BGRR-020

Brookhaven Graphite Research Reactor (BGRR) Decommissioning Project

ACTIVITY CLOSURE REPORT FOR PRIMARY AIR COOLING FANS AND MATERIALS REMOVAL

April 28, 2000

BROOKHAVEN NATIONAL LABORATORY
BROOKHAVEN SCIENCE ASSOCIATES
Under Contract No. DE-AC02-98CH01886 with the
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1.0 INTRODUCTION

1.1 Purpose

This activity closure report provides a compilation of the information that was used to develop and execute the Contractor Work Breakdown Structure (CWBS) for the primary air-cooling fans and associated equipment removals from the Fan House, Building 704.

1.2 Removal Authority

Removal of the primary cooling fans and equipment from Building 704 was authorized by the following approvals:

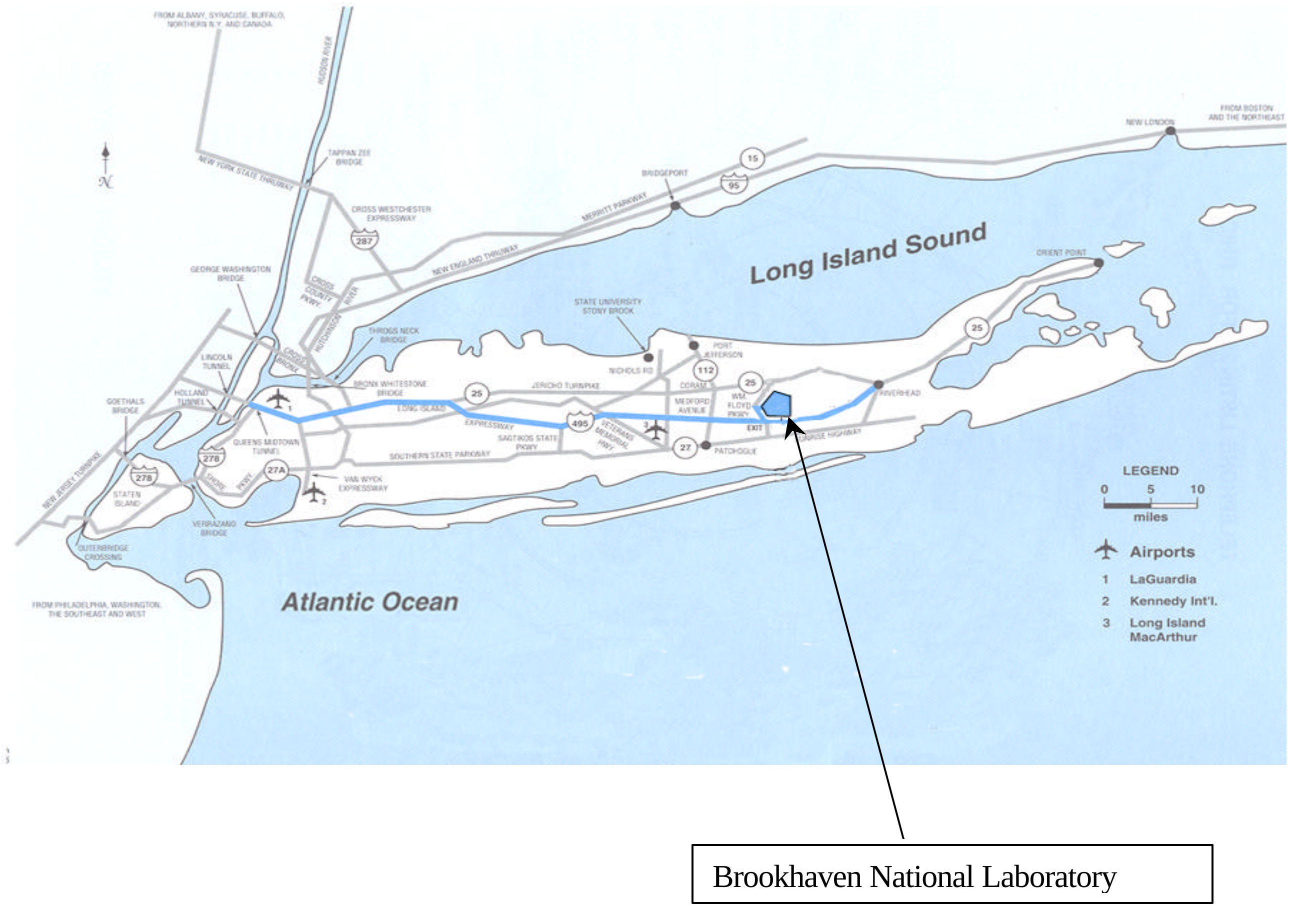
1. National Environmental Policy Act (NEPA) Environmental Evaluation Notification Form, NEPA Categorical Exclusion, CH NEPA Tracking No. BNL-367 (Attachment 1),
2. Approval of Unreviewed Safety Issue Determination/Safety Evaluation (USID/SE) for Pile Fan 5 Removal for Brookhaven Research Reactor Decommissioning Project (BGRR-SE-99-01). (Attachment 2),
3. Approval of Unreviewed Safety Issue Determination/Safety Evaluation for Residual Pile Fans Removal for Brookhaven Research Reactor Decommissioning Project (BGRR-SE-99-03) (Attachment 3),
4. BGRR Pile Fan 5 Removal and Fan House Decontamination, NESHAP compliance. (Attachment 4), and
5. Memo, L. Somma to C. Newson, Subject: Building 704 Fan House/Fan Cells, and Memorandum of Agreement (MOA) for the Ownership of the Fan House, Building 704, and the Primary Air Duct System and Associated Systems and Components, dated May 14, 1999 (Attachment 5).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Brookhaven National Laboratory

