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WMUR:TLJ
Docket No. 40-8786

Uranium Resources Inc.
ATTN: Mr. Mark S. Pelizza
735 Promenade Bank Tower
Richardson, Texas 75080

Gentlemen:

As part of our review of your application for a source material license for the North Platte R&D In-Situ Project, we have identified the need for additional information regarding the proposed evaporation ponds. Information pertaining to the following specific items should be submitted for NRC review no later than July 17, 1981.

1. A geotechnical investigation of the proposed site for the evaporation ponds must be conducted. General requirements are outlined in Attachment 1, "Staff Branch Position on Explorations for Design and Evaluation of Uranium Mill Tailings Retention Systems." As a minimum, three borings 15 feet deep should be drilled and sampled, and the engineering properties of the evaporation pond foundation soils reported. Provide boring logs, boring locations, standard penetration test values, and laboratory test results.

2. Provide gradations and permeabilities of both the material forming the layer in which the detection pipes are placed and the subgrade material. The subgrade should be at least two orders of magnitude less permeable than the leak detection layer. Also provide specifications for subgrade preparation.

3. Freeboard requirements for the ponds must be determined in accordance with Regulatory Guide 3.11, "Design, Construction and Inspection of Embankment Retention Systems for Uranium Mills" (Attachment 2). For these evaporation ponds, an acceptable design rainfall for computing the PMF series is the 6-hour Probable Maximum Precipitation (PMP), plus 40% of the 6-hour PMP, plus the 6-hour 100 year rainfall. Acceptable wave runup calculation methods are given in "Shore Protection Manual," U.S. Army Coastal Engineering Research Center, 1977, and Army Corps of Engineers ETL 1110-2-221, "Wave

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Runup and Setup on Reservoir Embankments." In addition, exterior slope protection in areas exposed to surface runoff from a PMF on adjacent water courses must be addressed. Any diversion ditches must also be designed to provide adequate capacity to pass the Probable Maximum Flood (PMF) without erosion. The ditches should be designed to convey the runoff from a PMP, corresponding to the time of concentration.

4. For the liner, leak detection system, perimeter fence, monitoring program, and other aspects of the liner design, provide the information and analyses specified in the attached Staff Technical Position (Attachment 3). Provide a program which satisfies the various testing and quality assurance criteria discussed in the position.

If you have any questions regarding these matters, please contact Mr. Ted Johnson of my staff at (301) 427-4539.

Original Signed by:
J. J. Linehan

John J. Linehan, Section Leader
Operating Facilities Section I
Uranium Recovery Licensing Branch
Division of Waste Management

Enclosure:
As stated

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STAFF TECHNICAL POSITION
URANIUM RECOVERY LICENSING BRANCH
#WM-8101

DESIGN, INSTALLATION, AND OPERATION OF NATURAL AND SYNTHETIC LINERS AT URANIUM RECOVERY FACILITIES

1 INTRODUCTION

This branch technical position describes the engineering practices, quality assurance requirements, and construction controls considered satisfactory for the selection, design, installation, and operation of natural and synthetic liners. They result from operating experience at several facilities utilizing liners and reflect the approaches and state-of-the-art methods that have been found acceptable to the NRC staff. If alternate approaches are proposed, they will be considered on a case-by-case basis.

2 DISCUSSION

The milling and processing of uranium ores results in the production of large volumes of liquid and solid wastes. These wastes normally are stored in man-made retention structures. Several licensees have utilized natural and synthetic liners to prevent seepage movement from both small evaporation ponds and large tailings impoundments. In the past, the design and construction of some of these impoundments and the selection of some liners were based largely on judgment and experience. In several cases, the experience and judgment utilized was not sufficient to prevent the occurrence of synthetic liner failures. These failures occurred principally as a result of improper installation techniques, improper design, and insufficient testing. Specific examples of the failures included torn field seams due to installation at less-than-optimum temperatures and damaged liners due to abrasion and foot traffic. No known failures of natural liners have occurred at licensed uranium recovery facilities. However, the staff has noted design deficiencies, particularly in the placement and operation of leak detection systems. In addition, the leak detection systems have not always been designed and installed properly to intercept and identify positively the source of leakage through synthetic liners.

The NRC staff has conducted site visits to several facilities utilizing liners, including those where failure occurred. The criteria outlined in this position paper have been developed on the basis of information gathered during these site visits, recommendations of licensees and industry consultants, information available in the literature, and from staff experience.

