PRNC - 72 PUERTO RICO NUCLEAR CENTER Procedures for Operating CO™ Gamma Pool Irradiation Facility Mayaguez ‘OPERATED BY UNIVERSITY OF PUERTO RICO UNDER CONTRACT NO. AT (40-1)-1833 FOR U.S. ATOMIC ENERGY COMMISSION ---Page Break--- AUTHORIZATION FRIICS72 Procedures for Operating Cobalt-60 Gamma Pool ---Page Break--- OPERATING PROCEDURES Cobalt-60 GAMMA POOL IRRADIATION FACILITY ---Page Break--- TABLE OF CONTENTS RESPONSIBILITY DESCRIPTION OF SOURCE AUTHORIZED PERSONNEL AND RESPONSIBILITIES SOURCE LOADING AND UNLOADING PROCEDURE TYPICAL IRRADIATION PROCEDURE SAFETY PROVISIONS IN CASE OF UTILITIES FAILURE OR MALFUNCTION LIST OF FIGURES GAMMA ROOM FLOOR PLAN POOL CROSS SECTION VARIABLE GEOMETRY IRRADIATOR 10 ---Page Break--- PROCEDURES FOR OPERATING Cobalt-60 Gamma POOL IRRADIATION FACILITY 1. RESPONSIBILITY The Reactor Division is directly responsible for the safe operation and maintenance of the Gamma Pool Irradiation Facility. The supervisor will appoint the assistant supervisor(s). 11. DESCRIPTION OF SOURCE (A) ROOM (Figure 1) The PRNC cobalt-60 Gamma Pool Irradiation Facility (GPIF) is housed in room 421A in the PRNC laboratory building in Mayaguez. This room has 2 double doors to the rear corridor and one single door to laboratory room 108. The door to room 103 is secured with a breakable seal at all times. The room has a cabinet for storing accessory equipment and survey meters. It also has work tables and a water circulating system for the pool. Oxygen, nitrogen, and compressed air will be provided according to the needs of an experiment. (B) POOL (Figure 2) A pool 9' x 8' x 14' deep, located in room 121, contains the Cobalt-60 using water as a shield. A dry well is adjacent to one end of the pool with an aluminum plate separating the two sides. Covers provide suitable scattered radiation protection on top of the dry well. A well with a lead cover is located at the bottom of the pool. A portable steel bridge across the top of the pool serves as the base for the operator conducting irradiations.

Break--- pool. This platform has twelve <j! odessa Tt also holds the hollow cylinders Yacsapar 5 A radiation monitor = 48 $4 ‘The probe is attached to the area where the irradiations are conducted (©) HOLLOW CYLINDER VARIABLE GEOMETRY IRRADIATOR ‘The Co®0 is contained at twelve pens, containing approximately 200 curies. the sspsu! Hollow Cylinder Variable Geometry can be remotely and continuously adjustable 5 inches to 19 1/2 inches in diameter A sample by using 3, 6 or 12 capsules (D) SAMPLE HOLDERS Samples to be irradiated may be p42 which can be lowered by means of a 5y wire or rod will be provided with 4 27 being removed it will reach a Container caps may be fixed with connect the desired atmosphere. TET, AUTHORIZED PERSONNEL AND RESPONS (A) SUPERVISOR: 1. The supervisor is responsible a. the facility b. training assistant supervisor ---Page Break--- keys for CPIF 4. changing geometry of variable geometry irradiator @, seeing that procedures are fully complied with scheduling use of GPIF ing to Health Physics the personnel to be assistant supervisors (B) ASSISTANT SUPERVISOR 1. The assistant supervisor is responsible for iters c, 4, ey and £ under supervisor. (c) PERSONNEL USING FACILITY: 1. Personnel using the facility are responsible for a. filing form 663 with Health Physics b. making appointment to use facility c. providing materials placed in pool 49 not contaminate facility 4. placing and removing materials to be irradiated 1. SOURCE LOADING AND UNLOADING PROCEDURE (A) STORAGE CONDITIONS. At time it may be necessary to unload the variable geometry irradiator for maintenance of the irradiator mechanism, to attach or remove auxiliary equipment on or around the irradiator, or to drain and clean the pool. The capsules will be stored in individual cylinders in the underwater platform when it becomes necessary to remove the irradiator mechanism, or they will be stored in the lead shield provided in the bottom of the pool when drainage of water is necessary. Normally, the ---Page Break--- the capsules will be kept in

