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Radiological Survey Results at Building 22, Washington Navy Yard, Washington, D.C. (WSN001)

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HEALTH SCIENCES RESEARCH DIVISION

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ABSTRACT

A radiological survey was conducted in a portion of Building 22 at the Washington Navy Yard, Washington, D.C., on December 13, 1995. The survey was performed because former employees thought the area surveyed had some previous association with radioactive material. Employees remembered seeing radiation signs in the area and indicated that personnel occupying this area wore dosimeters. Two rooms in the survey area were surrounded by 1-ft-thick poured concrete walls and similar 6-in.-thick ceilings, and situated on top of a 1-ft-thick concrete slab, a configuration commonly used for radiation shielding in industrial radiography facilities.

The radiological survey showed no gamma, beta-gamma, or alpha measurements above typical background levels. Low background radiation levels within the building indicated that even if low-level contamination were present beneath the tile, or larger amounts of contamination beneath the concrete slab, it poses no radiological hazard to building inhabitants under the present conditions. Further investigation may be required before drilling or demolition of the concrete slab. No photon radiation fields from sealed gamma sources or x-ray sources were detectable at the time of the survey. Gamma spectrometry analysis revealed no gamma emitters above typical background concentrations in one sediment and one water sample collected from a pit in the open bay area.

1. INTRODUCTION

A radiological survey was conducted in a portion of Building 22 at the Washington Navy Yard, Washington, D.C., on December 13, 1995. The survey was performed by the Measurement Applications and Development Group, Health Sciences Research Division, Oak Ridge National Laboratory (ORNL) at the request of ORNL's Office of Safety and Health Protection. A general outline of Building 22 is shown in Fig. 1 where shading indicates the portion of the building that was surveyed. An exterior view of Building 22 is shown in Fig. 2 and interior views in Figs. 3 and 4.

Based on information from former employees, the area surveyed was suspected of having some previous association with radioactive material. Employees remembered that radiation signs were formerly posted in the area and dosimeters were worn by personnel occupying the area. Also, it is believed that at one time radium dial painting was conducted in this building or in some other building in the Navy Yard. Two rooms in the survey area were surrounded by 1-ft-thick poured concrete walls and similar 6-in.-thick ceilings, a configuration commonly used for radiation shielding in industrial radiography facilities. A small 70 kVp x-ray machine was observed in the building. According to some of the workers, it is used intermittently to x-ray incoming mail packages.

Building 22 consists of an original load-bearing masonry brick building built in the 1860s and additions added in 1916 and 1926. The additions included a two-story shed on the north side and a five-story-high building with a crane rail to the south.[1] The building currently measures approximately 266 by 164 ft (43,624 ft^2) and is used for electronic instrument maintenance, office space, storage, and racquetball courts. The floor is typically exposed concrete. Beginning at Column Line 8 (a line drawn between columns numbered 8, Fig. 1), a 1-ft-thick concrete slab has been poured on top of the existing concrete floor. The concrete slab extends to Column Line 13 (approximately) where the floor begins tapering down to what appears to be the original concrete floor. In the surveyed area, all slab areas were covered with floor tiles and one room was covered with carpet; original concrete flooring was present in the open bay area.

2. SURVEY METHODS

A description of typical methods and instrumentation providing guidance for the conduct of this survey is presented in *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program.*[2] Guidelines for the use and calibration of instruments are given in *Measurement Applications and Development Group Guidelines.*[3] All direct-measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations measured in the environmental samples.