3 STAFF POSITION

Certain information and analyses need to be provided in various areas of liner selection, design, and installation. There are several features of a liner design which require particular attention, and these are addressed below.

The installation of any type of liner requires careful placement of the liner and careful testing of important features of the liner system during and after installation; staff research and experience indicate that most previous liner failures could have been prevented by more rigorous testing and test methods. Staff recommendations for testing and for development of a quality assurance program also are outlined below.

During plant operation, particular care must be taken to inspect the impoundments and maintain them so that design standards are met. Staff recommendations for inspection and maintenance of the impoundments during plant operation also are discussed below.

3.1 Selection of a Liner

3.1.1 Design

All constituents of the waste to be contained in the pond should be identified, including organics, inorganics, acids, and bases. It should be documented that the liner material (synthetic or clay) is physically and chemically inert under exposure to the waste to be placed in the pond. The liner manufacturer's recommendations should be followed in selecting the type of synthetic liner that will be used, relative to the waste product and atmospheric conditions. Compatability of the liner with various combinations of waste products and atmospheric phenomena should also be documented. For example, a liner may be resistant to ultraviolet rays and to organic matter, but not to a combination of the two.

Synthetic liners that are to be left uncovered should be demonstrated to be stable under exposure to ultraviolet radiation and ozone. The liner should also be capable of retaining its strength characteristics over the temperature ranges representative of the site. Tensile strength, brittleness, hardness, and elongation are included in the parameters which should be considered.

In general, synthetic liner manufacturers have tested the synthetic liner for exposure to various chemicals, atmospheric conditons, and temperature ranges. Those recommendations should be followed whenever possible.

As discussed in Appendix A, 10 CFR 40, extensive testing will be necessary for clay liners where design information may not be available (see 3.1.2, below, for testing recommendations).

3.1.2 Installation, Testing, and Quality Assurance

Most synthetic liners have usually been tested extensively by the liner manufacturer, who normally has published this information. However, any questionable liner/waste product combination should be tested carefully by the liner manufacturer or the licensee. The tests should show conclusively that the liner will not deteriorate when subjected to the waste product and expected atmospheric and temperature conditions at the site. These test data and all available manufacturers' test data should be submitted with the license application.

For clay liners, tests should be conducted to demonstrate that the liner has an original saturated hydraulic conductivity not greater than 10^{-7} cm/sec. The tests, at a minimum, should consist of falling head permeameter tests performed on columns of liner material obtained during and after liner installation.

Tests should be performed by the licensee to document that the clay liner material will not deteriorate or that its permeability will not increase when subjected to the waste products and weather conditions likely to be encountered during operation. The test program should be performed on the clay liner during and after liner construction. Representative soil samples should be tested for chemical reactivity to the waste product, for permeability (as a function of time) and for other parameters affecting liner integrity. See 3.6.2 below for guidance on a submission of the test results which should be submitted for staff review and approval.

When available, test data collected previously on other projects or by other research projects also should be submitted to demonstrate the integrity of the liner. Data collected by other licensees may also be used to demonstrate liner effectiveness.

3.1.3 Operation

Special care must be taken to ensure that no waste product or combination of products is introduced into the pond which would cause liner deterioration or damage. For example, failures have occurred because an acid solution was introduced in a pond containing a basic solution. The resulting heat of the chemical reaction caused damage to a liner seam. In any case, the expected reaction of the pond liner to any combination of solutions or atmospheric conditions should be known before the liner is exposed to them.

3.2 Subgrade Preparation and Slope Stability

3.2.1 Design

Proper preparation of the subgrade and slopes of a pond is very important to its success. The strength of the liner is dependent heavily on the stability of the slopes and subgrade.

The site should be cleared of all debris, vegetation, and associated root systems, because they can penetrate a liner or create methane gas upon decay. Because it is impossible to remove all organic matter, the subgrade should be treated with a soil sterilant. Application rates and techniques should be as recommended by the chemical manufacturer.

The surface which receives a synthetic liner should be graded to a surface tolerance of less than about one inch across a ten-foot straightedge. The surface should be smooth and free from protruding rock particles. If a sand bedding layer is used, this layer may be used as part of the leak detection system (see 3.5 below for criteria on leak detection systems). Information regarding proposed m ds for rolling, compaction, and moisture control should be provided f . staff review.

