PRNC 52 PUERTO RICO NUCLEAR CENTER PROCEDURES FOR OPERATING Co®° GAMMA IRRADIATION FACILITY ---Page Break--- ---Page Break--- The Procedure for operating Co® Gamma Irradiation Facility has been reviewed and approved by the Safety Committee. 30) 1968. As hereby approved and made operative as of April ---Page Break--- ---Page Break--- 1 Procedures for Operating Co Gamma Irradiation Facility DESCRIPTION OF SOURCE ) ® Ports The cobalt-60 Gamma Irradiation Facility (GIF) for FANG is housed in room 121 in the PRIC building at Maya sues. This room has a double door to the rear corridor and two separate single doors to laboratory room 103. The room will have a cabinet for storing grappling hooks etc., tables for working space, tanks of O2, N2 and compressed air, and a water circulating system for the pool. FOOU A pool 9" x 8' x 6" deep that is located in room 221 contains the cooling water as a shield. A dry well is adjacent to one end of the pool with an aluminum plate separating the two sides. The dry well will not be used and the port will be shielded as necessary to reduce scattered radiation through the dry well. A portable deck bridge which goes across the top of the pool will serve as the base for the operator conducting irradiations. A platform 4' x 8' is located 10 feet below the water in the pool. This platform has twelve cylinders --- Page Break --- ©) to hold the capsules. It will hold the hollow cylinder variable geometry irradiator. A radiation monitor with audio alarm is preset at 20 mR per hour. The probe will be attached to the underside of the triage above the platform area where the irradiations will be conducted. HOLLOW CYLINDER VARIABLE GEOMETRY IRRADIATOR The Co-60 is contained in twelve panel type capsules each containing approximately 200 curies. The capsules are inserted in the Hollow Cylinder Variable Geometry Irradiator (VOI). The VOI is adjustable to form a hollow cylinder from 1 inch to 18 inches in diameter. A 1D can be obtained by using 12, 6, or 3 symmetrical test capsules. SAMPLE

HOLDERS Samples to be Arranged will be placed in mouth polyethylene bottles of appropriate size from one to eighteen inches in diameter. The cap of the bottle has a connection for attaching a rod. A connection for fastening an air hose and a tube for release of excess air from positive pressure is part of some of ---Page Break--- TE, AUTHORIZED PERSONNEL AND RESPONSIBILITIES (A) SUPERVISOR RESPONSIBILITIES: In charge of facility. 2. Responsible for training of assistant supervisors. 3. Responsible for keys for OTF. 4. Responsible for changing geometry of variable geometry ‘irradiator. Responsible that procedures are fully complied with. 6. Responsible for scheduling use of GIP. 7. Responsible for recommending to Health Physics personnel to be assistant supervisors. (B) ASSISTANT SUPERVISOR RESPONSIBILITIES: 1. Responsible for items 3, 4, 5, 6 under supervisor. (C) PERSONNEL USING FACILITY RESPONSIBILITIES: Responsible for filing form 663 with Health Physics. 2. Responsible for making appointments to use facility. Responsible for placing and removing materials to be irradiated. 4. Responsible for ensuring that materials placed in pool do not contaminate facility. ---Page Break--- III. LOADING AND UNLOADING SOURCE PROCEDURE (4) Storage Compartments: The capsules will be stored in individual cylinders in the platform in the pool or in the variable geometry Irradiator. The grapplers etc. will be locked in their cabinet. (5) PROCEDURE FOR LOADING, UNLOADING AND CHANGING GEOMETRY: There will always be two persons involved in loading or unloading the VOI, at least one being the supervisor or an assistant supervisor. The step-by-step procedure is as follows: 1. Put signs on doors of ~21 and lock the room. 2. Unlock cabinet containing grapplers, portable monitor, etc. 3. Check monitor and radiation detection alarms, check portable survey meter. 4. Turn off all lights and count capsules in twelve holders as well as check VOI in pool. Check is by Cerenkov effect with lights off. 5. Turn lights on. 6. One person with portable survey

meter 42 on side of pool to check for radiation during rest of procedure, ---Page Break--- 7. Using grappler remove ‘from VGT and place on capsule holders. 8, Turn off all lights and count capsules

