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MULTIKILOCURIE RADIATION EFFECTS FACILITY

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SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS

MULTIKILOCURIE RADIATION EFFECTS FACILITY

Department of Automotive Research
Southwest Research Institute
San Antonio, Texas

MULTIKILOCURIE RADIATION EFFECTS FACILITY

INTRODUCTION

Southwest Research Institute has available two hot cells for radiation effects studies. This hot lab is part of the building shown in Figure 1. It has been constructed to assist government and industry in research programs that require high intensity cobalt-60 irradiation or experimental work with irradiated material.



Figure 1
Artist's View of Aviation Building

DESCRIPTION OF FACILITY

Figure 2 is a photograph of the front of the two hot cells. Figure 3 is a photograph taken inside of one of the hot cells showing the cobalt carriage and cobalt shielding door.

In front of the hot cells is an area of 1000 square feet for the preparation of unirradiated specimens and for test equipment to be used in conjunction with the hot cells. Figures 4, 5, 6, and 7 give details of construction. The cells were designed to handle 100,000 curies of cobalt-60; additional shielding will permit the installation to house 1,000,000 curies of cobalt-60.



Figure 2
Front View of Hot Cells



Figure 3
Interior of the Right Hand Cell

The cobalt is stored in the wall between the cells (Figure 7) and can be transported into either or both cells for irradiation of test materials. The cobalt storage room is approximately a four-foot cube. The cells themselves are each 9 feet by 15 feet in plan view and the ceilings are 13 feet high. A special pair of Central Research Laboratory Model 8 manipulators are available for operation in either cell. These manipulators have a 45-inch "Z" travel and a longer arm in the hot cell than on the operators' side. Motorized side and forward separation are built into these manipulators to facilitate operations in front of the viewing window.

The viewing windows, one to each cell, are conventional zinc bromide construction with three inches of nonbrowning glass on the hot side, 37 inches of optical-grade zinc bromide, and two inches of laminated plate glass on the viewer's side. The window area on the hot side is 48 inches wide by 42 inches high, and the operators' viewing area is 48 inches wide by 22 inches high. These windows are some of the largest ever built and offer superb vision.

The operators' wall consists of 42 inches of magnetite concrete (244 lbs/ft³), and will provide operational shielding with a million-curie source. The eight-ton access doors are lowered into a floor well to eliminate the psychological hazard of walking beneath a large suspended weight. The doors are raised and lowered hydraulically. A lift rod in the center of each door opening leaves sufficient opening for passage of personnel; when equipment is moved in or out of the cell, the lift rod is unthreaded within a few minutes and withdrawn into the walls. The doors for closing off the cobalt storage area are constructed in the same manner as the access doors. They also move hydraulically, but rise instead of dropping into the floor. The cobalt is transported on two steel dollies guided by tracks and moved by a roller chain traveling in a channel section in the floor. The movements of dollies and doors are, of course, remotely controlled and electrically interlocked for safety.

Each cell is ventilated with a complete change of air each minute. A high quality commercial air filter is used on the inlet side, and on the outlet side, an identical air filter is used ahead of a Cambridge absolute air filter. A blower is located on the suction side to keep the cell itself at a negative pressure. This insures that in the event of some catastrophic accident in the cell cobalt dust could not spread to the personnel area.