A settlement-consolidation analysis should be provided which demonstrates that settlement and consolidation of the subgrade will be sufficiently small that the tensile strength and elongation characteristics of the synthetic liner will not be exceeded at anticipated field temperatures.

Slope stability analyses are necessary to determine the safety of a pond slope, in a manner similar to that of a large dam embankment. In general, U.S. NRC Regulatory Guide 3.11 "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills" outlines acceptable methods for slope stability and settlement analyses, and should be used for design. The applicant should provide analyses along with liner manufacturer's specifications which document that the liner is capable of withstanding the expected settlement and soil movement without damage.

If an evaporation pond with a synthetic liner is located in an area where the water table could rise above the bottom of the liner, underdrains may be required. Such underdrains should be designed to prevent the development of upward pressure on the liner prior to pond filling. They may be utilized also as part of the leak detection system and may also be used to vent gases and release air pressure where organic decay or varying water table conditions cause such occurrences.

3.2.2 Installation, Testing, and Quality Assurance

A quality control program should be established for the following factors, as a minimum: (1) clearing, grubbing, and stripping; (2) excavation and backfill; (3) rolling; (4) compaction and moisture control; (5) finishing; (6) subgrade sterilization; and (7) liner subdrainage and gas venting. Because of the widely different soil characteristics of sites, no definitive quality assurance criteria can be established for any of these design factors. However, a program which ensures proper construction practices should be developed by the licensee and submitted for NRC review and approval.

Liners should be installed under the supervision of personnel who have demonstrable experience and training in liner installation. Experienced representatives of the synthetic liner manufacturer should always be present during installation and testing. Personnel trained in compaction analysis and moisture control should be employed during the construction and testing of clay liners.

3.2.3 Operation

General guidance for operational monitoring and inspection of facilities and structures can be found in U.S. NRC Regulatory Guide 3.11.1 "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings," but at a minimum, daily inspections should be made of the liner, liner slopes, and other earthwork features. Any damage or defects which could result in leakage should be immediately reported to the NRC staff. Appropriate repairs should be implemented as soon as possible.

3.3 Liner Protection

3.3.1 Design

Damage to liners may be caused by ultraviolet radiation, wave action, surface runoff, foot traffic, animals, ice, wind billowing, and dropping of objects. To prevent such damage, some form of protection should be provided. Some of the more common types of protection include (a) soil covers, (b) venting systems, (c) diversion ditches, (d) side slope protection, and (e) game-proof fences. Each of these is discussed below.

(a) Soil Covers. To prevent damage to synthetic liners from factors including ultraviolet radiation, wave action, foot traffic, animals, wind billowing, and dropping of objects, soil covers over synthetic liners have been utilized. Staff experience with soil covers has been that they should not be placed on steep side slopes. Soil covers have been observed to erode on steep slopes where the cover is susceptible to high-intensity rainfall and/or high winds. In general, observations indicate that slopes steeper than 1 Vertical on 3 Horizontal are probably too steep, because of sloughing along the smooth liner face due to soil saturation after high-intensity precipitation events. Where heavy rainfall could occur, liner slopes having soil covers should not be steeper than 1V on 5H. Exceptions include locations such as the Pacific Northwest, where high-intensity rainfall rarely occurs, and steeper side slopes may be acceptable. A stability and erosion analysis-should be provided by the licensee to demonstrate that the soil cover will remain in place and/or effective in protecting the liner.

Experience has shown that the best method for placing a soil cover is to dump the soil at the toe of the slope and bulldoze the soil up the slope. This results in slightly thicker cover at the toe, which tends to increase stability against sliding by effectively flattening the slope.

Use of soil binders to improve soil cohesiveness has been observed to be effective in preventing wind and water erosion of tailings. If severe freezing-thawing does not occur frequently, they are particularly effective.

Use of other forms of protection, such as sandbags (properly designed, located and anchored) to provide protection against wind wave activity, weight for liner stability in wind, and access for foot traffic, may prove to be more cost-effective than providing a complete soil cover protection.

Soil covers are often used to protect synthetic liners against ice, which may constitute a problem at the free-water surface synthetic liner contact. The licensee should assure that adequate measures have been taken to prevent damage to the liner by ice or ice forces. Particular care should be taken to assure that when rapid drawdown of a pond takes place for any reason, the liner is not damaged by the collapsing ice sheet. If a soil cover is not provided, liner manufacturer's reports on liner strength under ice conditions should be provided, to substantiate liner strength. If such tests are not available, the licensee should demonstrate that the proposed liner will withstand the effects of ice.

