specific Training			Procedure Training								
	QA Plan	H&S Plan	Work Plan	Procedure Groups								
				A	B	C	D	E	F	G	H	I
Decontamination Technician	✔	✔			✔			*	✔	*		
Equipment Operators	✔	✔	✔		✔			*	✔	*		
Health Physics Technician (Junior)	✔	✔	✔	✔	✔			*	✔	*	✔	
Health Physics Technician (Senior)	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	
Health Physicist	✔	✔	✔	✔	✔	✔	✔	✔	✔	*	✔	
Laborer	✔	✔	✔		✔			*	✔	*	*	
Project Supervisor	✔	✔	✔	*	✔	✔	✔	*	✔	✔	*	✔
Project Manager	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Project Director	✔	✔	✔		✔	✔	✔		✔	✔		✔
Radiation Safety Officer	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Radioactive Material Brokers	✔	✔	✔	✔	✔	✔	✔	✔	✔	*	*	
Sampling Technicians	✔	✔	✔		✔				✔	✔	✔	
Visitors		✔		*	*	*						

* = As Required by Project Manager or Contract Specifications

6.0 Attachments

Form MKMP 36-1	Individual Training Record
Form MKMP 36-2	Course Attendance Record
Form MKMP 36-3	Review of Personnel Qualifications

MKM Engineers Inc.

Individual Training Record

Name:
Address:
SSN:

Course Name	Date	Duration (# Days)	Job Function	Instructor	Grade

MKM Engineers, Inc.

Course Attendance Record

TRAINING DATE:_____ INSTRUCTOR:_____

LOCATION:_____ TOTAL CLASS HOURS:_____

TRAINING COURSE TITLE:_____

SCOPE OF TRAINING: ☐ Classroom ☐ Laboratory ☐ On-The-Job

NAME OF STUDENT	SOCIAL SECURITY NO.	SIGNATURE*

*Verification of attendees may be performed by Trng Instructor &/or Project Mgr (with basis, such as project logs or notes)

Training Conducted by: _____

INSTRUCTOR DATE

Training Approved By: _____

PROJECT MANAGER or DIRECTOR DATE

MKM Engineers, Inc.

Review of Personnel Qualifications

NAME: _____

POSITION: _____

EDUCATION, TRAINING AND EXPERIENCE:

School	Name/Location (City and State)	Date Graduated	# of Years
High School			
College 1			
College 2			
College 3			
Technical 1			
Technical 2			

QUALIFICATIONS: ☐ ACCEPTED ☐ NOT ACCEPTED ☐ NOT FIT FOR DUTY

ADDITIONAL TRAINING REQUIRED: _____

_____

REVIEWED BY: _____ DATE: _____
PROJECT MANAGER or DIRECTOR

ADDITIONAL TRAINING ASSIGNMENT: _____

QUALIFICATIONS: ☐ ACCEPTED ☐ NOT ACCEPTED

REVIEWED BY: _____ DATE: _____
PROJECT MANAGER or DIRECTOR

NOTES: _____

_____

_____

Radiation Safety Procedure

for

Radiological Compliance Audits

MKMP-037

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer — Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist — Date

MKM Engineers, Inc.

Procedure MKMP 037
Radiological Compliance Audits

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						
6	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP - 037
Radiological Compliance Audits

1.0 Purpose and Scope

1.1 The purpose of this procedure is to establish administrative controls and provisions relating to management review necessary to ensure safe operations under MKM's Nuclear Regulatory Commission Radioactive Materials License. This procedure establishes and defines the requirements for management audits of administrative practices and documentation, the radiological training program, technical operations, and compliance with program policy and procedures. In addition, it allows for surveillance on radiological safety equipment, job site work, and radiological area access controls.

1.2 This procedure will be used by MKM to verify by audit that it's radiological programs or any project, as part of those programs, is in compliance with applicable safety controls, and regulatory requirements and standards

2.0 General

This audit is to performed by the Corporate Health Physicist (CHP) or designee, or an independent Radiation Protection qualified auditor.

2.1 Definitions

2.1.1 Safety - A condition in which *you* are free from danger, risk or injury.

2.1.2 Quality Assurance - The entire suite of procedures, practices, documentation, and records required to provide confirmation of the accuracy of a measurement or of the degree of compliance of an activity with regulations and/or specifications.

2.13 Quality Control - Those actions that control the attributes of the analytical process, standards, reagents, measurement equipment, components, system or facility according to predetermined quality requirements.

2.1.4 Audit - A planned and documented activity performed to determine by investigation, examination, or evaluation of objective evidence, the adequacy of and compliance with established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance.

2.1.5 Observation - A practice or event noticed that needs improvement.

2.1.6 Requirement - Identification of the guidance(s) that have been 'deviated from', as identified in the observation.

2.1.7 Severity - The problem level of the identified observation:

- Deficiency (lowest level): an action or situation that is incomplete or insufficient.
- Deviation (median level): an action or situation that minimally differs from guidance (license, procedure, etc.) given on the subject.

- Violation (highest level): an action or situation in which the guidance specification has been omitted or held without regard.

2.1.8 Reason - A description of or the rationale for the *Observation* and its' *Violation* assignment.

2.1.9 Recommendation - A suggestion by the auditor for a solution to the observation that may bring the action or situation into conformance with the *Requirement(s)* it is required to meet.

2.1.10 Response - A statement or statements given with regard to a particular audit observation. These statements should explain the action(s) or fix(es) being implemented to correct the observation, if required.

2.1.11 Good Practice - An instance in which an auditor notes and/or documents an action on the part of a auditee that exemplifies a standard or regulation or practice, i.e. an ALARA principle..

2.2 Precautions

2.2.1 The auditor must comply with all safety requirements of the facility or project being audited.

2.2.2 The auditor and the audit function should minimize interference of operations in the areas being audited.

2.3 Quality Control

The RSC will conduct a review of the audit reports during their regular meeting, to verify effectiveness of the audits and corrective actions taken.

3.0 Records, References and Equipment

3.1 Records

Records produced as a result of these audits will be filed in the permanent project files

3.1.1 Audit Report: The original shall be forwarded to the Manager by the CHP with copies to the RSO, the Department Supervisor, and the Radiation Safety Committee.

3.1.2 Audit Responses: The original shall be forwarded to the CHP by the Manager with copies to the RSO, the Department Supervisor, and the Radiation Safety Committee.

3.1.3 Audit Close-Out and Related Correspondence: The original shall be forwarded to the Manager by the CHP with copies to the RSO, the Department Supervisor, and the Safety Committee.

3.1.4 All original audit records shall be maintained by the CHP and/or the Manager with copies maintained at appropriate location(s).

3.1.5 Copies of audit reports should be maintained at Las Vegas and Denver Operations for review by insurance carriers, federal and/or state regulators, and other parties with a need to have access to these audits. They will remain under the control of the Waste Management Division in both locations.

3.2 References

10 CFR 20	*Standards for Protection Against Radiation*
RSM	Radiation Safety Manual

3.3 Equipment

None Required

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel understand that they are subject to audit and have read and are familiar with this procedure, and have access to a copy of this procedure.

4.2 Radiation Safety Committee (RSC) - The Radiation Safety Committee is responsible for ensuring that these audits are conducted in a timely manner, reviews and evaluates, and may prescribe action on any issue concerning the audit.

4.3 Radiation Safety Officer (RSO) - The Radiation Safety Officer is responsible for training of personnel in this procedure, in addition to being the liaison/interpreter, if required, between the audit function and the license.

4.4 Corporate Health Physicist (CHP) - For the purposes of this procedure, the CHP or designee is auditor and performs the function of program examination.

4.5 Technicians - Technicians includes all personnel that are or may become subject to audit, and they are responsible to comply with the provisions of this procedure.

5.0 Procedure

NOTE: The steps of this procedure are written assuming that there is an auditor in addition to the CHP. In the event that the CHP is conducting the audit, he would assume responsibility for all actions, and in many cases, would combine steps. This is allowed as the CHP will still be held to the basic steps of radiological auditing.

5.1 Program and Project Audits

5.1.1 The audit program is controlled by the Corporate Health Physicist.

1. The CHP or designee must perform the audits.

2. Individuals designated by the CHP shall not be associated with the project that is being audited.

5.1.2 The CHP or designee shall schedule audits as described below:

1. An unannounced audit shall be performed at least semiannually.

2. An audit shall cover a minimum of two working days.

3. A minimum of four weeks shall have elapsed since conduct of the previous audit.

5.1.3 Each audit shall consist of an examination of selected aspects of license conditions, operational activities and applicable regulatory requirements using an audit checklist.

1. An audit checklist shall be prepared by the CHP or designee.

2. Audits shall be conducted such that a comprehensive review and inspection of all activities are performed over a period of two (2) years.

3. Audit checklists shall be prepared using applicable federal and state regulations, licenses, and previous audit findings.

4. Audit checklists shall be paginated and dated as to the date of preparation.

5. Checklist items shall be answerable by SAT, UNSAT, or NA with explanations of UNSAT areas or why an item is NA, if necessary.

5.1.4 Conduct of Audit

1. A preaudit interview shall be conducted with the Manager, RSO, Department Supervision and/or designated staff representatives to describe purpose and scope of audit, and procedure to be followed.

2. The audit shall consist of items specified on the approved checklist and include, but be not limited to:

   - Review of records;
   - Observing operations;
   - Review of corrective actions;
   - Follow-up audit items; and
   - Interviews with personnel.

3. When necessary, the scope of the audit may be expanded by the auditor to fully evaluate a finding or observation.

   - This expansion may be in addition to, but not in place of checklist items required by the CHP.

4. Findings must be recorded and be objective, factual and verifiable.

   - Copies of nonconforming documents should be made when possible.
   - Findings involving a specific procedure shall identify the procedure. Unless findings are willful violations of procedures or license, or a threat to employees, public, or environment, individuals will not be identified.

5. Those findings which present an imminent radiological control and safety threat or hazard shall be identified to the Manager, RSO, and staff immediately.

   - The CHP shall be notified as soon as possible if audit is performed by designee.
   - Immediate corrective action shall be required to be taken by the Manager, RSO or appropriate staff.
   - If necessary, the auditor shall instruct the Manager to stop operations.

6. Upon completion of the audit, the auditor shall:

   - Conduct a brief summary of findings, observations and recommendations, and;
   - Hold a post-audit interview with the Manager, RSO, Department Supervision and/or designated staff.

5.1.4 Audit Report

1. The auditor shall, within 10 working days after completing the audit, prepare an audit report and forward to the CHP, if appropriate.

2. The audit report shall include:

   - A title page to include the project name, date of audit, auditor's name and signature and CHP's name and signature, if different;
   - An introduction listing the general categories included in the audit;
   - A findings section - each finding shall be sequentially numbered.

NOTE: Copies of documents supporting a finding shall be made a part of the audit report when possible; and

   - A recommendations section - each recommendation shall be listed numerically.

NOTE: Recommendations or comments by the auditor are; to enhance the project safety program, or to prevent potential violations of operations requirements of the license or regulations.

3. CHP shall review and approve the final report within five (5) days of receipt from the auditor.

4. The CHP shall forward the audit report to the following:

   - Original to affected Manager; and

- Copies to the RSO, the appropriate Department Supervision, and the Radiation Safety Committee.

5.1.5 Audit Responses

The Manager or designee shall prepare a formal response to each audit finding and recommendation within 10 working days of receipt of the audit report. The responses shall correspond to the numerical system used in the audit report and shall include the following:

1. Date by which the corrective action was or shall be completed;

2. An explanation as to the cause of the deviation and the action(s) taken to prevent recurrence;

2. Action taken or to be taken regarding the recommendation; and

3. Date by which the action was or is to be completed on a recommendation.

4. The distribution shall be as listed in 5.2.4.4.

5.1.6 Response Review

1. The CHP and auditor shall review audit responses for appropriateness and completeness.

2. If audit responses are not satisfactory, additional information shall be requested in writing.

3. If audit responses are satisfactory, the CHP/Designee shall issue a memo to the Manager closing the audit.

4. Records shall be closed out and forwarded for retention upon completion of all required corrective actions and closeout of the audit.

