Pa'ina Hawaii LLC
Promoting Agriculture in Hawaii
PO Box 30542 Honolulu, HI 96820

March 9, 2006

Anthony Gaines
Sr. Health Physicist
Division of Nuclear Materials Safety
611 Ryan Plaza Dr., Suite 400
Arlington, TX 76011-4005

RE: Docket No. 030-36974

Mr. Gaines,

On behalf of Pa'ina Hawaii, please find the answers the questions you sent to us by fax on January 25th, 2006.

Please note that the answers to questions 1-11 are written with a certain set of assumptions. The method of installation may change based on local conditions that could not be foreseen with sample coring, and the expertise and experience of the contractor responsible for the work. Gray*Star and CHL Systems, the design and engineering firms behind the Genesis Irradiator will be working closely with the architect, soil experts, and contractors during the construction phase to be sure that any change in conditions will result in the most sound construction choices. We will of course notify you of any changes before they are finalized.

If you have any further questions, please let me know.

Regards,

Andrew E. Buchan
RSO/Production Manager

Enclosed: Drawing # POOLA-104-000-REV3

1) The pool is leak checked after manufacture to insure that both the ¼” inner pool wall and the ¼” outer pool wall are completely leak-free.

Once the pool arrives on site, it will be visually inspected to insure that no damage occurred during shipping.

Once the pool has been set in position and the foundation has been poured, the pool will be filled with water. The space between the inner pool wall and the outer pool wall will be checked to insure that there is no leak in the inner wall.

2) Yes, the overhead trolley, rail, and hoists have been designed, and will be tested, installed, and maintained in accordance with ANSI B30.16, “Overhead Hoists (Underhung). All of the hoist inspection, service, and maintenance records will be kept on file by the Applicant.

3) The walls of the pool have been designed to resist a combined equivalent “at-rest” fluid and hydrostatic pressure equal to what would be exerted by a fluid soil with a density of 144 pounds per cubic foot. This is true for the entire pool wall, from the top of the pool to the full depth of the pool.

The I-beams between the inner wall and the outer wall of the pool serve as a tension and shear connection between the inner wall and the outer wall before the installation (during leak checking). After the installation of the pool is complete, these I-beams serve as a shear connection between the inner wall and the outer wall of the pool. Cathodic corrosion will not be a factor at the joint between the stainless steel inner wall and the carbon steel I-beams for several reasons. First, the space between the inner wall and outer wall, where this joint is located, is a sealed area, no electrolyte will be present. Second, the surfaces of these two metals will be sealed in masonry material, which will protect them from any corrosive agents. Third, the lime itself that is used in the masonry material provides corrosion protection to these metals.

4) When the excavation for the pool is completed, the pool will be lowered into the hole and suspended from supporting beams attached to the top of the pool. Once the pool is in position, the foundation material will be poured into the excavation until it fills the space beneath the pool and comes up the side of the pool a short distance. This foundation material will be allowed to cure, then the pool will be filled with water. The space between the inner wall and outer wall will be checked to insure that there is no leak in the inner wall. The space between the two walls, and the backfill, will then be poured. The Pool Installation method is also shown on Drawing # POOLA-104-000-REV3. Some details are shown on this drawing for the purpose of illustration only. This is particularly true with the type of steel piling shown and the floor thickness shown. These items can be done differently as long as the functional requirements are met, they are only shown this way on the drawing for the purpose of illustration.

5) The island of Oahu is located in a Uniform Building Code (UBC) seismic zone 2A, which has a specified effective peak ground acceleration of 0.15g. This acceleration corresponds to a seismic event with a magnitude of 5.5. The pool is designed as an independent rigid structure. A seismic event of this magnitude, or even one of significantly higher magnitude, would not compromise the integrity of the pool structure in any way. Any acceleration of the pool, due to a seismic event,

would be experienced by the entire pool structure, thus resulting in no damage to the pool. It is not clear that liquefaction of the soil around the pool would ever occur as a result of a seismic event, but if it ever did, the only effect it would have on the pool would be to increase the soil pressure on the walls of the pool. Under normal conditions, the soil will exert an average soil pressure on the outsides of the pool walls equivalent to a fluid with a density of 64 lbs/cf. The most pressure the soil could exert on the walls of the pool would be if complete liquefaction of the soil occurred, the full depth of the pool. This would result in a soil pressure equivalent to a fluid with a density of 102 lbs/cf. The walls of the pool are designed to withstand at least the pressure equivalent to a fluid with a density of 144 lbs/cf. No damage to the pool would result from complete liquefaction of all the soil around the pool.