position in the irradiator ‘The grapplers and irradiator geometry adjusting tool will be kept locked in their special holders. (3) LOADING AND UNLOADING SOURCE There will always be two persons from the Reactor Division involved in loading and unloading the VGI; one supervisor or assistant supervisor and a regular operator. The supervisor in charge is responsible for ensuring that the following steps are carried out: 1. Lock entrance door 2. Unlock grapplers and secure portable survey meter. 3. Supervisor check and assure proper function of radiation monitor and alarm, using low level gamma source. Check survey meter. 4. Make an inventory of capsules (a portion may be in the irradiator and the remainder must be in their individual storage cylinders). The reactor operator aiding in the unloading and loading operation will remain on one side of the pool with a portable survey meter to check for radiation during the rest of the procedure. Using grappler, remove Co-60 capsules one by one from VGI and place in storage cylinders. 7. Have the width check and confirm the fact that the VGI is unloaded. Remove VGI from pool and perform the necessary work on it. Return VGI to underwater plate. 10. Using grappler, replace Co-60 capsules in VGI one by one. ---Page Break--- (©) caters ver geometry may be changed only by the supervisor or assistant supervisor using the following procedure: 1. Unlock geometry adjusting tool. 2. Set desired radius. 3. Insert tool in rotating gear and turn until indicated by position indicator. 4. Remove and lock tool in its holder. TYPICAL IRRADIATION PROCEDURE ‘The supervisor or assistant supervisor in charge will be responsible for the irradiation operation. The person (or his designated representative) requesting the use of the facility will insert the samples into the irradiator and remove them from the irradiator. ‘The following precautions will be observed by the supervisor or assistant supervisor in charge: 1. Supervisor check and assure proper function of radiation monitor and alarm, using 2.

level gamma source, Check survey meter. 2. Make sure that samples to be irradiated are properly packaged or sealed so that pool water is not contaminated. 3. If gas under pressure is to be used in a container, make sure all connections are tight and proper pressure is maintained. 4. Make sure that the stop on the lowering line, wire or red is properly latched under the container on the bridge. 5. Observe the insertion of the sample into the irradiator to ensure that capsules and irradiator mechanisms are not damaged or that settings are not altered. After irradiation is completed, observe the removal of the sample while at the same time monitoring with survey meters. ---Page Break--- 6 7. While the sample is kept under five feet of water after catching on the stop, visually check the irradiator and sample to ensure that all capsules are in the proper place. 8. Record irradiation in the log book. VI. SAFETY PROVISIONS IN CASE OF UTILITIES FAILURE OR MALFUNCTION (a) WATER Loss Water may be lost from the pool in three ways: (1) evaporation (2) pumping (3) earthquake cracking the walls. Evaporation loss will be compensated by the water supply line with a float valve that opens when the water level drops one inch. All permanent connections to and from the pump are not more than one foot below the normal level of the water; therefore, it is impossible to drain the pool below that level. Only in the event that the pool is to be deliberately drained will a temporary connection be used so that water may be completely pumped out. This connection is to be removed after refilling the pool. If an earthquake of sufficient magnitude to crack the reinforced concrete walls should occur, resulting in a loss of water, the area would be vacated. Health Physics would be notified and necessary remedial action taken. As an example, the source might be covered with sand or dirt to provide temporary shielding. Specific remedies will depend on circumstances. (b) POWER FAILURE The operation of the GPIF is entirely manual with the exception of the alarm systems and lights. A

Battery-operated portable light is available. In the event of electrical failure, all experiments will be stopped and the GPIP put in stand-by (storage) condition following the previously outlined

procedure. ---Page Break--- (©) carsubE ancioeNT There are various events in which a capsule incident is conceivable. 4. Drop If a capsule is dropped, it would always fall to the bottom of the pool or to the platform or other object above the bottom. Whenever a drop occurs, the capsule will not present a radiation hazard. The capsule is to be picked up with the grappler and returned to its place. 2. Jamming in Vor The capsules are not forced into place, so any jamming should be of a minor degree. Although if this incident occurs, a Health Physicist will be called before proceeding further. The VOI is made of aluminum, and a capsule could become wedged in it. If this does occur, all other capsules will be removed from the VOI. The capsule will be pulled up with the VGI held in place until it becomes loose. A sudden release of the capsule cannot produce a radiation hazard because it can be lifted over four feet before abnormal radiation levels can be detected at the surface. 9. Accidental Catching With Experiment one or more capsules may accidentally hook or otherwise catch on a sample container and be pulled out of the VGI while the sample is being removed. The nylon line, wire, or rod used to lower and raise samples into and from the irradiator will be provided with a stop. Prior to irradiation, the nylon line, wire, or rod will be engaged in the catch on the bridge so that when the sample is removed from the irradiator, it will remain under at least five feet of water. ---Page Break--- At this time, the supervisor in charge will inspect both irradiator and samples. If a capsule has been accidentally raised, it will be dislodged from the sample and lowered to its proper position. 4. In case of malfunction, the Health Physics Division should be notified. ---Page Break--- ---Page Break--- Scale used for GAMMA POOL CROSS SECTION Figure 2

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