(b) Venting Systems. Where synthetic liners are used and soil covers are not provided, liner venting systems should be installed to prevent liner billowing and stresses due to airfoil effects. In addition, the presence of decaying organic matter or a rising and falling water table immediately below the liner requires venting of the gases produced. In general, a description of the system and justification for its use constitutes sufficient documentation.

If neither a soil cover or venting system is provided, analyses should be submitted which document that the liner is sufficiently strong or is sufficiently anchored so that stresses are not produced which exceed those for which the liner was designed.

(c) Diversion Ditches. The freeboard requirements and design of diversion ditches for lined ponds should be determined in accordance with U.S. NRC Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills." Where soil covers are used to protect synthetic liners, particular care must be taken to ensure that runoff is diverted away from the soil cover to prevent erosion and/or saturation of the soil. If the runoff cannot be prevented from entering the pond, special hydraulic features may be necessary to channelize and transmit surface water safely over the soil cover. (See also below regarding slope stability under saturated conditions.) The licensee should provide the details of and bases for the design of the diversion system.

(d) Side Slope Protection. Where wave action could be damaging to liner side slopes, some type of side slope protection should be provided for a liner, particularly if a clay liner or soil cover is used. Regulatory Guide 3.11 discusses acceptable analyses and methods for providing the necessary protection.

For tailings ponds, it may be possible to spigot tailings along the face of the slope, keeping the free water surface well away from the slope. This method has proved practical and effective at many unlined tailings ponds, and at a portion of at least one lined tailings pond.

For small evaporation ponds, slope protection usually is not required because of the limited effective fetch available to produce wave activity. The applicant, however, should provide analyses and justification for the implementation or omission of side slope protection, regardless of the size or type of pond used.

(e) Game-Proof Fences. In those cases where a soil cover is not provided for protection of a synthetic liner, it will be necessary to provide a fence to prevent the entry of sharp-hoofed animals, such as antelope, deer, and cattle. If neither a soil cover nor a fence is provided, sufficient documentation should be submitted to justify why neither is required. The fence should have the minimum height and strength necessary to preclude the entry of the species known to be present in the area.

3.3.2 Installation, Testing, and Quality Assurance

(a) Soil Covers. Soil covers should be carefully observed and tested to assure that they are not susceptible to sloughing and wind erosion; criteria should be established for filling, finishing, rolling, and compaction. The work should be performed under the supervision of a competent, trained soils expert with experience in the placement and stabilization of soil covers.

(b) Venting Systems. A plan should be submitted for underdrains, soil sterilization and gas venting. Quality assurance for necessary venting systems shall consist of, at a minimum, inspection of the devices by qualified experts to ascertain that they are functioning effectively.

(c) Diversion Ditches. A plan for construction of the diversion ditches should include construction methods for slopes, grades, erosion protection (if necessary), and other pertinent features of the diversion system. Qualified experts should inspect the constructed features.

(d) Side Slope Protection. The plan for establishment of side slope erosion protection (where necessary) should include criteria for placement and testing of the protection. If riprap is provided, representative samples of the layer should be tested for durability and weighed to ascertain that the layer meets the strength and gradation requirements specified in the design. If a tailings beach is provided, a discussion of the anticipated peripheral discharge plan should be provided along with information on the expected size, shape, and configuration of the beach.

(e) Game-Proof Fences. Quality assurance requirements for game-proof fences should consist of, at a minimum, visual inspections to ascertain that the fences have been constructed properly. Manufacturer's tests for strength should be provided for those types of fences where data regarding their performance at other projects is unavailable.

3.3.3 Operation

During plant operation, daily inspections of the liner protection features should be performed to ascertain that they are functioning and have not been damaged. A program for maintenance of the features should be developed and repair techniques should be planned in advance. In particular, soil covers and erosion protection may be vulnerable to high intensity precipitation and should be inspected carefully after the occurrence of such an event.

Controls should be established over access to the pond, including access during routine maintenance. The licensee should develop standard operating procedures which assure that unnecessary traffic is not directed to the pond area.