6) Our pool design and installation method is based on the concept that the pool is a rigid structure, completely independent from, and not connected to the floor. This is done so that any seismic event that may be experienced at this site will have no effect on the pool. To accomplish this isolation of the pool from the floor we have provided a 6" space between the pool and the floor and between the surge tank and the floor on all sides where the floor meets the pool or surge tank. For the purpose of determining how much isolation space to provide between the pool and the floor we used the scenario that would result in the maximum amount of movement between the pool and the floor. This scenario is when liquefaction of the soil under the floor occurs. It is not clear that this would ever happen, but it was assumed that it would for the purpose of this analysis. Given a seismic event with a peak acceleration of 0.15g's, and the soil conditions at the site, and assuming that the soil under the floor experiences liquefaction, the maximum amount of movement that could be expected between the pool and the floor would be about 4.5". The 6" space we are providing insures isolation between the pool and the floor even in this worst-case scenario that was assumed for the purpose of this analysis.

7) The foundation material underneath the pool is a concrete material capable of curing under water. The pool will not be placed on this material after it has been poured, but the installation will be done with the pool suspended in position and the concrete foundation poured under and around it. There are I-beams welded to the outer wall of the pool, on the bottom of the pool and around the sides of the pool. When the concrete material is poured under and around the pool, these beams will tie the pool to the concrete material.

There will be steel sheet pilings driven down into the soil prior to excavating for the pool. The entire area within the sheet pilings will be excavated down to some depth that will be determined at the time of excavation. The space below the bottom of the pool to the bottom of the excavation will be poured with concrete material and the space between the outer wall of the pool and the sheet pilings will be poured with concrete material. So, the dimensions of the foundation will be the dimensions inside the steel sheet pilings, a minimum of 9' X 10'. The actual depth of the foundation will depend on the depth of the excavation, which will depend on actual conditions found at the time of excavation. But, the thickness of the foundation material under the I-beams on the bottom of the pool will not be less than 4 inches.

8) The concrete material used to fill the space between the inner and outer pool walls will have a minimum compressive strength of 1,000 psi. This is the same material that will be used to pour under and around the pool to fill the space at the bottom of the excavation and between the outer wall of the pool and the steel sheet pilings. Samples of this material will be taken during the pour, and these samples will be sent to a certified testing lab for testing. The results of these tests will be sent to the Architect overseeing the installation. A copy of these test results will be kept on file by

the Applicant. During the pouring operations, concrete vibrators will be used to eliminate any air or water pockets in the concrete.

9) These numbers came from references from CHL or Gray*Star, however, they are only preliminary numbers. Weidig will be involved with the calculations of the soils ability to bear the load from the irradiator, its components, backfill and the building once a final plan is completed. We will notify the NRC of the final numbers at that time.

10) B-5 is within 5 feet of the proposed pool location. B-2 is far enough away that it will not likely affect the irradiator hole site. Because the excavation for the irradiator tank is so deep, we expect to hit a layer of loose gravelly sand at some depth in the hole. Note that the B-5 data shows a similar layer with a blow count of 9 at 15 feet. We feel that the pile walls, combined with the fill concrete will mitigate any issues a layer of such material might pose.

11) A final decision on the pile driving method has not been made, however, it is most likely to be the vibration method. Once that has been decided (pending selection of a subcontractor) we will notify the NRC. The current plan is to not de-water the hole during excavation. Once the hole is deep enough a layer of treme concrete will be placed in the bottom of the excavation, effectively forming a box that should have little water intrusion. Any water removal at that point should be minimal and not effect the soil strength.