6.0 Attachments

MKMP Form 37-1	Radiological Audit Checklist
MKMP Form 37-2	Audit Report Format

MKM Engineers, Inc.

Radiological Audit Checklist

Reference: Radiation Safety Manual	Yes	No
This checklist is intended to be used as an aide in field observation of radiological work and radiologically controlled areas. It is organized to follow the order of the RSM. The RSM is MKM's implementation of and compliance with 10 CFR 20, and thus represents the minimum acceptable level of performance		
Is there a copy of the RSM onsite?		
Is the RSM accessible to all workers?		
Is there a copy of 10 CFR 20 onsite?		
Is there a copy of the Radiological Operations Procedures Manual onsite?		
MKMP-006 Radiation Work Permits (RWP): **This procedure is intended to meet the 10 CFR 20 requirement that workers have proper dosimetry for the expected radiation levels, that proper personal protective equipment is prescribed, that the hazards associated with the task are known, that the worker is informed, that the area is monitored for changes during the work, and that any special instructions required are communicated to the workers.**		
Does the worker know what document (SOP, RWP, HASP, OP, Program Plan) covers this job?		
Does the worker have a copy available, or is one posted at the worksite?		
Is the document still current?		
Are the RWPs being tracked by the RSC and the RSO?		
Is the RWP properly issued with a radiation protection team leader or supervisor's approval?		
Are the radiation, contamination, and airborne activity levels that are identified in the RWP based on recent (<5 days old) surveys of the area?		
Is the survey that the RWP is based on attached to the RWP or posted at the worksite?		
If the work to be done will change the radiological conditions (i.e., cutting into contaminated systems, handling radioactive materials) does the RWP specify the changes expected and provide instructions for controlling the conditions and PPE/CPC needed?		
Have all the personnel involved in the task properly signed-in on the RWP or SOP sign-in sheet?		
If an ALARA review is specified, has it been completed, and was a pre-job briefing performed?		
Are the RPTs aware that the work is going on?		
Is RPT coverage provided in accordance with the RWP or SOP.		

MKM Engineers, Inc.

Audit Report Format

The following format is supplied as an example. The headings identified in Section 2.0 are shown with an italicized example shown after. An audit format should contain the elements listed in this example.

(Facility or Project Name) - (Required Date of Audit -*First Quarter 199?*) - (Type - *Radiation Protection Audit*)
(Auditor's Name(s)), (Date of Audit - *January, 2000*)

(Observation - *Facility Posting and Control - Inadequate Postings*)

1. Postings near the south side of the building were down making them partially unidentifiable. Also, these auditors found the signs on the postings to be unreadable due to fading of the printing on the signs.

2. Postings around the material on the west side of the yard are in poor condition, and are inconsistent. Three signs on the same rope did not appropriately describe the area.

3. Posting Condition...

(Requirement - *10 CFR Part 20*)

(Severity - *Violation*)

(Reason - *Although postings were present in some cases, not all of the postings sited met the intent of the requirement which is to provide proper control of the areas posted.*)
(Response - *Not Required - Action Complete - Areas posted correctly.*)

Radiation Safety Procedure

for

Procurement, Receipt, and Opening of Radioactive Material

MKMP-038

Revision 0

Reviewed By: _____ 8/28/97
D.J. Wells, RRPT, Radiation Safety Officer — Date

Approved By: _____ 8/30/97
T.J. O'Dou, CHP, MKM Health Physicist — Date

MKM Engineers, Inc.

Procedure MKMP 038
Procurement, Receipt, and Opening of Radioactive Material

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-038
Procurement, Receipt, and Opening of Radioactive Material

1.0 Purpose and Scope

1.1 This procedure provides the methods used to evaluate, order, and receive radioactive sources.

1.2 Adherence to this procedure will provide reasonable assurance that radioactive materials in the form of sources (licensed or unlicensed) meet an accountability standard for need, procurement and receipt.

1.3 This procedure will be used by MKM Radiation Safety personnel to determine the need for any radioactive material source, procedural guidance and accountability in ordering, and proper receipt of and incorporation of sources into a system of control.

2.0 General

2.1 Evaluation of Source Procurement

2.1.1 Establish the need for ordering a new radioactive source by filling out the Radioactive Source Procurement Document, Form MKMP 38-1.

2.1.2 All requests for procurement of sources must be evaluated by the Radiation Safety Officer and/or the Radiation Safety Committee.

2.1.3 In accordance with 10 CFR 20.1906, packages containing radioactive materials will be surveyed for radioactive contamination and radiation levels within three (3) hours after receiving the package during normal working hours, or not longer than three (3) working hours from the beginning of the next scheduled working day after receipt.

2.1.4 Equipment Used for Analysis of Received Sources

- Smears, remote smear handing assembly (in the case of any high level source), and liquid cleaner (if recommended by source manufacturer).
- Portable radiation detection equipment, radioactivity counting equipment, and calibration sources.

2.2 Definitions

2.2.1 Procurement Document - A purchase requisition, order, specification or instruction used to define requirements for purchase.

2.2.2 Restricted Area - An area containing radioactive materials to which access is controlled to protect individuals from exposure to ionizing radiation.

2.2.3 Receipt Survey - A systematic physical evaluation of the radiation and radioactive contamination in or on a received source of radioactive materials.

2.2.4 Leak Test - A survey technique to determine the removable activity from the surface of a sealed source of radioactive material.

2.3 Quality Control

The quality of radioactivity material purchases is dependent upon the manufacturer and communication with that manufacturer. Periodic evaluation of the process shall be conducted to ensure appropriate methods are used and this procedure is followed.

3.0 Records, References, and Equipment

3.1 Records

Source procurement information shall be recorded on Form 38-1, Radioactive Source Procurement Form. This form shall be used for all source purchases, and shall be signed by the requestor, approver, and the Radiation Safety Officer.

3.2 References

RSM	Radiation Safety Manual
MKMP - 008	Radiation and Contamination Surveys
MKMP - 020	Use and Control of Radioactive Check Sources

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel assigned the task of evaluating, procuring, or receiving any source of radioactive material are familiar with this procedure, adequately trained in the use of the procedure and associated equipment and instruments, and have access to a copy of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer is responsible for review and authorization for procurement of any radioactive source, and for training of personnel in the conduct of procurement of radioactive sources.

4.3 Technicians - Technicians conducting surveillance of sources are responsible for complying with provisions of this procedure.

5.0 Procedure

5.1 Initial Evaluations and Processes

5.1.1 Determine that a need has been established for a new radioactive source.

5.1.2 Evaluate the type (radionuclide), activity, and traceability requirements necessary to meet the established need.

5.1.3 Fill out Form 38-1 and route for signature.

5.2 Non-Exempt Source Procurement

5.2.1 Evaluation and approval of Form 38-1 indicates the need for ordering a non-exempt source.

5.2.2 Prior to ordering the source, the RSO shall process a license amendment submittal, if required.

5.2.3 Upon NRC approval of the license amendment, the source may be ordered.

5.3 Receipt of Any Radioactive Source

NOTE: Immediately notify the RSO should any deviation from this procedure be encountered.

5.3.1 Verify receipt paperwork with procurement paperwork to ensure the proper (ordered) source has been received.

5.3.2 Verify external dose rates are within the expected level.

5.3.3 Verify by survey that there is no external contamination.

NOTE: Ensure that appropriate precautions have been taken to protect the surveyor before beginning the contamination survey. Set up or control a specific area for control of any loose surface contamination that may be encountered; don protection gloves, etc. Examine the package for signs of any potential for contamination; such as, crushed, wet, or damaged externally.

5.3.4 If this is a non-exempt source, conduct a leak test of the source in accordance with MKMP-020.

5.3.5 Perform a dose rate and contamination survey of the source container and source storage area.

5.3.6 For exempt sources, a surface smear shall be taken to ensure that the source is not leaking.

NOTE: If the activity estimation determines the leak test sample to be in excess of the leak test limit of 0.005 microcuries, then label the source as unusable to prevent further spread of activity. Conduct a detailed survey of the leak test work area to ensure that no activity from the source has escaped your control.

5.3.7 In the event a package containing radioactive material in excess of a Type A quantity as defined in 10 CFR 71.4 is received, these additional procedures will be enacted;

a. The package shall be received when delivered or have arrangements for immediate notification of the RSO that the material has arrived,

b. Verify it is properly labeled. Prior to disposal of packaging, verify that labels have been completely defaced.

5.3.8 Immediately notify the final delivery carrier and the NRC Region IV Administrator if;

- External radiation levels exceed the limits of 10 CFR 71.47 (200 mrem per hour at any point on the external surface of the package.

- Removable radioactive surface contamination exceeds the limits of 10 CFR 71.87, as specified in 49 CFR 173.443 [ten times (10x) the levels listed in Table 10 or β,γ=22 dpm/cm^2 (220), α=2.2 dpm/cm^2 (22)].

5.4 Inventory Control of Radioactive Sources

5.4.1 Place the source into inventory control system by use of MKMP-20.

5.4.2 Enter the inventory control number on the procurement document to complete the 'traceability loop'.

5.4.3 Indicate the completion of the receipt survey and reference the results.

5.4.4 Indicate the due date of the next leak test and inventory check.

5.4.5 Complete all required paperwork and forward to the RSO for review and approval.

6.0 Attachments

MKMP Form 38-1 Radioactive Source Procurement Form

MKM Engineers, Inc.

Radioactive Source Procurement Form

Applicability: This form shall be used for recording all information regarding procurement of sources of radioactive material.

Reason for Purchase:_____

_____

_____

Radionuclide requested:_____ Activity requested _____ Ci mCi uCi nCi dpm (Circle units of activity)

Date of request ____/____/____ Date source needed ____/____/____

Is it necessary that the activity in this source be traceable to NIST ? Yes ☐ No ☐

Source Information (After Procurement)

Source Manufacturer:_____ Date of Source Assay: ___/___/____

Source Model Number:_____ Source Serial Number:_____

Activity of Source at Assay Date:_____ Ci

Radionuclide name_____ Half-life of radionuclide_____

Is the activity in this source traceable to NIST ? Yes ☐ No ☐

The source radionuclide and activity are: Exempt ☐ Non-exempt ☐

Source Purchase Requested

By:_____ Date: ___/___/____

Source Purchase Approval

By:_____ Date: ___/___/____

Radiation Safety Officer

Radioactive sources may not be purchased without authorization of the Radiation Safety Officer or RSC.

Approval:_____ Date: ___/___/____
Signature (Print/Sign / Title

Source Receipt Data

Receipt survey number:_____ Completed: ___/___/___ Inventory control number: _____

Due date of next survey of this source: ____/____/_____

Reviewed By: _____ Date: ___/___/____

Radiation Safety Procedure

for

Radiological Conditions Awareness Report

MKMP-039

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer — Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist — Date

MKM Engineers, Inc.

Procedure MKMP 039
Radiological Conditions Awareness Report

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-039
Radiological Conditions Awareness Report

1.0 Purpose and Scope

1.1 This procedure provides methods MKM utilizes to document a Radiological Conditions Awareness Report (RCAR), and provide a complete evaluation of all situations requiring management recognition.

1.2 This procedure will be used by MKM to alert management to any situation that may require them to take some action and provide a response/resolution for which they would be held responsible. The RCAR may be used within the MKM organizations, on project sites, on transport pickups, etc.

1.3 This procedure will provide reasonable assurance that MKM management will be made aware of situations, including positive notations, problem solving situations, ideas for improvement in any area of radiation health and safety, project progress, and so forth.

The following, although not all inclusive, are examples of what this document may be used for:

1.3.1 Industrial Safety

- Materials which may be needed to improve personnel and/or equipment safety.
- Procedural changes which may be needed to improve personnel and/or equipment safety.
- Awareness and/or operation training of personnel to improve personnel and/or equipment safety.
- Special work or situations which may need preplanning.

1.3.2 Radiation Safety

- Materials which may be needed to improve personnel and/or equipment safety.
- Procedural changes which may be needed to improve personnel and/or equipment safety.
- New techniques, equipment, or procedures which may increase efficiency and safety.
- New techniques, equipment, or procedures which enhance the ALARA principles.
- Training for situations and/or requirements to improve personnel and/or equipment efficiency and safety.
- Special work or situations which may need preplanning.