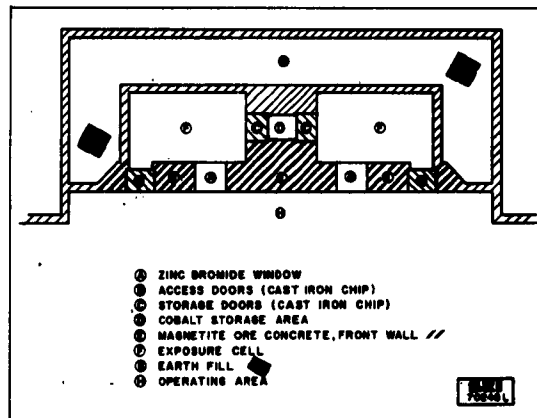


Figure 4
Plan View of Hot Cells

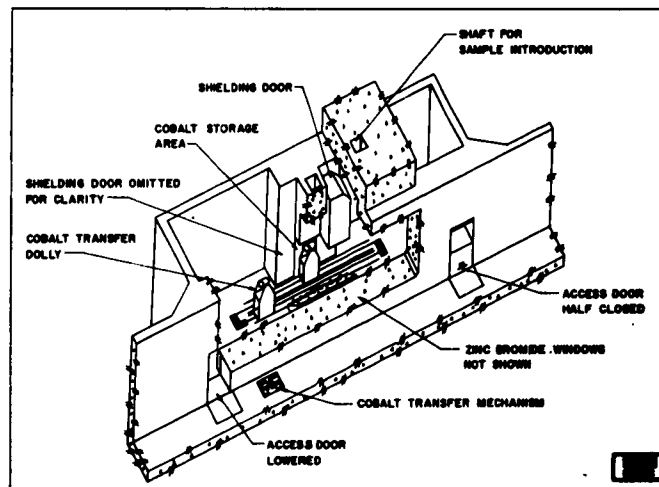


Figure 5
Isometric of Hot Cell Arrangement

In addition to the manipulator holes in line with the viewing window, two additional holes are installed in the wall on three-foot centers to allow the movement of the manipulators to cover the entire cell area. Figure 7 shows the location of the manipulator holes and utility access holes. Adequate access holes for utilities, pressure connections, instrumentation, and electrical leads are provided near the floor line and just below the ceiling line (Figure 7). The utility and instrumentation leads pass through corkscrew-shaped conduits through plugs of high density material. This eliminates line-of-sight radiation through the utility connections.

The 32" wide doors in each cell provide easy access for moving the equipment or irradiated material into the cells. Each cell is provided with a radiation monitor. The radiation monitors are interlocked with the doors for safety protection of the personnel operating the caves. In addition, there are two monitors in the preparation room.

DESCRIPTION OF GAMMA FLUX SOURCE

The cobalt presently used to provide the gamma flux field consists of 40 curie-per-gram specific activity cobalt-60. This material is in gold- and nickel-plated cobalt discs one centimeter in diameter and two millimeters thick. The cobalt discs are encapsulated, four to a capsule, in 0.020" stainless steel tapes 0.500" wide by 0.130" thick by 2-1/16" long. A holder for each cobalt tape permits a rapid change of configuration using only the manipulators.

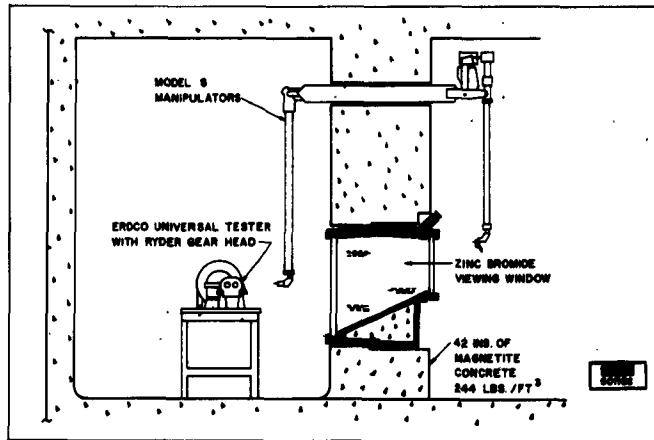


Figure 6
Section through Hot Cell Wall

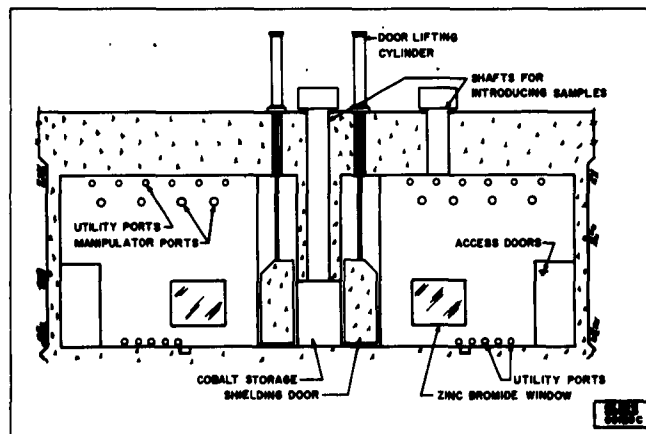


Figure 7
Section through Hot Cells
Looking at Operators' Shielding Wall