12) The requirements for training for the RSO are found on pages 8-11 and 8-12 of NUREG 1556V6, while they suggest that completion of a training course as modeled in Appendix G is <u>evidence</u> of adequate training and experience, the specific criteria are as follows:

"The RSO should have at least 3 months (full-time equivalent) of experience at the applicant's irradiator or at another irradiator of a similar type. The 3 months of experience may include preoccupational involvement, such as acceptance testing, while the irradiator is being constructed."

"However, to allow flexibility, the NRC will determine the adequacy of the RSO's training and experience on a case-by-case basis, looking at his or her actual qualifications and drawing on the NRC Staff's experience in reviewing such qualifications."

Mr. Buchan has had over 13 years of increasing radiation safety responsibility, including eighteen months as the RSO for the University of California, Merced. Further he has completed a 40 hour training course on Occupational and Environmental Radiation Protection from Harvard University and a 40 hour training course from the manufacturer of the irradiator.

He will be overseeing the construction and installation of the irradiator working directly with representatives of the manufacturer. Presently Mr. Buchan's office is located within a few miles from the irradiator site. He will move his office onsite as soon as occupancy has been granted. He will be doing all the acceptance testing of the irradiator and its safety systems. We expect this phase to last approximately three months. Including operating the irradiator (in simulation) prior to the installation of cobalt, and will receive further training and guidance from the manufacturer.

As outlined on page 13 and 52 of the application, we believe that Mr. Buchan’s work experience, the classes he has taken, and his involvement in the construction and acceptance testing of the irradiator prior to cobalt installation meet the intent of the RSO training and experience requirements.

13) Pa’ina Hawai’i will not be performing source loading, unloading, or repositioning. One or both of our source suppliers will be performing these actions per 10CFR36.13(g). We will be reviewing their procedures to make sure they comply with Pa’ina’s license and they will be approved by the Radiation Safety Committee prior to these activities being conducted.

14)

(a) The following are outlines for emergency procedures for 10CFR36.53(b)(5):

Low Water Level (Summary)

Frequency: Low water level indicator, an abnormal water loss, or leakage from the source storage pool

Responsibility: The Radiation Safety Officer

Summary: Low water level indicator:

There are two types of "low water level indicators". The first are indicators to an Operator or the RSO that water should be added to the pool. [Adding water is a manual operation, see "Adding Pool Water summary, page 75 of the Application.] If the water level is below this mark, water should be added to the pool. The second is a "minimum water level indicator". There is no normal condition that would allow for water being below this indicator. Therefore, if water is below this indicator, water should be added to the pool immediately and the RSO notified. The RSO should investigate the cause of this indication and notify the NRC if a leak in the pool is suspected. The Radiation Safety Committee will convene to determine what corrective action needs to be taken. In the event that water level cannot be maintained through the system, the RSO must take steps to maintain the water level through other methods (e.g. bring in outside water) until the situation is stabilized.

Summary: Abnormal water loss:

A check of the status of the water level is performed under Routine Operation procedure (GI-101). The status is recorded on the "Safety Log". The safety log is reviewed periodically by the RSO. Further, a log is maintained when water is added to the pool. This log is also periodically reviewed by the RSO. The log will provide a baseline loss of water for normal reasons (e.g. evaporation). With a baseline established, increased use of water may be an indication of abnormal water loss. The cause of abnormal water loss must be investigated. The Radiation Safety Committee will convene to determine what corrective action needs to be taken. The NRC will be notified if a leak in the pool is suspected.

Summary: Leakage from the source storage pool:

Whether determined by the methods above and/or some other method (e.g. visual observation), that there is a leak in the pool, the Radiation Safety Committee will convene to determine what corrective action needs to be taken and the NRC will be notified. If repair to the pool necessitates removal of the sources, either the sources will be maintained onsite in approved shipping packages (casks) or arrangements will be made to transport and store the sources at an appropriate and licensed facility until the situation is rectified.

If a low water event leads to an abnormal radiation level then the Abnormal Radiation Level procedure (GI-301) must be followed.