Brookhaven National Laboratory (BNL) is located in Upton, Long Island, New York, near the geographic center of Suffolk County, approximately 60 miles east of New York City (Figure 1). Approximately 1.32 million people reside in Suffolk County and about 0.41 million people reside in Brookhaven Township, within which BNL is situated.

Figure 1. BNL Location Map



The BNL facility contains 5,265 acres (8.23 square miles). BNL terrain is gently rolling with elevations varying between 44 and 120 feet above mean sea level (amsl). The land lies on the western rim of the shallow Peconic River watershed, with a principal tributary of the river in the north and west sections of BNL.

BNL's principal facilities are located, with few exceptions, near the geographic center of the site. They are contained in an area of approximately 900 acres, of which about 500 acres were originally developed for U.S. Army uses. The remaining 400 acres are occupied, for the most part, by various large research facilities. Outlying facilities occupy about 550 acres and include apartment areas, biology research fields, a solid waste management area, closed landfills, a sewage treatment plant, and firebreaks. The balance of the site, approximately 75 percent of its total area, is largely wooded. The

BNL site, formerly known as Camp Upton, was used by the U.S. Army during World Wars I and II and by the Civilian Conservation Corps Camp between the wars. In 1947, ownership was transferred to the Atomic Energy Commission for peaceful research on atomic energy and materials. The site was subsequently transferred to the Energy Research and Development Administration in 1975, and finally to the Department of Energy (DOE) in 1977. These later transfers were the result of agency name changes, not changes in occupancy or function.

BNL carries out basic and applied research in the fields of high-energy nuclear and solid state physics; fundamental material and structure properties and the interactions of matter; nuclear medicine, biomedical and environmental sciences; and selected energy technologies.

2.2 Brookhaven Graphite Research Reactor

The Brookhaven Graphite Research Reactor (BGRR) at BNL was the first reactor built for the sole purpose of providing neutrons for research. During its years of operation, it was one of the principal research reactors in the United States. Construction on the BGRR was completed in August 1950, and initial criticality of the reactor was achieved the same month. The BGRR operated until June 10, 1968 when operation of the reactor was terminated and deactivation of the facility was initiated. In June of 1972 defueling and shipment of the fuel to the DOE Savannah River Site was completed. The BGRR complex was described as being in a safe shutdown condition by the U.S. Atomic Energy Commission and became a Surplus Facility within the DOE complex. From 1977 until 1997, portions of the facility were used as the BNL Science Museum.

The BGRR was an air-cooled graphite moderated reactor. The Primary Air-Cooling System utilized cooling fans that were located in a building (704) separate from the reactor building (701). Exhaust ducting constructed of reinforced concrete runs in two separate ducts below the ground from the reactor exhaust plenums to the system cooler and filters. Downstream of the filters, the ducting rises above the ground and combines into one large duct, which is located on, and supported by, the Fan House (704). The individual cooling fans took suction through 48-inch diameter ducts, which penetrated the building roof and connected at the duct bottom. There is approximately 225 feet of above-grade ducting. An aerial picture of the BGRR site is shown in Figure 2.

During reactor operations, filtered outside cooling air was drawn across the reactor pile through this ductwork by the fans where it was cooled, filtered and eventually exited through the 100-meter tall exhaust stack.