1.3.3 Product Improvement

- New techniques, equipment, or procedures which may increase efficiency.
- New ideas which may increase productivity or services available to clients.

1.3.4 Quality Assurance

- Items, equipment, etc. which are noted to be nonconforming to QA procedures or practices.

- New techniques, equipment, or procedures which may improve QA methods.

2.0 General

2.1 Definitions

2.1.1 Safety - A condition in which *you* are free from danger, risk or injury.

2.1.2 Quality Assurance - The entire suite of procedures, practices, documentation, and records required to provide confirmation of the accuracy of a measurement or of the degree of compliance of an activity with regulations and/or specifications.

2.1.3 Quality Control - Those actions that control the attributes of the analytical process, standards, reagents, measurement equipment, components, system or facility according to predetermined quality requirements.

2.1.4 Radiological Awareness Report - A document generated for the purpose of obtaining resolution for problem solving or providing information for improvement. A copy of the completed RCAR will be provided to the preparer of the RCAR upon request.

2.1.5 RCAR Log - A system maintained by the RSC which logs and tracks all RCARs from submittal through all reviews and discussions to completion.

2.2 Precautions and Prerequisites

2.2.1 The RCAR should be used for documentation of all situations requiring management recognition.

2.2.2 All RCARs must be logged into the RCAR logging system upon receipt, except events requiring immediate attention for personnel and/or equipment safety. In this instance, the RCAR will be filed after immediate actions have been implemented.

2.2.3 While on field projects, RCAR accountability will be maintained in the project log book. The designated project radiation safety person will perform the initial evaluation, handle or follow-up on immediate actions, and ensure submittal to the RSO and/or the RSC.

2.2.4 Periodic review of the RCAR log will be completed by the RSO to ensure timely completion of RCAR assignments.

2.2.5 Final disposition of the RCAR is to be reviewed and approved by the RSC for all RCARs completed.

2.2.6 Lessons learned through the RCAR program will be shared with all MKM team members.

2.3 Quality Control

The RSC will conduct a review of the "Active RCAR" files at least once per quarter. Completed RCARs may be included as an item in an annual audit of the Radiation Protection Program.

3.0 References, Records, and Equipment

3.1 References

RSM Radiation Safety Manual

3.2 Records

MKMP Form 39-1 Radiological Conditions Awareness Report
MKMP Form 39-2 RCAR Log

3.3 Equipment

None Required

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel working in radiologically controlled areas are familiar with this procedure, adequately trained in the use of the procedure and have access to a copy of this procedure.

4.2 Radiation Safety Committee(RSC) - The Radiation Safety Committee is responsible for final review, evaluation and action on RCARs that affect the Radiation Safety Program.

4.3 Radiation Safety Officer(RSO) - The Radiation Safety Officer is responsible for training of personnel in the use of this procedure, in addition to providing initial evaluation of all RCARs for submittal to the proper management division. Field project initial evaluations will be performed by the designated project radiation safety person.

4.4 Technicians - Technicians includes all personnel that would have need or cause to generate a RCAR, and they are responsible to comply with the provisions of this procedure.

5.0 Procedure

5.1 When a situation has been identified which requires management attention, the individual noting such a situation shall obtain a blank RCAR (Form MKMP 39-1)from the RSO or designed and fill in the 'Submitted By" section and mark the box appropriate to the situation.

5.2 The submitter should describe the situation in as much detail as possible, and submit it to the RSO or designee for logging and initial evaluation for assignment.

5.3 If the RCAR requires immediate action, those actions shall be performed as documented on the form.

5.4 The RCAR will be assigned by the RSO or RSO designee to the appropriate person or organization for investigation and resolution, or forwarded to the RSC for assignment and/or investigation.

5.5 A copy of the original RCAR will be retained by the RSO or designee after each action step is completed.

5.6 When a final resolution of the RCAR situation has been completed by the assigned individual, the completed RCAR and all documentation will be returned to the RSO, Designee, or RSC.

5.7 The RSC will evaluate the final resolution to the RCAR for completeness and acceptability.

6.0 Attachments

MKMP Form 39-1	Radiological Conditions Awareness Report
MKMP Form 39-2	RCAR Log

MKM Engineers, Inc.

Radiological Conditions Awareness Report

Reportable Condition: _____ Serial Number: _____

Submitted By: _____ Date: __/__/____

Assigned To: _____ Date: __/__/____

☐ Industrial Safety ☐ Radiation Safety ☐ Product Improvement ☐ Quality Assurance ☐ Other

*Description: _____

*Immediate Action Taken: _____

*Final Resolution: _____

*Attach additional pages as necessary. Identify additional pages using the assigned Serial Number.

Radiation Safety Officer: _____ Date: __/__/____

Radiation Safety Committee: _____ Date: __/__/____

MKM Engineers, Inc.

Radiological Conditions Awareness Log

Serial Number	Submitted By	Assigned To	Date	Category	Description (Include any immediate actions taken)	Completion Due	RSC Evaluation	Logged By:

Radiation Safety Procedure

for

Leak Tests for Non-Exempt Sources of Radioactive Material

MKMP-040

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer — Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist — Date

MKM Engineers, Inc.

Procedure MKMP 040
Leak Testing for Non-Exempt Sources of Radioactive Material

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-040
Leak Testing for Non-Exempt Sources of Radioactive Material

1.0 Purpose and Scope

1.1 This procedure provides the methods MKM utilizes to evaluate sources for leakage of radioactive material.

1.2 This procedure will be used by MKM to determine the degree, if any, of leakage of radioactive materials from licensed radioactive sources.

2.0 General

2.1 Definitions

2.1.1 Restricted Area - An area containing radioactive materials to which access is controlled to protect individuals from exposure to ionizing radiation.

2.1.2 Leak Test - A survey technique to determine the removable activity from the surface of a sealed source of radioactive material.

2.2 Precautions and Prerequisites

2.2.1 Sealed sources of activity may exhibit very high dose rates, ensure that a thorough dose rate survey has been performed and documented prior to beginning any leak test evaluation.

2.2.2 Generate a Radiation Work Permit for leak testing of non-exempt sources.

2.3 Quality Control

The quality of leak test analyses is dependent upon the quality of the wipe, and the quality of the analysis. Periodic evaluation of the process and analysis methods shall be conducted to ensure appropriate methods are used and this procedure is followed.

3.0 References, Records, and Equipment

3.1 References

RSM	Radiation Safety Manual
MKMP-001	Operation of Contamination Survey Meters
MKMP-002	Alpha/Beta Sample Counting Instrumentation
MKMP-008	Radiation and Contamination Surveys

3.2 Records

MKMP Form 6-1	Radiation Work Permits
MKMP Form 8-1	Radiological Survey Report
MKMP Form 10-2	ALARA Pre-Job Review
MKMP Form 40-1	Source Leak Test Data Sheet

3.3 Equipment

- Remote smear handing assembly
- Liquid cleaner (if recommended by source manufacturer)
- Smears
- Portable radiation detection equipment
- Radioactivity counting equipment
- Calibration sources.

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for insuring that all personnel assigned the tasks of leak testing sealed sources of radioactive material are familiar with this procedure, adequately trained in the use of the procedure and associated equipment and instruments, and have access to a copy of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer is responsible for training of personnel in the conduct of leak tests of sealed sources.

4.3 Technicians - Technicians conducting leak tests of sealed sources are responsible to comply with provisions of this procedure.

5.0 Procedure

5.1 Precautions and Initial Preparations

5.1.1 Select an area to conduct the leak test which is free of radioactive contamination.

5.1.2 Select instruments which are capable of measuring activity associated with the source of interest and capable of detecting at least 0.005 microcuries of the radionuclide of concern.

5.1.3 Prepare ethanol, propanol, or DI water in a nearby container as appropriate for the equipment being tested. Specific solutions may be mentioned in vendor documentation. If they are, use the solutions required by the vendor.

5.1.4 Inform the RSO of the source leak test to be done. The RSO will evaluate the test and provide precautionary measures to ensure protection of people and equipment in the work area.

5.1.5 Be aware of other counting equipment in the area of the source. Inform counting room personnel that they may experience increased count rates during source exposure for the leak test.

DANGER

Do not ever touch or get close to an exposed source of high activity. Sealed sources of activity may cause extremely high dose rates which may result in physical damage to your body.

5.1.6 Use remote means to cause a cloth or paper smear to contact the outside surface of the source. This smear will be the leak test sample which must be analyzed for activity associated with a potentially leaking source.

5.1.7 Be cautious when handling the leak test sample to prevent the spread of contamination should the sample have loose surface activity from a leaking source.

5.1.8 Ensure accountability and direct control of the source at all times when it is unlocked. Minimize the number of people in the area of the source during the leak test exposure of the source. High radiation area controls are necessary; ie; the source must be either locked or guarded.

5.1.9 Inform the senior radiation protection person on-site prior to the source exposure for leak testing.

5.1.10 Minimize the time period of the source exposure. In a well planned test, the source exposure time should be less than 10 seconds total.

5.1.11 If the source emits particulate radiation, the radioactive material will typically be covered by a very thin window for protection of the source surface. Take special precautions to prevent damage to the window during the leak test.

5.1.12 Be sure to wear rubber or latex gloves when handing equipment associated with the test or the leak test samples.

5.2 Monitoring Technique

CAUTION: The window area of a particle detector is covered with a thin window and can be easily punctured. Avoid surveying areas which have protruding fragments that might puncture the detector face. Upon removal of the leak test sample, monitor the sample away from the source. If the sample yields a high count rate compared to background, assume the source to be leaking and estimate the activity based on the reading of your portable instrument.

Beta Sources

Beta particles have a range in air of greater than a few inches to several feet. The detector must be held within ½ inch of the survey surface to ensure a reproducible geometry for activity estimation. However, touching the surface with the detector may contaminate the detector - avoid contact with the surface to be surveyed.

Alpha Sources

Alpha particles travel only a few centimeters in air. The detector must be held within ¼ inch of the survey surface to detect alpha particles. However, touching the surface with the detector may contaminate the detector - avoid contact with the surface to be surveyed.

NOTE

If the activity estimation determines the leak test sample to be in excess of the leak test limit of 0.005 microcuries, then label the source as unusable to prevent further spread of activity. Conduct a detailed survey of the leak test work are to ensure that no activity from the source has escaped your control.

5.4 Analysis

The leak test sample shall be analyzed by a method which will ensure detection of at least 0.005 microcuries of the radionuclide of interest in the source. MKM procedures shall be used as practical to ensure appropriate analysis and documentation of results.

5.5 Interpretation of Results

The results of leak test samples shall be less than 0.005 microcuries in order to comply with NRC requirements.

6.0 Attachments

MKMP Form 40-1 Source Leak Test Data Sheet

MKM Engineers, Inc.

Source Leak Test Data Sheet

Applicability: This form shall be used for recording all information regarding the leak testing of sources of radioactive material.

Source Information

Source ID Number:_____

Source Manufacturer:_____ Date of Source Assay:___/___/____

Source Model Number:_____ Source Serial Number:_____

Activity of Source at Assay Date:_____ Ci

Radionuclide name_____ Half-life of radionuclide_____

Activity of Source Today:_____ Ci

Leak Test Sample Information

Location of Leak Test Work Area_____

Describe the method of leak testing:_____

_____

Sample Geometry:_____ Detector:_____

Detection Efficiency:_____ c/d Background count time:_____ minutes

Background count rate:_____ counts/minute MDA:_____ microcuries

Sample net count rate:_____ counts/minute Sample count time:_____ minutes

Leak test sample activity:_____ microcuries

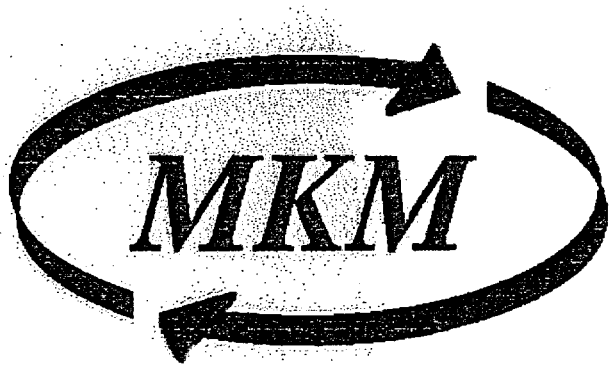
Leak Test Result - Check all boxes that apply.