Documentation: The actions taken, the results, and any corrective actions are documented. Water level status is recorded in the "Safety Log" (GI-101-01)

High Water Level (Summary)

Frequency: High water level indicator

Responsibility: The Radiation Safety Officer

Summary:Water is added to the pool manually. It is possible for an Operator or the RSO to add "too much" water to the pool and exceed the water level indicator(s). This is not an "emergency" situation. However, it should be noted as an abnormal event in the Safety Log (GI-101-01).

If a significant "overfilling" situation occurs (e.g. it might lead to the over flow of the pool), the RSO must be notified prior to operating the unit. The Radiation Safety Committee will convene to determine what corrective actions need to be taken.

Documentation: The actions taken, the results, and any corrective actions are documented. Water level status is recorded in the "Safety Log" (GI-101-01)

(b) The following are outlines for emergency procedures for 10CFR36.53(b)(9) as appropriate for the geographical location of the facility: [There are only two significant natural phenomena that Pa'ina Hawaii has identified for the geographical location of the irradiator. Tsunamis and Hurricanes.]

Emergency procedures:

Natural Disaster (Summary)

Frequency: Tsunami Alert, Hurricane Alert, Earthquake, Tornado, Any Event that might lead to flooding, lead to anticipated loss of building power, any damage to the irradiator, any significant damage to the building.

Responsibility: Irradiator Operator(s) and The Radiation Safety Officer

Summary:
In the event that there is an alert for a natural phenomena that might damage the irradiator and/or present physical risk to personnel on site:

1. Secure the Irradiator and the Facility. This includes halting the operation of the irradiator, following the "End of Shift" procedures outlined in GI-101 (Routine Operation), and shutting main hoist power at the main breaker box.
2. Notify the RSO.
3. Follow local emergency guidance to protect personnel.

In the event there is a natural phenomena that might damage the irradiator and/or present physical risk to personnel on site with no prior alert:

1. Take all steps necessary to protect personnel.
2. If possible, secure the Irradiator and the Facility (as stated above).
3. If possible, notify the RSO.
4. If possible, follow local emergency guidance to protect personnel.

After the event, (assuming that local authorities have determined that the area is safe to enter).

1. Enter the Restricted Area per GI-101 (Routine Operations). [Note: Be cognizant that there might be damage to the building and / or the irradiator.]
2. The Radiation Safety Officer is to perform an inspection on the entire unit specifically including but not limited to the following:

a) Check hand held radiation survey meters.
b) Check for physical damage to any part of the irradiator.
c) Check water level for abnormally low or high water level.
d) Check conductivity of water. (e.g. determine if salt water has entered the system.)
e) Check radiation monitors (ARM and WRM) for damage and function.
f) Check any off site alert systems. Determine that communication lines are still functioning properly.

3. If the unit appears to be damage free, turn on hoist power and run through a test cycle or cycles to assure that the unit if functioning properly prior to commencing operations.

4. If there is damage to the unit, hold a Radiation Safety Committee meeting to determine the appropriate course of action.

NOTE 1) If there is damage that requires immediate remediation, take appropriate steps. e.g. follow GI-301, GI-302 or GI-303.

NOTE 2) If there is any damage that the RSO determines might have any effect on the safe operations of the unit, appropriate personnel will inspect the unit. Determination for any remediation would be conducted by the Radiation Safety Committee based on inspection findings.

NOTE 3) The NRC will be notified if appropriate.

Documentation: The actions taken, the results, and any corrective actions are documented.

15) We wish to delete our previous method of leak testing from our Application (page 71) and replace it with a continuous monitoring system as outlined below. Also, please delete the section on "Periodic Leak Test (Six Month Intervals):"on page 68 of the Application.

Leak Test (Summary)

Frequency: Start of Shift / On alert / The first time an Operator or RSO enters the Restricted Area after being left unattended.

Responsibility: The Radiation Safety Officer or an Irradiator Operator.

Summary: The WRM continuously monitors for contamination (see pages 32 and 33 of the Application). The monitor has both an alert system and a digital readout. The readout is in 0.1 mR/hr. increments. At the frequency stated above, the readings are recorded on the "Safety Log" (GI-101-01-00).