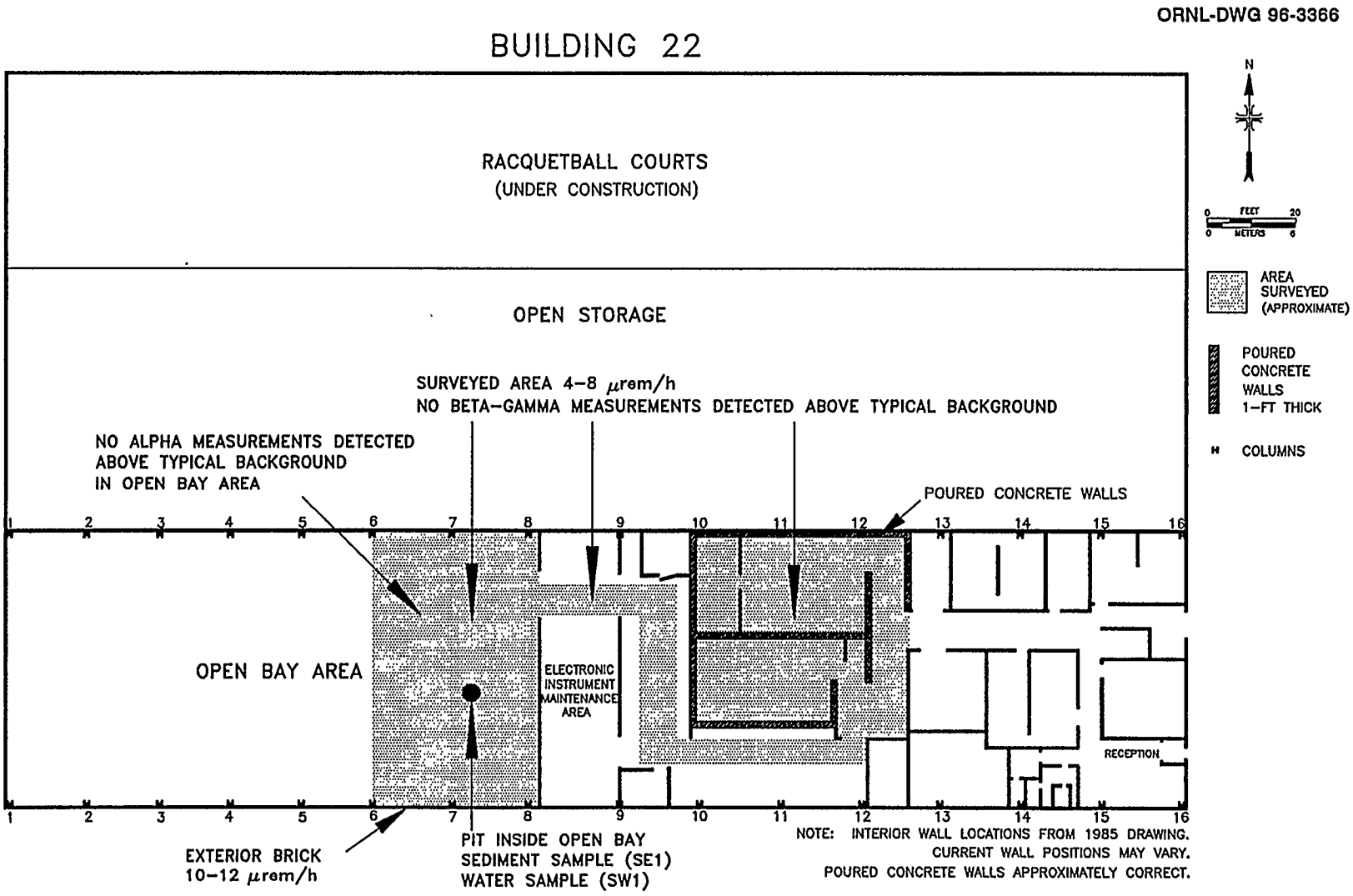

Fig. 1. Diagram showing general outline of Building 22 at the Washington Navy Yard. Shading indicates the surveyed area.