- ☐ The leak test sample is in excess of the 0.005 microcurie limit
- ☐ The leak test sample is below the 0.005 microcurie limit
- ☐ The source has been controlled to prevent spread of activity from the shield.
- ☐ The source has been released to the operators for continued use.

Source Leak Test Performed by:_____ Date:___/___/____

Leak Test Analysis Conducted by:_____ Date:___/___/____

Radiation Safety Officer:_____ Date:___/___/____



Radiation Safety Procedure

for

Confined Space Entry

MKMP-041

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist Date

MKM Engineers, Inc.

Procedure MKMP 041
Confined Space Entry

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99	19	0	8/28/99			
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						
6	0	8/28/99						
7	0	8/28/99						
8	0	8/28/99						
9	0	8/28/99						
10	0	8/28/99						
11	0	8/28/99						
12	0	8/28/99						
13	0	8/28/99						
14	0	8/28/99						
15	0	8/28/99						
16	0	8/28/99						
17	0	8/28/99						
18	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-041
Confined Space Entry

1.0 Purpose and Scope

This procedure defines the minimum requirements and procedures to protect the health and safety of workers entering a confined space on MKM field projects.

This procedure also provides the methodology to meet the requirements of 29 CFR 1910.146, Permit-Required Confined Spaces.

1.1 This procedure applies to all areas posted as a confined space, any other space meeting the definition of a permit-required confined space, or any space in which confined space hazards (such as oxygen deficiency, trapped gasses, etc.) are present or possibly present.

1.2 This procedure does not attempt to outline the specific entry procedures and requirements for the different types of hazards which could be encountered in confined spaces. Specific procedures for certain confined spaces may be required; for example, radiological requirements for entry into a underground tank. The Confined Space Entry Permit and any attached procedures (i.e., RWP) serve to specify conditions and requirements for entry.

1.3 This procedure applies to all MKM and subcontractor personnel who are required to enter confined spaces on MKM field projects.

DANGER

THIS PROCEDURE REQUIRES ACTIONS TO ENSURE A CONFINED SPACE IS HABITABLE WITH PROVIDED PROTECTION. DEVIATION FROM GUIDELINES OF THIS PROCEDURE MAY BE HARMFUL OR DEADLY.

2.0 Applicability

This procedure will be used to prevent the likelihood of health effects due to work in confined spaces as required by 29 CFR 1910.146, Permit-Required Confined Spaces.

3.0 General

3.1 Definitions

3.1.1 Acceptable Entry Conditions: The conditions that must exist in a permit space to allow entry and to ensure that workers involved with a permit-required confined space entry can safely enter into and work within the space.

3.1.2 Attendant: A worker who is stationed outside a permit-required confined space and is authorized by MKM and trained to monitor Authorized Entrants inside a confined space the entire time the space is occupied.

3.1.3 Authorized Entrant: A worker who is authorized by MKM and trained to enter non-permit and permit-required confined spaces.

3.1.4 Confined Space: A space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, underground vaults, and pits are spaces that may have limited means of entry.); and
- Is not designed for continuous employee occupancy.

3.1.5 Confined Space Entry Permit: The Confined Space Entry Permit (CSEP) is the instrument by which MKM authorizes entry into permit-required confined spaces. The CSEP will identify the permit space, define the conditions under which the confined space may be entered, state the reasons for entering the space, list the anticipated hazards of the entry, document monitoring for known and suspected hazards, list eligible Attendants, Authorized Entrants and individual(s) who will be in charge of the entry, and establish the length of time for which the permit remains valid. The Confined Space Safety Checklist (CSSC)is part of the CSEP and must accompany the CSEP for it to be valid.

3.1.6 Confined Space Safety Checklist: The Confined Space Safety Checklist (CSSC) is the checklist portion of the entry permit which addresses the following:

- The hazards of the permit space;
- The measures for isolation of the permit space;
- The measures used to remove or control potential hazards, such as lockout/tagout, equipment and procedures for purging, inerting, ventilating and flushing hazards;
- Acceptable environmental conditions, quantified with regard to the hazards identified in the permit space;
- Testing and monitoring equipment and procedures by which the employer shall verify that acceptable environmental conditions are being maintained during entry;
- The rescue and other services which would be summoned in case of emergency and the means of communication with those services;
- The communication procedures and equipment used by authorized entrants and attendants to maintain contact;

- The personal protective equipment such as respirators, clothing, and retrieval lines, provided in order to ensure employee safety; and

- Any other information whose inclusion is necessary, given the circumstances of the particular permit space in order to ensure employee safety.

3.1.7 Double Block and Bleed: The closure of a line, duct or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

3.1.8 Emergency: Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger the entrants.

3.1.9 Engulfment: The surrounding and effective capture of a worker by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing.

3.1.10 Entry: The action by which an Authorized Entrant passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening in the space.

3.1.11 Entry Supervisor/Qualified Person: A person who by reason of training, education, and experience is knowledgeable in the operation to be performed, is competent to judge the hazards involved, is able to determine if acceptable entry conditions are present and is able to determine when entry should be terminated. The entry Supervisor authorizing or in charge of entry into permit spaces will be designated by MKM management.

3.1.12 Hazardous Atmosphere: An atmosphere which exposes workers to risk of death, incapacitation, impairment of ability to self-rescue, injury or acute illness from one or more of the following causes:

- A flammable gas, vapor or mist in excess of 10 percent of its Lower Flammable Limit (LFL);

- An airborne combustible dust at a concentration that obscures vision at distances of 5 feet or less;

- An atmospheric oxygen concentration below 19.5 (oxygen deficient) or above 23.5 percent (oxygen enriched);

- An atmospheric concentration of any substance for which a Permissible Exposure Limit (PEL) is published in Subpart Z of 29 CFR 1910 or for which a Threshold Limit Value (TLV) is published in the latest issue of the American Conference of Governmental Industrial Hygienist (ACGI) Manual

for "Threshold Limit Values and Biological Exposure Indices," and could result in employee exposure in excess of either the PEL or TLV; or

- Any atmospheric condition recognized as Immediately dangerous to Life or Health (IDLH).

3.1.13 Hot Work: Operations which could provide a source of ignition such as riveting, welding, cutting, burning, or heating.

3.1.14 Hot Work Permit: Written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

3.1.15 Immediately Dangerous to Life or Health (IDLH): Any condition which poses an immediate threat of loss of life; may result in irreversible or immediate/severe health effects; may result in eye damage; irritation or other conditions which could impair unaided escape from confined spaces.

3.1.16 Inerting: The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. A properly inerted atmosphere will not support flame, fire, combustion, or life. Inerted atmospheres are IDLH atmospheres and may cause death upon exposure.

3.1.17 Isolation: Separation of a confined space from unwanted forms of energy which could be a serious hazard to confined space entrants. Isolation is usually accomplished by blanking or blinding; removal or misalignment of pipe sections or spool pieces; double block and bleed; lockout/tagout of all energy sources, etc.

3.1.18 Line Breaking: The intentional opening of a pipe, line or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

3.1.19 Lockout/Tagout: The placement of a lock and tag on the energy isolating device, indicating that the energy isolating device shall not be operated until removal of the lock and tag in accordance with the established procedure.

3.1.20 Lower Flammable Limit (LFL): The minimum concentration of a combustible gas in the air that will ignite and burn. Ten percent (10%) of the LFL in a confined space is the established action level for worker protection. This protection factor, 10 percent of the LFL, is only for flame/fire and ignition/explosion protection. Ten percent of the LFL can be extremely hazardous from a toxicological perspective depending on the substance in question

3.1.21 Non-Permit Confined Space: A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

3.1.22 Oxygen Deficient Atmosphere: An atmosphere containing less than 19.5 percent oxygen by volume.

3.1.23 Oxygen Enriched Atmosphere: An atmosphere containing more than 23.5 percent oxygen by volume.

3.1.24 Permit-Required Confined Space (Permit Space): A space which has limited or restricted means of entry or exit; is large enough and so configured that an employee can bodily enter and perform assigned work; and is not designed for continuous employee occupancy. A permit space has one or more of the following characteristics:

- Contains or has a known potential to contain a hazardous atmosphere;
- Contains a material with the potential to engulf an entrant;
- Has an internal configuration such than an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which sloped downward and tapers to a smaller cross-section; or,
- Contains any other recognized serious safety or health hazard (not to be limited to atmospheric hazards, but also including mechanical, electrical, radiological, and other hazards).

3.1.25 Permit-Required Confined Space Program (Permit Space Program): Is MKM's overall program for controlling and, where appropriate, for protecting workers from permit space hazards for regulating workers entry into permit spaces.

3.1.26 Permit System: Use of this procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

3.1.27 Prohibited Condition: Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

3.1.28 Rescue Service: The personnel designated to rescue entrants from permit spaces.

3.1.29 Retrieval System: The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) to be used for non-entry rescue of entrants from permit spaces.

3.1.30 Testing: The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit spaces.

3.2 Precautions

An entry program has been established to control entry into all identified confined spaces at MKM field project sites.

CAUTION
The absence of confined space records does not indicate the absence of a confined space hazard. If you are concerned about a space, ask your supervisor or the project manager.

3.2.1 Hazard Identification: A pre-job survey of the MKM field project sites to identify permit-required and non-permit required confined spaces. This survey shall be completed by a person knowledgeable in the operations that shall be performed and is competent to judge the hazards involved (a Qualified Person).

3.2,2 Based upon the presence or absence of each of the potential hazards listed below, a confined space shall be designated as either a permit or non-permit space. Each space shall be posted with an appropriate sign.

- The past and current uses of the confined space which may adversely affect the atmosphere of the permit space;
- The physical characteristics, configuration and location of the permit space;
- The potential for a hazardous atmosphere as defined in Section 3.1.12;
- The mechanical, electrical, biological and radiological hazards;
- The potential for changing conditions in the permit space; or
- The work activities anticipated which would require entry into the permit space.

3.3 Permit Entry System

A Confined Space Entry Permit (CSEP, Form MKMP 41-3) and the Confined Space Safety Checklist (CSSC, Form MKMP 41-2) must be completed by the Entry Supervisor/Qualified Person prior to entry into a permit-required confined space.

3.3.1 The identity of the permit space, the purpose of the entry, the date of entry, and the authorized duration the CSEP is valid, shall be documented on the CSEP.

3.3.2 The names of the Attendants and Authorized Entrants shall be documented on the CSEP.

3.3.3 The name of the individual in charge of entry (entry supervisor) shall be documented on the CSEP.

3.3.4 The CSEP shall not be signed authorizing entry until all actions and conditions necessary for safe entry have been identified and are verified to be in place.

3.3.5 A hot work permit shall be issued in conjunction with the CSEP if hot work is required in the permit space.

3.3.6 A lockout/tagout clearance shall be issued in conjunction with the work on any CSEP if work on energy sources is required in the permit space.

3.3.7 A Radiological Work Permit (RWP) Form MKMP 6-HHS-RWP shall be issued in conjunction with the CSEP if a radiological hazard is present.

3.3.8 The CSEP shall be canceled by the individual authorizing entry after completion of entry and once all entrants have exited.

3.3.9 The CSEP shall be in effect for one shift only. If the space is vacated for any reason during the day, but work in the space is not completed, CSSC and CSEP shall be reviewed prior to re-entry on that day. The requirements of the CSEP shall be completed prior to re-entry into a permit required confined space if the space has been completely vacated for any reason. Where the work in the space is required for more than one day, the authorizing persons (entry supervisors) must add the new date of entry to the CSEP and initial and date the signature block. The CSSC shall also be reviewed and modified, if required, and initialed each day by the Attendants, Authorized Entrants and the Entry Supervisor/Qualified Person.