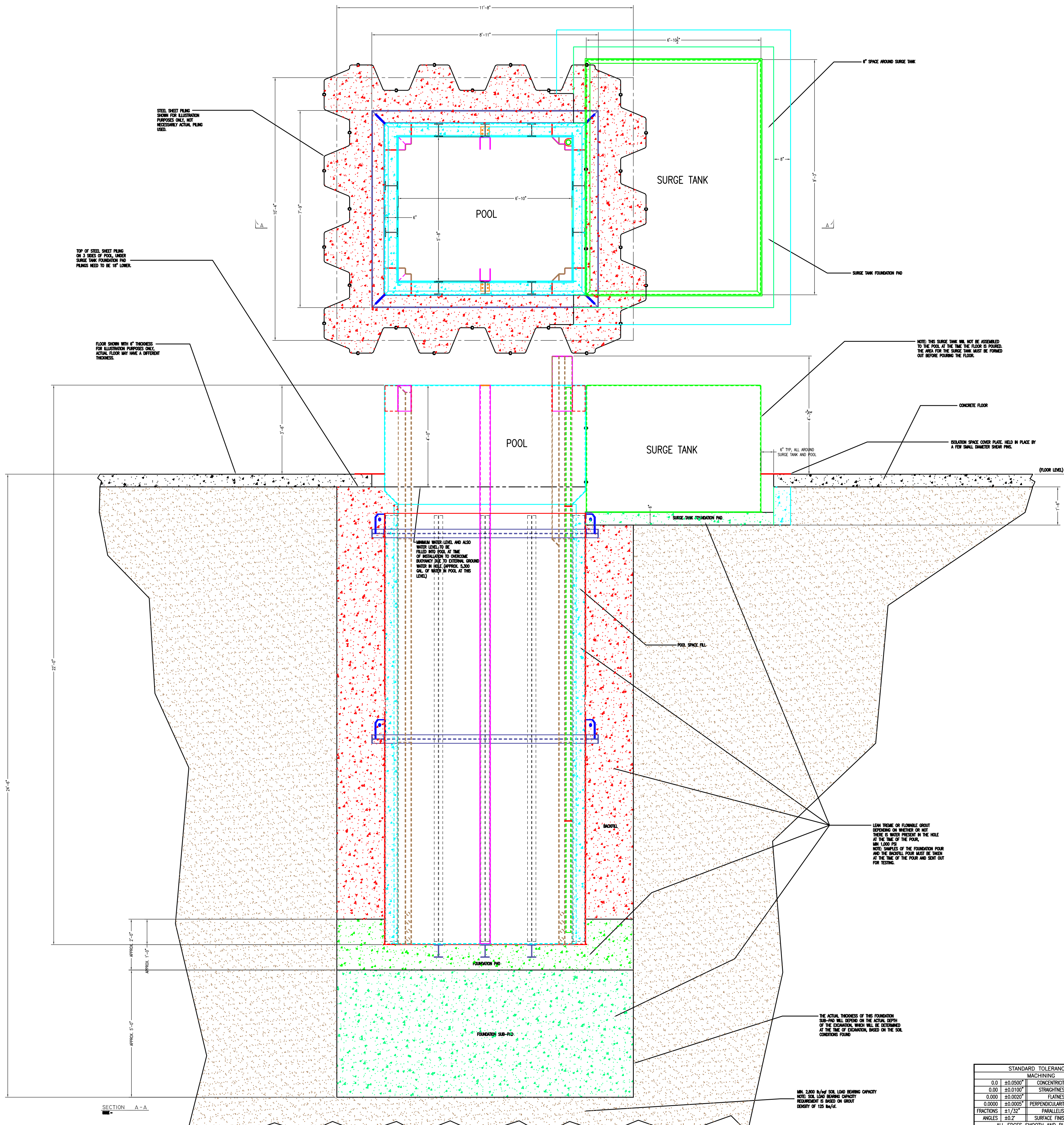
During periods when the unit is unattended, any alert of the WRM will be monitored offsite.

In the event of an abnormal radiation level, procedure GI-301, "Abnormal Radiation Level", will be followed.

In the event that a reading of the WRM is above nominal, the RSO will be notified. The RSO will determine if the WRM is functioning properly. If radiation levels are abnormal at any point of the water circulation system, the RSO will take corrective action including contacting the NRC if a leaking source is suspected.