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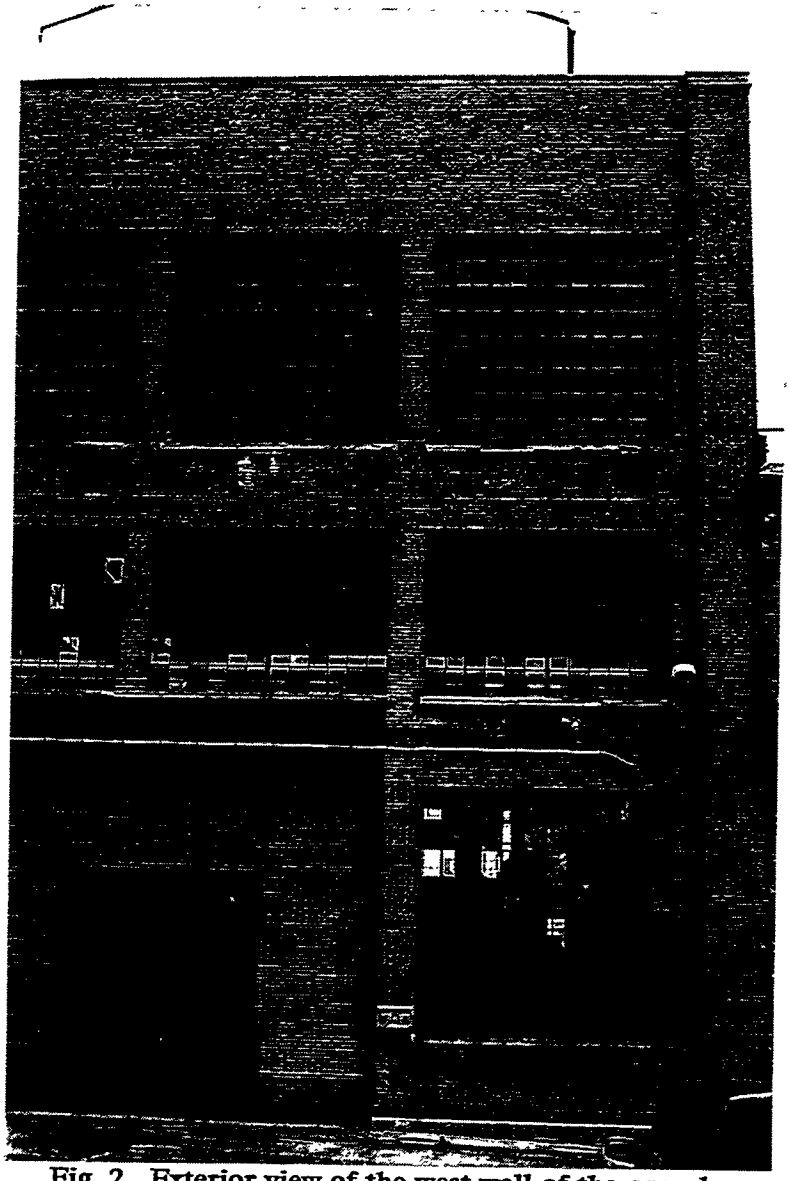

Fig. 2. Exterior view of the west wall of the open bay area, Building 22, Washington Navy Yard.

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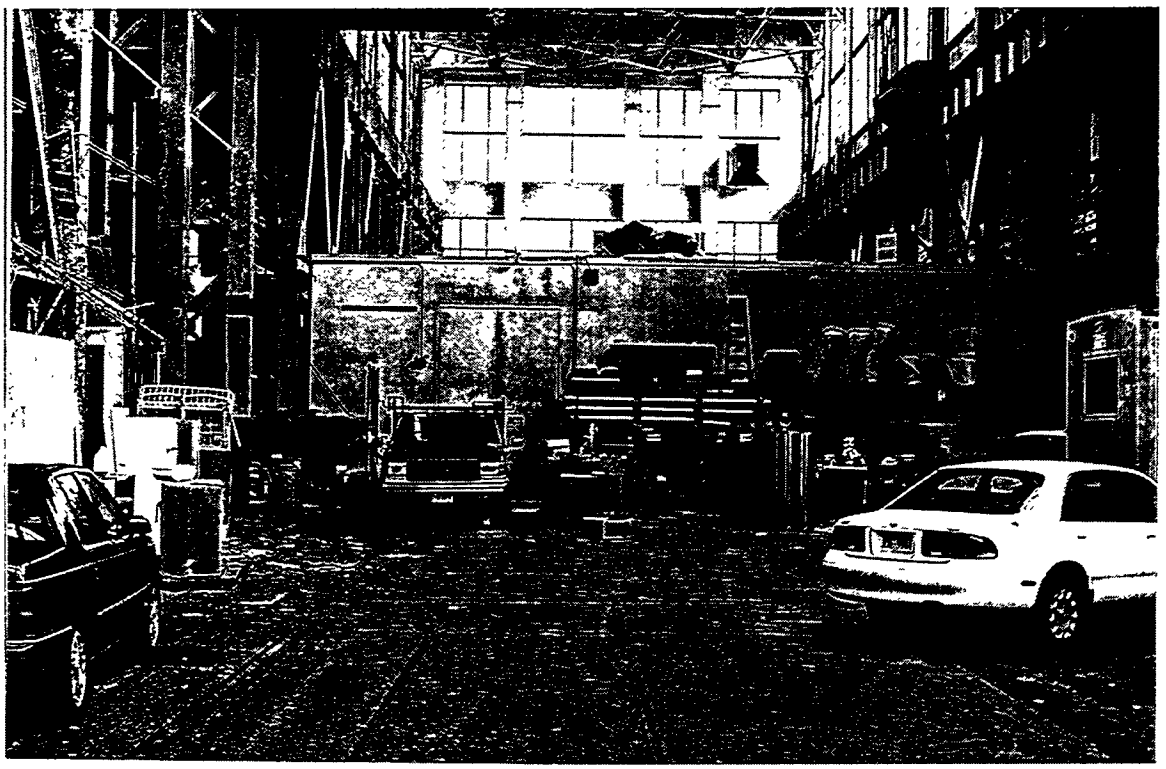

Fig. 3. View from open bay area looking east at entrance to electronic instrument maintenance area.