NOTE: Entry to a non-permit confined space may be authorized for a period of up to one year as specified on the Confined Space Entry Permit.

3.4 Hazard Control

The appropriate equipment and/or procedures for hazard control/reduction shall be maintained and available for permit space entry. The type of equipment and procedures needed shall be determined from the initial hazard identification and characterization of permit-required confined spaces, and the hazard evaluation conducted when the CSEP and CSSC are completed. The need for the following equipment and/or procedures shall be evaluated and indicated on the CSEP.

3.4.1 Atmospheric Monitoring: Atmospheric monitoring shall be conducted prior to entry or re-entry into any permit-required confined space. Monitoring shall be conducted for oxygen deficiency and combustible gases/vapors as a minimum. The need for monitoring for toxic gases shall be determined by the Entry Supervisor/Qualified Person based on the characteristics of the permit space and work activities to be conducted. The appropriate intervals to monitor or the need for continuous monitoring shall be determined by the Entry Supervisor/Qualified Person prior to entry into the permit space.

NOTE: If a confined space is designated as a non-permit confined space, air monitoring may not be required. The CSEP shall indicate whether air monitoring is required.

3.4.2 Ventilation: The need for mechanical ventilation shall be determined when the CSEP and CSSC are completed for a permit space. The permit space shall be purged with fresh air prior to entry except where ventilating is not consistent with the potential hazards of the space (for example, if there is a potential for airborne radiological hazards, or when determined not to be necessary by the Entry Supervisor/Qualified Person.) Continuous ventilation may be specified on the CSEP and CSSC based upon hazard evaluation. Atmospheric monitoring shall be conducted prior to ventilation and after ventilation was begun for a predetermined time to verify that the ventilation system is not introducing any air contaminants (carbon monoxide, for example) into the permit space atmosphere and that the ventilation is effective in establishing an acceptable environmental condition before entry is allowed.

3.4.3 Personal Protective Equipment (PPE): The type of PPE required for entry into a confined space shall be determined by the Entry Supervisor/Qualified Person when the CSEP and the CSSC are completed for a permit space.

- Head protection shall be required when there is a potential for falling objects, both from within the confined space and also through the entryway, and when there are structures and equipment that present hazards to the head.

- Eye and face protection shall be required when there is a potential for irritant dusts, vapors, mists, abrasive particles, chemical splashes, flying objects, or impacts. Safety glasses, impact goggles, chemical goggles, or face shields appropriate for the conditions in the confined space and the work to be performed shall be required as specified in the CSEP and CSSC.

- Hand protection shall be required for mechanical protection (sharp edged, abrasions, punctures), chemical protection, (acids, solvents) physical protection (heat, cold), electrical protection, radiological protection, and when handling slippery tools and materials based on hazards of the permit space.

- Foot protection shall be required when physical hazards (falling objects, rolling equipment), chemical hazards (acids, solvents), slip resistance, electrical conductivity, and the generation of sparks are potential hazards in the permit space.

- Protective clothing shall be required based upon the potential for radiological contamination, chemical contamination, or the physical conditions of the permit space.

- Hearing protection shall be required when there is potential of excessive noise exposure in the confined space. Alternative communication shall need to be developed if the ambient noise levels interfere with verbal communication.

- Respiratory protection shall be required when there is a potential for a hazardous atmosphere as defined in Section 3.1.12 or there is a potential for airborne radioactive material (Authorized Entrants required to wear respirators must meet the requirements of Reference 8.4.)

3.4.4 Isolation and Lockout/Tagout: All energy sources which are potentially hazardous to Authorized Entrants shall be secured, relieved, disconnected, locked out/tagged out and/or restrained before entry into the permit space. The type of energy sources and method of controlling energy sources shall be specified on the CSEP.

- Hazardous materials, high pressure, high temperature or other piping which could introduce hazards into the permit space shall be isolated through blanking and binding, removal or misalignment of pipe sections, double block and bleed, or other isolation methods.

- Equipment or processes which can introduce hazards in the permit spaces shall be locked and tagged out.

3.4.5 External Hazards: The CSEP shall specify the type of barricades and/or warning system which shall be used around the entrance to prevent persons or objects from falling into the permit space. The protection provided shall not interfere with the required ventilation of the permit space or the egress from the permit space.

3.4.6 Non-Permit Spaces: The CSEP shall indicate whether the confined space is a non-permit space. Entry into a non-permit space may be authorized for a period up to one year without providing an Attendant provided that:

- Appropriate entry practices and procedures have been determined and are followed.

- If a potential for atmospheric hazards exist, the atmosphere is tested prior to entry, and as entry proceeds using a direct reading meter and a remote sensing probe.

- Permit space hazards (defined in Section 3.1.24) are not present immediately before entry.

- The CSEP must be revoked when the direct reading instrument or some other circumstances indicated conditions are no longer acceptable for entry. The space shall not be considered a non-permit space until conditions are restored.

3.5 Special Hazards:

There are certain conditions and operations which take place in permit spaces which need special procedures and precautions prior to entry. These conditions/operations may require additional permits and written procedures prior to authorizing entry.

3.5.1 Hot Work: The CSEP shall note whether hot work is to be performed in the permit space. The CSEP shall indicate how the hot work shall impact the atmosphere.

- Additional monitoring and PPE requirements shall be determined by the Entry Supervisor/Qualified Person.

- Hot work shall not be done if flammable dusts or vapors (at any measurable concentration) are present in the permit space or in the air around the permit space.

- Cylinders of compressed gases used for welding/cutting shall never be taken into a permit space, and shall be turned off at the cylinder when not in use.

- All hot work equipment shall be removed from the permit space when the space is vacated for any reason. Gas hoses shall be immediately removed from the permit space when disconnected from welding/cutting torches or other gas consuming devices.

3.5.2 Radiological Work: When radiological hazards are evaluated and found to represent a significant potential hazard, a radiological work permit (RWP) MKMP 6-HHS-RWP must be issued and so noted on the CSEP.

3.5.3 Wet Location: Electrical equipment used in permit spaces which have residual water, or wet surfaces because of condensation, shall be used with a ground fault interrupter (GFI).

3.5.4 Excavations: Permit-required confined space entry procedures may be required for entry into certain excavations and trenches. Each situation must be evaluated separately to determine whether the anticipated work will include work in a confined space. Generally, excavations greater than four feet in depth would be considered a confined space.

- Excavations and trenching shall be completed in accordance with 29 CFR 1926 Subpart P- Excavations.

- The potential for a hazardous atmosphere shall be determined by the Entry Supervisor/Qualified Person.

- Rescue methods must consider the potential for hazardous atmospheres and the potential for a cave-in. (Rescue from a hazardous atmosphere requires removing the victim from the hazardous atmosphere as quickly as possible and could entail using hoisting devices. Serious injury could result if these devices were used to attempt to rescue a victim trapped by a cave-in.)

3.5.5 Tanks and Vessels: Specific procedures would need to be developed based upon the characteristics of the tank or vessel.

3.6 Rescue

Emergency rescue from confined spaces shall be accomplished by one of three mechanisms: (a) by the attendant using rescue equipment provided from outside the space without the attendant or others entering the space, (b) by MKM rescue team, and (c) by the outside rescue team. It is mandatory that the rescue plan and procedure establish whether the MKM or the outside rescue team will be summoned to perform the rescue. Even if rescue capability from outside the space is provided to the attendant, the rescue plan and procedure must also include either the MKM or outside rescue team response.

3.6.1 Rescue Plan and Procedure: Rescue plans and procedures shall be determined prior to authorizing entry into a permit space. The plan shall include the methods of rescue which is to be implemented based upon the characteristics of the space. The CSEP shall designate how rescue shall be accomplished and the type of rescue equipment that shall be used. It shall include rescue procedures for the attendant from outside of the space as well as rescue procedures by either MKM or outside rescue team. The means to summon the rescue team(s) must be included in the rescue plan.

3.6.2 Rescue by the Attendant: Unless authorized by the Entry Supervisor/Qualified Person and the CSEP, the attendant must perform rescue only by using the equipment provided from outside the space without entering the space. Such equipment may include hoists which are attached to the lifelines and safety harnesses worn by the authorized entrants. The attendant must also summon, rescue and direct other emergency services as soon as the attendant determines that the authorized entrants need to escape from the permit space.

3.6.3 Rescue by the MKM Rescue Team: MKM may choose to establish an in-house rescue team. Once established, all authorized entrants, attendants, and qualified persons must be officially informed of the MKM Rescue Team capability by the Project Manager. Until such official notification is provided, reliance must be placed on the outside rescue team. The means to summon the rescue team must be established. When the Entry Supervisor/Qualified Person determines that an entry presents a significant potential hazard, the Entry Supervisor/Qualified Person can specify in the CSEP and rescue plan that the rescue team must be notified in advance when entry into the space is under way.

3.6.4 Training of MKM Rescue Personnel: MKM rescue personnel shall be trained in the following areas:

- Proper use of PPE, including respiratory protective equipment.
- Practice in making permit space rescues at least annually, or more frequently as needed.
- Training in basic first-aid and cardiopulmonary resuscitation (CPR) skills. (At least one member of each rescue team shall maintain current certification in first-aid and CPR.)
- Training required for Authorized Entrants as outlined in Section 3.7.1.

  (a) All training shall be documented on Form MKMP 41-1, MKM Confined Space Training Record.

3.6.5 Rescue by the Outside rescue Team: The outside rescue team must not be summoned until notification is made by the Project Manager that the MKM Rescue Team has been established and is operational. The Project Manager must arrange with local rescue services such as fire departments or other rescue squads to provide rescue for confined space entries. Arrangements must be made with the outside rescue team representatives to visit the MKM project sites and view

representative confined spaces and their associated hazards to be aware of the conditions which they would confront during the rescue. The outside rescue teams will be allowed the opportunity to practice rescues at the MKM project sites in representative confined spaces, so long as such exercises do not place the rescue team at undue risk from site hazards.

3.7 Employee Information and Training

Permit-Required and Non-Permit Confined Spaces on MKM field projects shall be identified and posted with signs. Authorized Entrants, Attendants and Entry Supervisors in charge of confined space entry shall receive training as specified in this section in order to perform their duties with regard to entering into permit-required and non-permit confined spaces.

3.7.1 The training required and duties of the Authorized Entrants are as follows:

- The hazard which may be faced during entry: signs and symptoms of exposure to the hazards and consequences of the exposure;
- The method (i.e., headphones, hand signals) to be used to maintain communication with the Attendant and notification of Attendant when they self-initiate evacuation of the space;
- The equipment required to enter the permit space, and how to use it properly, including external barriers needed to protect against external hazards, and
- When to exit from the confined space (when ordered by the attendant, when an automatic alarm sounds or when the entrants perceive danger).

3.7.2 The training required and duties of the Attendant are as follows:

- Maintain an accurate count of the number of entrants in a permit space;
- Recognize permit space hazards and monitor activities inside and outside the permit space to determine if it is safe for entrants to remain in the space;
- Maintain effective and continuous communication with entrants;
- Order evacuation when: unauthorized activity is taking place, behavioral effects from hazardous exposures are observed, unacceptable activity outside the permit space occurs, there is an uncontrolled hazard in the space, or the attendant must focus on rescue in another permit space or leave the work station for any other reason;
- Warn unauthorized persons away from the space and warn against entering the permit space, order them to exit if they have entered the permit space, inform the Entry Supervisor/Qualified Person if unauthorized persons have entered the permit space; and;

- Summon rescue and other emergency services when determined that the authorized entrants need to escape from permit space hazards, properly use any rescue equipment without entering the permit space.

- Have training required under Section 4.7.1, "Authorized Entrant".

3.7.3 The training required and duties of the Entry Supervisor/Qualified Person authorizing and supervising entry are as follows:

- Determine whether the entry permit (CSEP) contains the requisite information, the necessary procedures and equipment are in place, whether acceptable entry conditions are present and terminate entry if necessary, and conclude entry operations when completed;

- Take appropriate measures to remove unauthorized personnel who are in or near permit spaces; and

- Serve as Authorized Entrants and/or Attendants since they are required to have the training outlined in Sections 4.7.1 and 4.7.2.