3.4 Field Seaming

3.4.1 Design

In general, field seams constitute the weakest portion of a synthetic liner. Several failures have occurred at uranium recovery facilities involving weak or improperly installed field seams.

Field seams running perpendicular (in plan) to pond side slopes should be avoided, except when pond size necessitates their use. When pond size makes them necessary, this type of field seam should be given special treatment. This special treatment may consist of placement of the upper edges of the lowermost liner in a trench at a horizontal bench on the slope, or other methods as recommended by the liner manufacturer. Field seams should not be designed to carry the weight of a downslope sheet. If field seams are installed perpendicular to slopes, the method of anchoring should be designed so as to eliminate tensile stress on the contact between the upper and lower sheets. A field seam should not be installed with the lower sheet overlapping the upper sheet.

3.4.2 Installation, Testing, and Quality Assurance

Field seams of synthetic liners should be tested along the entire length of the seam. Representative sampling may be used for factory seams, but it is not considered acceptable for field seams. The testing should be performed using state of the art test methods recommended by the liner manufacturer. Compatability tests, documenting the compatability of the field seam material with the waste product and expected weather conditions, should also be submitted for NRC staff review and approval.

Field seaming should be done only when the ambient air temperature is within the range specified by the liner manufacturer. If necessary, artificial heaters may be used to achieve the temperature window but they should be used only as a last resort. If it becomes necessary to achieve the required temperature artificially, NRC staff approval should be requested prior to initiation of seaming operations. If seams are heated to sustain the required temperature window, heating should be conducted in a mobile tent to maintain the temperature until bonding is complete.

Liners and field seams should be installed under the supervision of trained personnel who have experience in liner installation. Experienced representatives of the liner manufacturer should be present during the entire installation and testing program of synthetic liners. The qualifications, training, education, and experience of this representative should be submitted for NRC staff review.

Sufficient flexibility should be provided in the liner construction schedule to account for adverse weather and/or unusual occurrences. This may be particularly important when providing a soil cover for field seams of a synthetic liner to prevent exposure to sunlight or wave activity. If a construction or operation schedule is interrupted, the licensee should submit a report detailing the causes of the interruption and its potential effects upon the liner or liner seams. Special precautions should be taken to prevent hazardous conditions from developing during the period of inoperation and threatening the integrity of a pond liner or its field seams.

3.4.3 Operation

Daily inspections should be conducted to determine if any damage has occurred to the liner or liner seams by animals, foot traffic, wind stresses, wave activity, etc. Any damage should be repaired promptly.

If it is necessary to repair the liner, representatives of the liner manufacturer should be called upon to supervise the repairs. If the damage results in a leak, the procedures outlined in 3.5, below should be followed.

3.5 <u>Leak Detection System</u>

3.5.1 Design

A leak detection system should be installed at all sites utilizing natural or synthetic liners. The system should be designed to perform the following functions: (a) detect accidental leaks from the pond; (b) identify the location of the leak so that liner repair can be implemented immediately; and (c) isolate the leakage and control it.

(a) <u>Seepage Detection</u>. The leak detection system should be capable of reliably detecting an accidental leak through a liner. The areal coverage of the system should be such that no leaks have the potential for undetected vertical or horizontal movement to the groundwater environment.

In general, for both small evaporation ponds and large tailings ponds, an acceptable system consists of a highly permeable layer of sand* (directly under the liner), with perforated pipes draining to standpipes or sumps. This permeable layer should overlie a less permeable layer of compacted soil (preferably clay or with a high clay content), that has vertical and horizontal permeabilities of approximately two orders of magnitude less than the sand or gravel layer. This arrangement will assure that seepage movement will not be vertical through the subgrade but, rather, horizontal through the sand toward the collector pipes. The sand layer should also be extended up the side slopes of the pond to minimize the potential for undetected leakage along the face of the interior side slopes.

In addition, the sand and gravel underdrain should also act as a filter layer below a clay liner. Thus, careful design will be required, so that piping and removal of fines from the clay layer is prevented in the event of a failure.

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*In many cases, a sand layer could also be used as an underdrain, smooth subgrade, venting system, and filter layer below a clay or synthetic liner.

In cases when it may not be practical to employ such a system, alternate methods of seepage interception or detection will be reviewed on a case-by-case basis.