holders as well as check VUE in pool. The ty Corsakow ert with lights off. WILL be double checked with lights off and on to make sure so capsule has been left in by not taken 9. Turn lights on. 10, Remove VOT from pool and place on table. 11, Set VOT to desired position. 22, Return VOT to pool and platform. 23, Using grappler, place co6? capsules one by one. s. Return grappler, etc., to cabinet and lock. 15. Check compressed air (or any O2) supply and connections. Ready for irradiation. Scientific staff may use room 12L as a laboratory during irradiations but will not be present when loading or unloading of tubes to the VOT is being conducted. Because of the storage of og eyLingers in the room it is STRICTLY forbidden to smoke or use open flame. ---Page Break--- be RE TV, SAMPLE IRRADIATION PROC ‘The responsibility for an irradiation procedure will fall on the person conducting the experiment after he has become familiar with the facility. Until then, the supervisor will be responsible. Samples to be irradiated will be placed in polyethylene containers and kept dry. They may be irradiated in air, oxygen or nitrogen atmospheres. The procedure is as follows: 6 10. a. a 2h Place sample in polyethylene container. Secure cap on container. Connect appropriate air pressure hose to cap. Connect vent rod to cap. Lower container to pool just below surface and test for air pressure by observing bubbles from outlet. Set time for desired interval (determined from charts), Place container in VOT and start timer. When time interval has elapsed, remove container from pool and place on table. Shut off air pressure. Remove vent rod, remove air hose. Remove cap. Take out sample, record in log book. ---Page Break--- V. SAFETY PROVISIONS IN CASE OF ULTTRAFILTRATION FAILURE OR MALFUNCTION w (3) WATER Loss the pool is provided with a water level

alarm set to sound when the Level drops 8" below normal (1M'). There are three ways in which water may be lost from the pool: (1) evaporation (2) pumping (3) earthquake cracking walls. Evaporation loss will be compensated by the water line with a float valve that opens when the water level drops one inch. The pump will be modified so that all outlets from it go into the pool. This will not affect its standard operation as the purpose is to circulate and filter the water. If an earthquake occurs of sufficient magnitude to crack the reinforced concrete walls resulting in a loss of the water, the area will be vacated. The radiation alarm should sound (if there is still electricity) but no detailed corrective procedures are offered at this time. The circumstances would be such that they could best be worked out after such an eventuality. POWER POWER The operation of the GIF is entirely manual operation. The alarm systems are electrical and lights to observe the operations also are electrical, but otherwise, the facility is independent of electrical power. A battery-operated portable light is available. In the event of electrical failure, all experiments will be stopped and the GIF put in stand-by condition (as if in storage) following the previously outlined procedure. CAPSULE INCIDENT There are various ways in which a capsule incident is conceivable. 1. 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 corrective procedure is to pick it up with the grappler and place it where it belongs. 2. Jammed in VOT If this incident occurs, a health physicist will be called before proceeding. The VOT is made of aluminum and a capsule could become wedged in it. If this does occur, all other capsules will be removed from the VOT. The capsules are not forced into place so any jamming should be of a minor degree. The capsule will be

pulled up with the VGE handle in place until it becomes loose. A sudden release of the capsule cannot cause radiation basing and it could be lifted over four feet, therefore radiation can be detected at the surface. ‘The height raised too high in loading. ‘The grappler used to transfer the capsules from their storage container to the VOR is designed with such a length that when the capsule is six inches above the top of the VOR, the opposite end of the grappler strikes the ceiling

in room 121. The grappler will always be held in a vertical position when used to transfer the capsules. ‘The radiation monitor audible alarm sounds when the level reaches 20 mR/hr. A second person will be at the poolside to observe errors of judgment, as to distance and will have a portable survey meter to indicate radiation levels. Lifting VOR with capsule still in irradiator, before raising the VOR, the capsules will always be counted in the twelve capsule holders. The VG any capsules with length on and off (for Cerenkov effect). When the VOR is raised from the pool, it will be done slowly and the operation will be monitored in the manner best for accidental capsule raising. Sample bottle cannot be removed from the VOR. ‘The platform has two brackets fastened to it which cover the glass of the VOR. If the bottle becomes jammed to that an upward pull would lift the entire VOR, the brackets will restrict the movement to 3 inches. ‘The procedure that will be followed under these circumstances is to remove the capsules as outlined in section 3 of TE. Then the entire VOR can be removed from the pool and the bottle separated from it.