3.8 Documentation

MKM field projects shall maintain a current list of workers who have received proper training to become Attendants, Authorized Entrants, rescue personnel, and Entry Supervisor Qualified Persons designated to authorize and be in charge of entry into permit spaces. All training completed shall be documented on Form MKMP 41-1, Confined Space Training Record.

4.0 Responsibilities for Permit-required Confined Space Program

4.1 Responsibilities of MKM Project Manager or his/her Designee.

4.1.1 Ensure permit-required and non-permit confined space areas have been identified and posted at MKM field project locations.

4.1.2 Ensure that the Confined Space Entry Program and Procedures are properly implemented and effective by performing periodic reviews of CSEP's and by conducting on site inspections.

4.1.3 Ensure that Entry Supervisors/Qualified Persons, Attendants, and Authorized Entrants have received proper training in confined space entry.

4.2 Responsibilities of the Entry Supervisor/Qualified Person (individual authorizing and in charge of entry into a Permit Area).

4.2.1 Complete a Confined Space Entry Permit (CSEP) and a Confined Space Safety Checklist (CSSC) in accordance with the requirements of the Entry permit system as defined in section 4.3. Sign the CSEP in conjunction with the Project Manager or his/her designee.

4.2.2 Ensure that necessary procedures, practices, and equipment for safe entry and emergency rescue are in place before allowing entry.

4.2.3 Ensure the CSEP contains the requisite information before authorizing and allowing entry.

4.2.4 Determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are present.

4.2.5 Cancel the entry authorization and terminate entry whenever acceptable entry conditions are not present.

4.2.6 When entry procedures are complete, take necessary steps to close off the space and cancel the entry permit.

4.2.7 Take appropriate measures to remove unauthorized personnel who are in or near entry permit spaces.

4.2.8 Be able to perform the duties as outlined in Sections 5.3 and 5.4.

4.3 Responsibilities of Authorized Entrants.

4.3.1 Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure.

4.3.2 Properly use PPE as defined by Section 4.4.3.

4.3.3 Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

4.3.4 Alert the attendant whenever:

- Any entrant recognizes any warning sign or symptom of exposure to a dangerous situation; or
- Any entrant detects a prohibited or unusual condition.

4.3.5 Exit from the permit space as quickly as possible whenever:

- An order to evacuate is given by the attendant or the entry supervisor;
- The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
- The entrant detects a prohibited condition; or
- An evacuation alarm is activated.

4.4 Responsibilities of Attendants

4.4.1 Know the hazards that may be faced during entry, including information on the mode (e.g., inhalation, absorption, etc.), signs or symptoms, and consequences of exposure.

4.4.2 Shall be aware of possible behavioral effects of hazard exposure.

4.4.3 Continuously maintain an accurate count of authorized entrants in the permit space.

4.4.4 Remain immediately outside the permit space during entry operations until relieved by another attendant.

4.4.5 Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

4.4.6 Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

- When the attendant detects a prohibited condition;
- When the attendant detects behavioral effects of hazard exposure in an authorized entrant;
- When the attendant detects a situation outside the space that could endanger the authorized entrants; or
- When the attendant cannot effectively and safely perform all his or her duties.

4.4.7 Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards. Establishes these lines of communication from entry point prior to entry.

4.4.8 Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:

- Warn the unauthorized persons that they must and shall stay away from the permit space;
- Advise the unauthorized persons that they must and shall exit immediately if they have entered the permit space; and
- Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

4.4.9 Perform non-entry rescues as specified by Section 4.6 of this procedure.

4.4.10 Perform no duties that might interfere with his/her primary duty to monitor and protect the authorized entrants.

4.4.11 Be able to perform the duties outlined in Section 5.3.

4.5 Responsibilities of all MKM or MKM Contractor Employees at MKM field project sites

4.5.1 Observe and obey signs posted near permit-required confined spaces.

4.5.2 Participate in required training for Attendants and Authorized entrants before performing the duties of an Attendant or an Authorized Entrant.

4.5.3 Do not enter any permit-required confined space without reviewing and understanding the completed CSEP and CSSC. Each Attendant and Authorized Entrant shall initial the CSSC indicating they understand the hazards and controls prior to entry.

4.5.4 Bring any unsafe condition to the immediate attention of the MKM supervisor. The supervisor shall document and resolve any unsafe condition reported.

5.0 Procedure

5.1 The following procedures shall be followed for permit-required confined space entry at MKM field project sites.

5.1.1 The MKM Project Manager or his/her designee and/or a Subcontractor shall inform the site's designated Safety representative of the need for entry into a permit-required confined space.

5.1.2 An Entry Supervisor/Qualified Person, along with the Project Manager or his/her designee and/or Subcontractor shall complete the CSEP and CSSC. The Entry Supervisor/Qualified Person shall sign the CSEP.

5.1.3 The hazard identification and characterization previously completed (Section 4.1) on the permit space shall be reviewed. It shall be determined whether conditions have changed since the characterization.

5.1.4 The actual work that will be completed in the permit space must be evaluated to determine the impact on the hazard evaluation of the permit space. Control of hazards associated with both work activities and the space itself must be considered.

5.1.5 The atmospheric monitoring requirements, ventilation requirement, personal protective equipment requirements, isolation requirements, lockout/tagout requirements, rescue procedures and other hazard control procedures needed, shall be determined and documented on the CSEP.

5.1.6 Entry into the permit space shall be authorized by the Entry Supervisor/Qualified Person after all actions and conditions necessary for safe entry have been met, including verifying that Attendant(s) and Authorized Entrant(s) listed on the CSEP have received proper training. The CSEP must be signed by the MKM Entry Supervisor/Qualified Person.

NOTE: If the confined space is determined to be a non-permit space that does not require an Attendant, there will be no Attendant listed on the CSEP.

5.1.7 A safety meeting shall be conducted by the Entry Supervisor/Qualified Person prior to entry for the Attendants and Authorized Entrants. The meeting shall consist of a review of the CSEP and CSSC, and include the potential hazards in the permit space, safe work practices, and emergency procedures. This meeting shall be documented. (Any changes in hazardous conditions or additional people involved shall require an additional safety meeting with all or additional participants, addressing the changes in conditions).

5.1.8 The CSEP shall be posted in a conspicuous location adjacent to the permit space access opening.

5.1.9 The Entry Supervisor/Qualified Person shall ensure that:

a. The proper equipment is available prior to entry into the permit space.

b. The Authorized Entrants are provided with and use the PPE specified on the CSEP.

c. Safety and rescue equipment is available and ready for use as required by the CSEP.

d. Signs are posted and barriers are erected as required by the CSEP.

e. The necessary hazard controls are in place prior to entry, such as cleaning/purging, isolation, lockout/tagout, etc.

5.1.10 Initial atmospheric monitoring shall be conducted prior to entry or re-entry into a permit space by the Entry Supervisor/Qualified Person or an attendant trained in the use of the equipment.

a. When monitoring indicates the atmosphere is hazardous as defined in Section 3.1.12 entry shall be prohibited until appropriate controls are implemented.

b. Monitoring shall be conducted before mechanical ventilation has been provided and during ventilation to ensure the ventilation system itself is not causing a hazardous condition by bringing outside contaminants into, or disturbing contaminants in the space.

c. Monitoring shall be conducted prior to entry using remote sampling probes to check all areas of the permit space at various levels (for example; high and low in the space, in corners, ducts, etc.). The monitoring sequence should be for oxygen concentration, flammable gas or vapor concentrations, potential toxic contaminants, and radiological contaminants.

5.1.11 Immediately before entry, the Entry Supervisor/Qualified Person shall revise the CSEP and the CSSC with the Attendant(s) and Authorized Entrant(s) to ensure they understand the hazards and the controls that are in place. The CSSC shall be initialed by all.

5.1.12 The Authorized Entrant(s) shall sign in on the Confined Space Sign In/Out Log prior to entry into the permit space (MKMP 41-4). This log shall be maintained by the Attendant at all times.

5.1.13 Communication between the Attendant and Authorized Entrant(s) shall be maintained at all times.

a. The Attendant shall order the Authorized Entrant(s) to evacuate immediately when:

- Conditions are observed which are not allowed on the CSEP;
- Behavioral effects from hazardous exposure are observed;
- Conditions outside the permit space are observed which could endanger the Authorized Entrant(s);
- An uncontrolled or previously unidentified hazard is observed within the permit space;
- The Attendant is monitoring entry in more than one permit space and must focus attention on one of the spaces (Authorized Entrants of the other spaces must and shall exit in this circumstance); and
- The Attendant must leave the station.

b. Under no circumstances shall the Attendant enter the permit space unless another person qualified as an Attendant is present.

5.1.14 Upon exit from the permit space the Authorized Entrant(s) shall sign out on the Confined Space Sign In/Out Log MKMP 41-4.

5.1.15 The Entry Supervisor/Qualified Person shall cancel the CSEP when work in the permit space is complete, or has been terminated.

5.2 The following precautions shall be implemented for authorizing entry into all posted non-permit confined spaces at MKM field project locations.

5.2.1 An Entry Supervisor/Qualified Person shall complete and sign a CSEP.

5.2.2 Prior to each entry the Authorized Entrant shall review and initial the CSSC.

5.2.3 Entry into a non-permit space may be authorized for a period of up to one year without the presence of an Attendant provided that the following conditions are met:

- The atmosphere is tested prior to each entry to document that atmospheric hazards are not present.

- Atmospheric testing shall be performed using a direct reading meter equipped with a remote sensing probe.
- Entry shall be suspended immediately when the direct reading instrument or some other circumstance indicates that conditions are no longer acceptable for entry. The area of entry shall cease to be considered a non-permit space until conditions are fully restored.
- All sampling data shall be recorded on the CSEP.

6.0 Quality Control

6.1 The requirements of this procedure shall be audited yearly by observation of control of confined spaces at MKM work sites.

6.2 The records created to establish compliance evidence with this procedure shall be reviewed by the project manager and shall be audited yearly as a part of project reviews.

7.0 Records

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1	Form MKMP 41-1	Training Record
7.2	Form MKMP 41-2	Confined Space Safety Checklist
7.3	Form MKMP 41-3	Confined Space Entry Permit
7.4	Form MKMP 41-4	Confined Space Sign In/Out Log

8.0 References

8.1 29 CFR 1910.146, Permit-Required Confined Spaces
8.2 29 CFR 1926.650, 651 and 651, Excavations
8.3 ANSI Z117.1-1989, Safety Requirements For Confined Spaces
8.4 MKMP-032 Respiratory Protection

9.0 Attachments

9.1	Form MKMP 41-1	Training Record
9.2	Form MKMP 41-2	Confined Space Safety Checklist
9.3	Form MKMP 41-3	Confined Space Entry Permit
9.4	Form MKMP 41-4	Confined Space Sign In/Out Log

Radiation Safety Procedure

for

Lockout - Tagout

MKMP-042

Revision 0

Reviewed By: _____ 8/28/99
D.J. Wells, RRPT, Radiation Safety Officer Date

Approved By: _____ 8/30/99
T.J. O'Dou, CHP, MKM Health Physicist Date

MKM Engineers, Inc.

Procedure MKMP 042
Lockout - Tagout

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-042
Lockout - Tagout

1.0 Purpose and Scope

1.1 This procedure provides the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is performed on machines or equipment.

1.2 Adherence to this procedure will provide reasonable assurance that personnel working on machinery or equipment will be safe from unexpected situations as described.

1.3 This procedure will be used by MKM personnel to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

2.0 General

2.1 Description of procedures.

2.1.1 Procedures used for servicing or maintenance of machinery or equipment where the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees.

2.1.2 Procedures used to return machinery or equipment to normal operating condition after servicing or maintenance has been completed.

2.2 Definitions

2.2.1 Affected employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

2.2.2 Capable of being locked out - An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

2.2.3 Energized - Connected to an energy source or containing residual or stored energy.

2.2.4 Energy isolating device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or

isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

2.2.5 Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

2.2.6 Lockout - The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

2.2.7 Lockout device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

2.2.8 Tagout - The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.2.9 Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.3 Quality Control

2.3.1 If the machine or equipment is locked our or tagged out for over one week, the status is verified and documented weekly.