Documentation: The actions taken, the results, and any corrective actions are documented. WRM readings are recorded in the "Safety Log", which is reviewed periodically by the RSO.

Mark	Revision	ECR #	By	Date	Check'd By	Apprv'd By



INSTALLATION PROCEDURE:

1. EXCAVATE REQUIRED HOLE DOWN TO THE PROPER DEPTH USING STEEL SHEET PILINGS, IF REQUIRED.
2. CONTINUOUSLY REMOVE ANY EXCESS GROUND WATER.
3. PLACE POOL IN HOLE AND SUPPORT WITH TEMPORARY BEAMS FROM ABOVE.
4. ADJUST LATERAL POSITION AND VERTICAL ORIENTATION OF POOL.
5. POUR FOUNDATION UNDER POOL AND UP THE SIDE OF THE POOL ABOUT 12". (CAN BE DONE IN TWO SEPARATE POURS.) ALLOW TO CURE.
6. FILL POOL WITH APPROX. 5,300 GAL. (MIN.) OF WATER.
7. GROUT VOID BETWEEN POOL WALLS (APPROX. 9 CUBIC YARD OF GROUT REQUIRED)
6. BACK-FILL HOLE TO TOP OF STEEL SHEET PILINGS WITH FLOWABLE GROUT.
7. POUR SURGE TANK FOUNDATION PAD, FLAT AND LEVEL AND FLUSH WITH THE TOP OF THE ANGLE IRON GUIDE ON THE POOL.
8. FORM OUT AREA FOR SURGE TANK BEFORE POURING FLOOR.
9. REMOVE WATER IN POOL ONLY AFTER GROUT HAS CURED (IF DESIRED).

FLOWABLE GROUT DENSITY (125 LBS./CU.FT)	
FOUNDATION SUB-PAD WEIGHT	76,000 LBS. (608 CF)
FOUNDATION PAD WEIGHT	24,000 LBS. (190 CF)
POOL SPACE FILL WEIGHT	28,500 LBS. (228 CF)
BACKFILL WEIGHT	133,500 LBS. (1,068 CF)
POOL WEIGHT (STEEL ONLY)	18,000 LBS.
WATER WEIGHT	44,000 LBS. (705 CF)
GROSS WEIGHT OF POOL ASSEMBLY (WITH ALL GROUT MATERIAL AND WATER):	324,000 LBS.

STANDARD TOLERANCES UNLESS SPECIFIED OTHERWISE							
MACHINING					GENERAL FABRICATION		
0.0	±0.0500"	CONCENTRICITY	◎	0.002" TIR	< 36"		±1/32"
0.00	±0.0100"	STRAIGHTNESS	—	0.002"	> 36"		±1/16"
0.000	±0.0020"	FLATNESS	▱	0.002"	ANGLES		±0.5°
0.0000	±0.0005"	PERPENDICULARITY	⊥	0.002"/10"	STRAIGHTNESS	—	1/16"
FRACTIONS	±1/32"	PARALLELISM	//	0.002"	FLATNESS	▱	1/16"
ANGLES	±0.2°	SURFACE FINISH	32 μ"AA		PERPENDICULARITY	⊥	1/16" /24"
ALL EDGES SMOOTH AND BURR FREE					PARALLELISM	//	1/16"
ALL DIMENSIONS ARE INCHES UNLESS SPECIFIED OTHERWISE							

APPROVALS		DATE
Drawn	Rick Keiper	02-20-06
Engineer	Rick Keiper	02-20-06
Approved		
Checked		
Issued		
Revised		

CLAYTON H. LANDIS COMPANY INC.
476 Meetinghouse Rd. Souderton, Pa. 18964
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Customer: GRAY STAR

Title: THE GENESIS II IRRADIATOR POOL INSTALLATION INSTRUCTION

Ref. Dwg.: 33248-208-000

Dwg. No.: POOLA-104-000 | Rev.: 3

Job Number: 40798 | Size: D | Scale: 1/2" = 1'-0" Unless Noted Otherwise | Sheet 1 Of 2

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