(b) Identification of Leak Location. In order to facilitate liner repair, minimize further leakage, and eliminate the source of leakage, the system should have the capability of locating a leak near its point of occurrence. This may be particularly important for large tailings ponds, where complete removal of the pond contents is impossible in a short period of time. Where a leak detection system at a large tailings pond consists of gravel underdrains, it may be necessary to achieve close spacing of the horizontal perforated pipes, with each pipe monitored individually, rather than at one central location. By monitoring each horizontal pipe, the location of the leak could be determined within a fairly narrow band. Regardless of the method employed, the licensee should document the capability of the leak detection system to determine quickly a leak location.

(c) Leakage Control. The leak detection system should be able to isolate the leakage and to collect and transmit it to a safe point of disposal, treatment, or storage. An auxiliary or back-up storage plan should be provided to accommodate the contents of the leaking pond. In order to positively provide this storage capacity, use of the cell concept of pond construction should be considered. In many cases, where several small cells are planned, construction of one of the cells at the time of construction of the first waste pond may prove to be practical in providing the required extra storage capability. However, the additional capacity may be provided in other ways.

In addition to monitoring of the leak detection system, the licensee should monitor the groundwater environment in the vicinity of and downgradient from the lined pond. In general, monitoring of both the unsaturated zone and aquifers should be performed. The required monitoring may be performed using negative pressure lysimeters and monitor wells. The exact number of monitoring points will be a function of the hydrogeology of the area and on the size and type of pond. In general, sampling of the lysimeters and wells can be relatively infrequent (quarterly), provided that daily monitoring of the leak detection system has shown no liner leakage. If leakage has been determined to have occurred, more frequent downgradient monitoring and sampling will be necessary.

The licensee should provide analyses documenting that the area of influence of both the lysimeters and monitor wells (or other devices) is sufficient to detect any leakage from the pond. Detailed rationale for the placement, locations, type, and number of wells should be provided, in addition to the proposed frequency of sampling. Regulatory Guide 4.14 "Radiological Effluent and Environmental Monitoring of Uranium Mills" describes programs acceptable to the NRC staff for groundwater monitoring around tailings and evaporation ponds.

3.5.3 Installation, Testing and Quality Assurance

In order to document that the leak detection system has been constructed as designed, several tests are necessary. First, if the system consists of sand and gravel layers with collectors beneath the liner, tests should be conducted to demonstrate that the saturated hydraulic conductivity of this layer is at least two orders of magnitude greater than that of the underlying soil. Based on these tests, the spacing of the collector pipes should be determined with respect to the distribution of leakage and its detection. Secondly, after the system is installed, but prior to placement of the liner, the system should be field tested to demonstrate that it meets the design criteria above. To simulate leaks, liquid samples should be introduced, monitored, and tracked. Tests should be conducted of the liquid volumes and travel times so that the effectiveness of the system can be determined prior to the start of operations. Information gathered can be used to predict the behavior of a leak during pond operation. These tests should be performed under the supervision of a qualified hydrologist or hydrogeologist familiar with field tests to determine permeability and seepage behavior.

To assure the functioning of monitor wells, samples should be collected and analyzed prior to pond use. These measurements also will provide background data against which subsequent monitoring data can be compared.

3.5.3 Operation

During operation, the leak detection system should be inspected daily for the presence of liquid. If liquid is detected, it should be sampled for the various contaminants known to be present in the pond liquid. If sampling reveals that the pond is leaking, measures should be taken to identify the leak location and repair it. Sampling of nearby monitoring wells should be increased, to assure the functioning of the leak detection system.

3.6 <u>General Information Submittals</u>

3.6.1 Design

The design of a clay or synthetic liner and its appurtenant component parts should be presented in the license application or related amendment applications for a uranium recovery operation. The report should have sufficient detail to permit the NRC staff to perform an independent evaluation of the liner system. At a minimum, design details, drawings, and pertinent analyses are needed for each design area discussed above. In addition, expected construction methods, testing criteria, and quality assurance programs should be presented.

3.6.2 Construction, Testing, and Quality Assurance

After pond construction, but prior to facility operation, a report should be submitted to the NRC staff detailing the construction and test methods utilized in pond construction. This report should provide documentation of the testing performed (including test methods and test results) and of the quality assurance program that was actually implemented during construction.

3.6.3 Operation

Planned modes of operation, inspection, and maintenance should be discussed in the license application documents. Deviation from these plans should be submitted to and approved by the NRC staff prior to implementation.