3.0 References, Records and Equipment

3.1 References

SHSP	Site Health and Safety Plan
SDWP	Site Detailed Work Plan
RSM	MKM Radiation Safety Manual
29 CFR 1910.147	

3.2 Records

The Lockout/Tagout Control Log (Form MKMP 42-1) and Weekly Status (Form MKMP 42-2) is kept in the project control office and provides a list of all lockout/tagout devices currently in use.

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel assigned the tasks of working on potentially hazardous energy sources are familiar with this procedure, adequately trained in the use of this procedure, and have access to a copy of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for training of personnel working on potentially hazardous energy sources described in this procedure. The RSO ensures the Health Physics Technicians are aware of the imlications of working on hazardous energy sources, and are qualified by training and experience to perform the requirements of this procedure.

4.3 Project Manager - The Project Manager is responsible for identifying systems needing lockout/tagout controls.

4.4 Health Physics Technicians - Health Physics Technicians are responsible for performing the lockout/tagout in accordance with this procedure.

4.5 Workers - All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

5.0 Procedure

5.1 When servicing or maintenance is required on machinery or equipment the following steps shall be taken to prevent unexpected energization or start up of the machines or equipment, or release of stored energy which could cause injury to employees.

5.1.1 The Project Manager shall review each job site and identify all potential hazardous energy sources where the unexpected energization, start-up of a machine of equipment or release of stored energy could cause injury.

5.1.2 The Project Manager will notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

5.1.3 The Project Manager shall identify the type and magnitude of the energy that the machine or equipment utilizes, determine the hazards of the energy, and identify the methods to control the energy. If the project manager is not knowledgeable of the system he will contact and consult with qualified individuals (ie electricians, engineers, etc.) for this analysis.

5.1.4 If the machine or equipment is operating, the project manager will have qualified individuals shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.)

5.1.5 The Project Manager directs qualified individuals to de-activate the machine or equipment energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

5.1.6 The Health Physics Technician locks out the energy isolating device(s) with individual lock(s) or tags if the device does not have provisions for an individual lock. The Health Physics Technician logs the individual lock number (or tag number) and location where the lock was installed on the lockout/tagout control log (Form MKMP 42-1) along with the date, time, expected duration, and initials of the individual installing the lock (or tag).

5.1.7 Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, blank flanging etc.

5.1.8 The Project Manager or his/her designee shall ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

5.1.9 The Health Physics Technician will visually determine that the lockout/tagouts listed as currently active in the lockout/tagout log are in service on a weekly basis. This visual observation is documented weekly on Form MKMP 42-2 by date and initials.

5.2 When the servicing of maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:

5.2.1 The Project Manager or his/her designee shall check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

5.2.2 The Project Manager or his/her designee shall check the work area to ensure that all employees have been safely positioned or removed from the area.

5.2.3 Verify that the controls are in neutral.

5.2.4 The Health Physics Technician will remove the lockout devices and inform the machine or equipment operator that the machine or equipment can be re-energize. The Health Physics Technician closes the lockout/tagout control log (Form MKMP 42-1) entry by entering the date, time, and initials of the individual removing the lock (or tag).

5.2.5 The Project Manager or his/her designee shall notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

6.0 Attachments

MKMP Form 42-1	Lockout/Tagout Control Log
MKMP Form 42-2	Lockout/Tagout Weekly Status

MKM Engineers, Inc.
High Hazard Services
LOCKOUT/TAGOUT CONTROL LOG

Lock/Tag Installed							Lock/Tag Removed		
Entry #	Date	Time	Initials	Lock/ Tag #	Location	Est. date of Removal	Date	Time	Initials

MKM Engineers, Inc.

High Hazard Services

LOCKOUT/TAGOUT WEEKLY STATUS

Entry #	Date	Initials	Date	Initials	Date	Initials	Date	Initials	Date	Initials

MKM Engineers, Inc.

Procedure MKMP 042
Lockout - Tagout

LIST OF EFFECTIVE PAGES
(Revision Level 0 = Original Document)

Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date	Page Number	Revision Level	Revision Date
1	0	8/28/99						
2	0	8/28/99						
3	0	8/28/99						
4	0	8/28/99						
5	0	8/28/99						

This table provides the most recent changes to pages in this document. A '0' means the original page is valid, a date in the revision level box indicates the date of the most recent change to the page indicated.

MKMP-042
Lockout - Tagout

1.0 Purpose and Scope

1.1 This procedure provides the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is performed on machines or equipment.

1.2 Adherence to this procedure will provide reasonable assurance that personnel working on machinery or equipment will be safe from unexpected situations as described.

1.3 This procedure will be used by MKM personnel to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

2.0 General

2.1 Description of procedures.

2.1.1 Procedures used for servicing or maintenance of machinery or equipment where the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees.

2.1.2 Procedures used to return machinery or equipment to normal operating condition after servicing or maintenance has been completed.

2.2 Definitions

2.2.1 Affected employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

2.2.2 Capable of being locked out - An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

2.2.3 Energized - Connected to an energy source or containing residual or stored energy.

2.2.4 Energy isolating device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or

isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

2.2.5 Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

2.2.6 Lockout - The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

2.2.7 Lockout device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

2.2.8 Tagout - The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.2.9 Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.3 Quality Control

2.3.1 If the machine or equipment is locked our or tagged out for over one week, the status is verified and documented weekly.

3.0 References, Records and Equipment

3.1 References

SHSP	Site Health and Safety Plan
SDWP	Site Detailed Work Plan
RSM	MKM Radiation Safety Manual
29 CFR 1910.147	

3.2 Records

The Lockout/Tagout Control Log (Form MKMP 42-1) and Weekly Status (Form MKMP 42-2) is kept in the project control office and provides a list of all lockout/tagout devices currently in use.

4.0 Responsibilities

4.1 Program Manager - The Program Manager is responsible for ensuring that all personnel assigned the tasks of working on potentially hazardous energy sources are familiar with this procedure, adequately trained in the use of this procedure, and have access to a copy of this procedure.

4.2 Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for training of personnel working on potentially hazardous energy sources described in this procedure. The RSO ensures the Health Physics Technicians are aware of the imlications of working on hazardous energy sources, and are qualified by training and experience to perform the requirements of this procedure.

4.3 Project Manager - The Project Manager is responsible for identifying systems needing lockout/tagout controls.

4.4 Health Physics Technicians - Health Physics Technicians are responsible for performing the lockout/tagout in accordance with this procedure.

4.5 Workers - All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

5.0 Procedure

5.1 When servicing or maintenance is required on machinery or equipment the following steps shall be taken to prevent unexpected energization or start up of the machines or equipment, or release of stored energy which could cause injury to employees.

5.1.1 The Project Manager shall review each job site and identify all potential hazardous energy sources where the unexpected energization, start-up of a machine of equipment or release of stored energy could cause injury.

5.1.2 The Project Manager will notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

5.1.3 The Project Manager shall identify the type and magnitude of the energy that the machine or equipment utilizes, determine the hazards of the energy, and identify the methods to control the energy. If the project manager is not knowledgeable of the system he will contact and consult with qualified individuals (ie electricians, engineers, etc.) for this analysis.

5.1.4 If the machine or equipment is operating, the project manager will have qualified individuals shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.)

5.1.5 The Project Manager directs qualified individuals to de-activate the machine or equipment energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

5.1.6 The Health Physics Technician locks out the energy isolating device(s) with individual lock(s) or tags if the device does not have provisions for an individual lock. The Health Physics Technician logs the individual lock number (or tag number) and location where the lock was installed on the lockout/tagout control log (Form MKMP 42-1) along with the date, time, expected duration, and initials of the individual installing the lock (or tag).

5.1.7 Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, blank flanging etc.

5.1.8 The Project Manager or his/her designee shall ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

5.1.9 The Health Physics Technician will visually determine that the lockout/tagouts listed as currently active in the lockout/tagout log are in service on a weekly basis. This visual observation is documented weekly on Form MKMP 42-2 by date and initials.

5.2 When the servicing of maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:

5.2.1 The Project Manager or his/her designee shall check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

5.2.2 The Project Manager or his/her designee shall check the work area to ensure that all employees have been safely positioned or removed from the area.

5.2.3 Verify that the controls are in neutral.

5.2.4 The Health Physics Technician will remove the lockout devices and inform the machine or equipment operator that the machine or equipment can be re-energize. The Health Physics Technician closes the lockout/tagout control log (Form MKMP 42-1) entry by entering the date, time, and initials of the individual removing the lock (or tag).

5.2.5 The Project Manager or his/her designee shall notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

6.0 Attachments

MKMP Form 42-1	Lockout/Tagout Control Log
MKMP Form 42-2	Lockout/Tagout Weekly Status

MKM Engineers, Inc.
High Hazard Services
LOCKOUT/TAGOUT CONTROL LOG

Lock/Tag Installed							Lock/Tag Removed		
Entry #	Date	Time	Initials	Lock/ Tag #	Location	Est. date of Removal	Date	Time	Initials

MKM Engineers, Inc.

High Hazard Services

LOCKOUT/TAGOUT WEEKLY STATUS

Entry #	Date	Initials	Date	Initials	Date	Initials	Date	Initials	Date	Initials

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. MKM Engineers, Inc. 2. 3620 North Rancho Drive, Suite 106 Las Vegas, Nevada 89130-3149	3. License number 27-27643-01 4. Expiration date December 31, 2009 5. Docket No. 030-35232 Reference No.

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Any byproduct material with Atomic Nos. 1 through 83	A. Any	A. 100 curies
B. Any byproduct material with Atomic Nos. 84 through 103	B. Any	B. 1 curie
C. Any source material	C. Any	C. 10,000 kilograms
D. Any special nuclear material	D. Any	D. 350 grams uranium 235, or 200 grams plutonium, or 200 grams uranium 233, or any combination of these provided the sum of the ratios of the quantities does not exceed unity

9. Authorized use:

A. through D. For receipt, storage, use, and or possession incidental to any activity as follows:

1. Any activity related to site characterization, decontamination and decommissioning of facilities, equipment, and containers;
2. Solidification and treatment of waste;
3. Packaging and repackaging of customer waste for transport; and
4. Transport in packages or containers approved for use under the provisions of 10 CFR Part 71, for transfer to licensees authorized to receive the materials, in accordance with the terms and conditions of licenses issued by the NRC or an Agreement State.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
27-27643-01

Docket or Reference Number
030-35232

CONDITIONS

10. Licensed materials shall be used only at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material, including areas of exclusive federal jurisdiction within Agreement States. Except for calibration sources, reference standards, and radioactively contaminated equipment owned by the licensee, possession of licensed material at each temporary job site shall be limited to material originating from each site. This material must either be transferred to an authorized recipient or remain at the site after licensee activities are completed.

    If the jurisdiction status of a federal facility within an Agreement State is unknown, the licensee should contact the federal agency controlling the job site in question to determine whether the proposed job site is an area of exclusive federal jurisdiction. Authorization for use of radioactive materials at job sites in Agreement States not under exclusive federal jurisdiction shall be obtained from the appropriate state regulatory agency.

11. A. Licensed material shall be used by or under the supervision of, individuals designated in writing by the Radiation Safety Committee, Thomas J. O'Dou, Chairperson.

    B. The Radiation Safety Officer for this license is Bruce D. Wells.

12. In addition to the possession limits in Item 9 the licensee shall further restrict the possession of licensed material to quantities below the limits specified in 10 CFR 30.32 which require consideration of the need for an emergency plan for responding to a release of licensed material.