ORNL-PHOTO 413-96

Fig. 4. Looking south at cover to pit in open bay area.

The survey was designed to detect any radioactive anomaly that might be present in the survey area. Gamma radiation and beta-gamma radiation were measured on floors in the shaded areas (Fig. 1). Measurements were taken underneath the carpet at several locations, but floor tiles were not removed. Alpha measurements were taken only on the original concrete floor in the open bay area because all other surveyed areas were covered with new tile or carpet.

Gamma radiation was measured with a sodium iodide (NaI) scintillation probe connected to a Victoreen Model 490 Thyac III ratemeter. The detector was held approximately 2 in. above the surface. Because NaI gamma scintillators are energy-dependent, measurements made with this instrument were normalized to Bicron microrem meter measurements in order to estimate gamma dose equivalent rates in μrem/h.

A Bicron miniscaler/ratemeter with a Geiger-Mueller (GM) pancake detector was used to detect beta-gamma radiation. After characterization of the detectors with known beta fields,[4] beta radiation detection levels in counts per minute were converted to dose rates in millirads per hour.

Direct alpha radiation measurements were made with an ORNL alpha survey meter connected to a zinc sulfide (ZnS) scintillation probe. Counts per minute were recorded for a direct, 60-s measurement and converted to disintegrations per minute (dpm) per 100 cm^2 using the instrument-specific conversion factor.

One sediment sample (SE1) and one water sample (SW1) were collected from a pit in the open bay portion of the building. Gamma spectrometry analysis was performed to determine if any gamma emitters were present in the samples. The location of the pit is shown in Fig. 1 and a photograph of the pit cover in Fig. 4.

3. SURVEY RESULTS

Gamma radiation dose equivalent rates in the surveyed area ranged from 4 to 8 μrem/h. No measurements above typical background were detected during the gamma survey. The slight elevations in outdoor gamma levels near the exterior brick (10 to 12 μrem/h) can be attributed to naturally occurring radioactive substances present in brick, cinder blocks, and other such materials used in building construction.

Similarly, no beta-gamma dose rates above typical background were detected inside the rooms surrounded with thick poured concrete walls, along the path leading from these rooms to the open bay area, or in the surveyed section of the open bay. No elevated beta-gamma levels were detected under the carpet, which was pulled up in several locations. No floor tiles were removed.

Likewise, no elevated alpha radiation measurements were detected in the surveyed section of the open bay. All radiological survey results are indicated on Fig. 1.

Gamma spectrometry analysis of the sediment and water samples revealed no gamma emitters above typical background levels. Concentrations of ^{238}U, ^{235}U, ^{226}Ra, ^{232}Th, and ^{137}Cs are shown in Table 1. Cesium-137, which is not ordinarily detectable, can frequently be found in roof drains, ditches, and along the driplines of buildings where runoff containing normal atmospheric fallout is concentrated. This small amount of ^{137}Cs is of no radiological concern.

Table 1. Concentrations of radionuclides in sediment and water collected from a pit in the open bay area of Building 22 at the Washington Navy Yard

Sample[a]	Radionuclide concentration[b]				
	^{238}U	^{235}U	^{226}Ra	^{232}Th	^{137}Cs
	Sediment Sample (units: pCi/g)				
SE1	0.74±0.11	<0.10	0.29±0.04	0.24±0.04	0.13±0.01
	Water Sample (units: pCi/mL)				
SW1	0.05±0.05	<0.01	<0.01	0.02±0.01	*c*

[a]Sample location is shown on Fig. 1.
[b]Indicated counting error is at the 95% confidence level (±2σ).
[c]Not analyzed.

4. SIGNIFICANCE OF FINDINGS

The radiological survey conducted December 13, 1995, on portions of Building 22 at the Washington Navy Yard, Washington, D.C., showed no gamma, beta-gamma, or alpha measurements above typical background levels. Low background radiation levels within the building indicated that even if low-level contamination were present beneath the tile, or larger amounts of contamination beneath the concrete slab, it poses no radiological hazard to building inhabitants under the present conditions. Further investigation may be required before drilling or demolition of the concrete slab. No photon radiation fields from sealed gamma sources or x-ray sources were detectable at the time of the survey. Gamma spectrometry analysis revealed no gamma emitters above typical background concentrations in one sediment and one water sample collected from a pit in the open bay area.

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