13. The licensee shall notify the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, ATTN: Director, Division of Nuclear Material Safety, in writing at least 14 days before initiating activities under this license at a temporary job site, excluding routine packaging or repackaging for purposes of transporting and not requiring a job or site specific work package, and characterization and/or final surveys where radioactive materials and/or radiation are not likely to be detected. This notification shall include:

    A. The estimated type, quantity, and physical/chemical forms of licensed material to be used
    B. The specific site location
    C. A description of planned activities including waste management and disposition
    D. The estimated start date and completion date for the job, and
    E. The name and title of a point of contact for the job, including information on how to contact the individual.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
27-27643-01

Docket or Reference Number
030-35232

14. This license does not authorize the use of licensed material at temporary job sites for uses already specifically authorized by a customer's license. If a customer also holds a license issued by the NRC or an Agreement State, the licensee shall establish a written agreement between the licensee and the customer specifying which licensee activities shall be performed under the customer's license and supervision, and which licensee activities shall be performed under the licensee's supervision pursuant to this license. The agreement shall include a commitment by the licensee and the customer to ensure safety, and any commitments by the licensee to help the customer clean up the temporary job site if there is an accident. A copy of this agreement shall be included in the notification required by License Condition 13.

15. The licensee shall maintain records of information important to decommissioning each temporary job site at the applicable job site pursuant to 10 CFR 30.35(g), 40.36(f), and 70.25(g). The records shall be made available to the customer upon request. At the completion of activities at a temporary job site, the licensee shall transfer these records to the customer for retention.

16. Pursuant to 10 CFR 30.11, 40.14, and License Condition 10, the licensee is exempted from the requirements of 10 CFR 30.35, 40.36, and 70.25, to establish decommissioning financial assurance.

17. If approved by a Radiation Safety Officer specifically identified in this license, the licensee may take reasonable action in an emergency that departs from conditions of this license when the action is immediately needed to protect public health and safety and no action consistent with all license conditions that can provide adequate or equivalent protection is immediately apparent. The licensee shall notify the NRC before, if practicable, and in any case immediately after taking such emergency action using the reporting procedure specified in 10 CFR 30.50(b)(2).

18. Within 30 days of completing decontamination and decommissioning activities at each job site location, the licensee shall notify the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, ATTN: Director, Division of Nuclear Material Safety, in writing of the temporary job site status and the disposition of any licensed material used.

19. Sealed sources or detector cells containing licensed material shall not be opened or sources removed from source holders by the licensee.

20. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as specified by the certificate of registration referred to in 10 CFR 32.210.

    B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.

    C. In the absence of a certificate from a transferor indicating that a leak test has been made within 6 months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License Number
27-27643-01

Docket or Reference Number
030-35232

20. (Continued)

D. Sealed sources need not be leak tested if:

(i) they contain only hydrogen-3; or

(ii) they contain only a radioactive gas; or

(iii) the half-life of the isotope is 30 days or less; or

(iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or

(v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

E. The leak test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(b)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, ATTN: Director, Division of Nuclear Materials Safety. The report shall specify the source involved, the test results, and corrective action taken.

F. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

21. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license.

22. The licensee is authorized to transport licensed material only in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

23. This license does not authorize the import of byproduct material wastes.

License Number
27-27643-01

Docket or Reference Number
030-35232

MATERIALS LICENSE
SUPPLEMENTARY SHEET

24. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

A. Application dated September 10, 1999
B. Letter dated December 3, 1999

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date December 03, 1999

By *[Original signed by Jack E. Whitten]*
Jack E. Whitten, Senior Health Physicist
Nuclear Materials Licensing Branch
Region IV
Arlington, Texas 76011

TABLE 10.2
MKM INTERNAL CALL LIST

In the event of an injury, accident, fire, explosion, spill, release, or other non-routine event, immediately contact one of the people starting with:

	Name	Business Phone No.	Home Phone No.	Cell Phone No.
1.	Thomas J. O'Dou Program Manager	(702) 395-9238	[redacted]	[redacted]
2.	Dixie J. Wells Radiation Safety Officer	(702) 395-9238		
3.	Robin E. Beasley Certified Waste Broker	(702) 395-9238		
4.	Khodi G. Irani President	(281) 277-5100		

E46

B11

TABLE 10.2

In the event of an injury, accident, fire, explosion, spill, release, or other non-routine event, immediately contact one of the following people for further instructions; starting with:

Name	Position	Business Phone	Home Phone	Other Numbers
Thomas O'Dou	Rad Program Manager	702-395-9238	[redacted]	
Dixie Wells	Radiation Safety Officer	702-395-9238	[redacted]	
James Maffessanti	Rad Pro Supervisor	602-862-0453	[redacted]	
Robin Beasley	Certified Waste Broker	702-395-9238	[redacted]	

E #6

6.0 Attachments

None

B/2

7. **Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

a. **Name and Title:**
THOMAS J. O'DOU, CHP, RRPT

b. **Project Assignment:**
CHAIRMAN, RADIATION SAFETY COMMITTEE

c. **Name of firm with which associated:**
MKM ENGINEERS, INC.

d. **Years experience:**
With this firm 3 mo. With other firms 21

e. **Education: Degree(s)/Year/Specialization:**
BS [redacted] Radiological Health Physicist
MS [redacted] Radiological Sciences and Protection

f. **Active Registration: Year first Registered/Discipline:**
Certified Health Physicist, ABHP, 1990, 1994, 1998
Registered Radiation Protection Technologist, NRRPT, 1981
OSHA hazardous Materials Training, 1993, 94, 95, 96, 97, 98, and 99
NQA1 Lead Auditor, 1996
President, Lake Mead Chapter (Nevada) of HPS

g. **Other experience & qualifications relevant to the proposed project:**

Mr. O'Dou is currently holding the position of Corporate Health Physicist and Program Manager for MKM Engineers. His responsibilities include management of the Operations Center at the Las Vegas Office and program management of Radiological/D&D projects. Mr. O'Dou participated in the negotiation of several NRC Radioactive Materials License that have allowed his team to provide services for control of radioactive materials by various processes, including; characterization, remediation, decontamination, decommissioning (D&D), and waste disposal and processing. His main areas of focus are radioactive/mixed waste decontamination and decommissioning, and radioactive waste brokering.

Mr. O'Dou has managed field operations, including the activities of numerous project managers in characterization, remediation, and the D&D of hazardous and radioactive material sites in various areas in the United States. As the Corporate Heath Physicist, he provides technical support for all LV field operations, instrumentation use, instrument calibration, and is responsible for assessing company radiation protection programs and client radiation programs, as required. He has developed and conducted various training programs in radiation safety. In his capacity as Chairman of MKM's NRC Radiation Safety Committee, he leads discussions on the operation of projects and maintaining strict cognizance over project dosimetry, instrumentation, dose evaluations, and field operations procedures.

Mr. O'Dou has over 21 years in managing radiation safety programs and providing technical support in health physics in both power operations and radioactive waste management. He has been charged with developing and conducting radiation safety training programs including protection programs, operational safety programs. From 1989 through 1999, Mr. O'Dou designed, developed and copyrighted computer application software to assist the radiation safety industry. Through his marketing skills and efforts, he has provided technical support to over 300 clients and facilities around the world with this software.

Through continuous assessment of radiological control operations, Mr. O'Dou has provided program direction and has made recommendations for improvement to nuclear power stations, Naval shipyards, utility companies, waste facilities, and private engineering corporations. He has served on radiation protection advisory boards as a Radiological Control Ombudsman as well as participating in Radiological and Chemistry Subcommittee, Radiological Health Advisory Boards, and Emergency Control Centers in the nuclear industry.

Mr. O'Dou has been responsible for maintaining NRC licenses, including the Portsmouth Naval Shipyard where he was charged with industrial radiography and instrument calibration facilities. In addition, he has conducted audits of radiological control operations for compliance with NAVSEA and Army regulations.

A brief summary of Mr. O'Dou's projects include the following:

Project Manager for Lake City Army Ammunition Plant to characterize an outside firing range for DU projectiles. He was also responsible for radiation protection coverage for the excavation of radioactive plants from various areas of the range;

Project Manager for Picatiny Arsenal for the characterization of an inside firing range and weapons repair room located in New Jersey;

Project Manager for North Island Naval Air Station for the characterization and development of plans for separation of MgTh from waste material;

Program Manager for Alameda Naval Air Station for the cleanup of Strontium-90 on an open air pier;

Project Manager for Rock Island Arsenal for the characterization of a tritium accident site; and

Project Manager for Los Alamos National Laboratory for preparation of software for radiation work permits.

Mr. O'Dou has authored over 20 papers on various topics in the radiation industry and participated in over 40 professional courses.

B/3

7. **Brief resume of key persons, specialists, and individual consultants anticipated for this project.**

a. **Name and Title:**
DIXIE J. WELLS, RRPT

b. **Project Assignment:**
HEALTH AND SAFETY OFFICER, RADIATION SAFETY OFFICER

c. **Name of firm with which associated:**
MKM ENGINEERS, INC.

d. **Years experience:**
With this firm 3 mo. With other firms 26

e. **Education: Degree(s)/Year/Specialization:**
BA/English [redacted]
BS/Electrical Engineering [redacted] E46

f. **Active Registration: Year first Registered/Discipline:**
Registered Radiation Protection Technologist/1987
OSHA Hazardous Materials Training/1993, 94, 95, 96, 97, 98, and 99
NQA 1 Lead Auditor, 1996
National HPS Affiliates Chairman, 1998-2000

g. **Other experience & qualifications relevant to the proposed project:**

Ms. Wells is the Health and Safety Officer and Radiation Safety Officer for MKM Engineers, Inc. Her responsibilities include evaluation of all health and safety operations at project sites and the Continual Improvement Program for the MKM Corporate Health and Safety Plan. Ms. Wells is tasked with conducting OSHA training classes and updates for MKM personnel and is responsible for all regulatory compliance. She has completed the negotiation of NRC Radioactive Materials Remediation Licenses of Broad Scope. These licenses allow her team to provide services in special nuclear materials, source materials, by-product materials, waste disposal, and waste processing. She implements a corporate program focusing on radioactive waste brokering, radioactive and mixed waste decontamination and decommissioning; including explosive ordnance disposal.

Ms. Wells has over 25 years experience in the health physics industry, in both power operations and radioactive waste management. She was Vice-Chair of the NRC Region III 10 CFR 20 Working Group and as technical training specialist, was responsible for setting up the December 1992 training session for the NRC Region III site inspectors. She has authored, co-authored and taught Radiation Worker and Respiratory Protection training and Practical Health Physics to numerous firms, project managers, and decommissioning personnel. She has set up health physics and radioactive waste supply systems on a company-wide basis, and served as the direct interface with corporate and medical personnel.

MKM ENGINEERS, INC.

Ms. Wells is well known throughout the industry for her precise and timely performance in handling the NRC license process. She has written and implemented two (2) NRC Radioactive Materials Licenses within 2 to 10 months, and successfully completed and implemented a multi-part Agreement State license for a waste processing facility, within 7 months. She has successfully negotiated other Agreement State licenses, and completed an audit of the Army's Radiation Protection Program as it was implemented by ACALA, the Major Subcommand. This audit was required by, and returned to the NRC.

In Ms. Well's most recent positions, she has been responsible for corporate radiation protection programs, project management for a variety of routine D & D projects, as well as auditing other facilities for license and regulatory compliance. She has had a major responsibility in project support for DoD and DOE facilities and contracts. She has established policy and parameters for radiological assessor, health physics coordinator, and junior technicians.

Ms. Wells is trained in accordance with the Navy Nuclear Program and NavSea Articles 107 and 108. Her responsibilities included radiation protection and contamination control during the refueling of nuclear submarines, shield and routine surveys, and job coverage as required in submarines and within the refueling complex.

A brief summary of Ms. Wells projects include the following:

Radiation Safety Officer for Picatiny Arsenal for the characterization of DU contamination at an inside firing range;

Radiation Safety Officer for the North Island Naval Air Station for the characterization and separation of MgTh from waste metal;

Project Manager for the Alameda Naval Air Station for the cleanup of Strontium-90 from an open pier;

Radiation Safety Officer at Fort Devens for the characterization and removal of a tritium contaminated structure and it's contents; and

Radiation Safety Officer for Stanford Linear Accelerator for the characterization of the activated scrap metal for disposal from a SLAC linear accelerator.

Ms. Wells is a member of the Health Physics Society, Chairman of HPS Affiliates Committee, and the National Registry of Radiation Protection Technologists. She has completed numerous courses in health physics theory both locally and nationally as well as national leadership training seminars.

B/H