Figure 2. BGRR Site Looking North

2.3 Primary Air Cooling Fans and Equipment, Fan House Building 704

The Fan House Building 704 has two major sections. The main section is the motor-house area located on the south side of the building that includes the normal and emergency electrical power feeds to the High Flux Beam Reactor (HFBR). This section includes one primary fan motor, the secondary fan motor, and some associated valves and instrumentation. The north and west ends of the building are divided into nine rooms. Five of the rooms house the primary air-cooling fans. One room houses instrumentation for fan operations. One room houses the primary emergency fan. One room houses the secondary air-cooling fan and associated valves. The southwest room houses the emergency engine for the primary air emergency-cooling fan. The fans are internally contaminated, and there are contaminated areas in most of the fan rooms.

There are five primary air-cooling fans. Fans 4 and 5 are original fans, while fans 1, 2, and 3 are newer replacement fans. The primary fans were used to draw filtered air through the reactor pile to cool it. A secondary air fan located near the west end of the fan house was used to cool the outer walls of the below ground air-cooling ductwork.

In recent years, the fan rooms have been used by the High Flux Beam Reactor (HFBR) organization for storage of materials and experimental equipment used at the HFBR.

3.0 REMOVAL ACTIVITY

3.1 Objectives

3.1.1 Remove and dispose of contaminated equipment in the fan rooms.

3.1.2 Decontaminate or fix as appropriate contamination in the fan rooms.

3.1.2 Return custody of the fan rooms to the Reactor Division.

3.2 Activities

The work was performed as described using required work permits, Radiological Work Permits (RWPs), cutting and burning permits, and critical lifting permits. Removal of Fan 5 began on November 3, 1999. BNL Plant Engineering personnel performed the preparation for the removal of the fans and associated equipment. Removal activities required a sequenced approach that applied many skilled trades to perform each fan removal. Each fan weighed approximately 26,000 pounds and had to be partially dismantled for removal from its fan room location. Surveys of the fan rooms following the fan removal activities were completed mid-February 2000.

The first step in the process was to evaluate the potential radiological and hazardous materials that may be on or within the fans. Fans 5 and 3 were selected for characterization. Fan 5 was selected because it is one of the two original fans, and Fan 3 was chosen because it is one of the newer, heavier fans. Evaluating one older and one newer fan was necessary to determine which fan should be removed first. It was thought that the first fan to be removed would take longer than subsequent fans. Therefore, in keeping with As Low As Reasonably Achievable (ALARA), it was necessary to characterize one fan of each type to determine which had the lowest contamination levels. The fan with the lowest contamination levels would be the first fan to be removed. The results of the radiological characterization of the internals of the two fans were very similar in the radionuclide types and amounts of radioactivity, primarily, Cesium-137 (Cs-137), 44,000 pCi/gm max.; Cobalt-60 (Co-60), 75 pCi/gm; and Americium-241 (Am-241), 27 pCi/gm. The hazardous materials identified were lead in the paint and asbestos in gaskets and piping insulation. Based on the results, the first fan to be removed would be Fan 5.

Radiological surveys and air monitoring was performed throughout the work activity. The first step in removing a fan was to drill small holes in the casing of the fan and spray a fixative to fix the radiological contamination on the interior of the fan.

Worker, public, and environmental safety were paramount in the planning and implementation of the removal work. There were no instances of personnel radioactivity contamination, overexposures, or internal uptakes during the performance of the fan-removal activities. There were no lost-time accidents during the performance of the fan removal activities (see Attachment 6).

Following the removal of Fan 5, Fans 4, 3, 2, 1, and the secondary air fans were removed and packaged for shipping off the BNL site (see Attachment 7).

A picture summary for the removal of one of the primary air cooling fans is included in this closure report (see Attachment 8).

3.3 Final Conditions

Following the removal activities, the Facility Support technicians assigned to the BGRR Decommissioning Project performed a complete set of radiological routine surveys and adjusted radiological postings to document the as-left conditions of each of the fan rooms and areas where work was performed. During the removal of the Above-Ground Ducts, additional work will be performed in the fan rooms. The fan inlet isolation valves will be removed from each room. When the valve removal work is completed, final work completion surveys will again be performed in each fan room (Attachment 9).

3.4 Activity Cost

The cost of the activity was approximately $575,000. The cost includes planning, execution, waste disposal, and closure of the activity.

4.0 WASTE MANAGEMENT

Radiological surveys of materials that determined them not to be radiologically contaminated were released as construction debris.

Approximately 150,000 pounds of metal materials were disposed of as contaminated materials. The fans will be processed at a licensed off-site facility using a super-compaction process and transported to a regulated disposal facility. The fan motors were contaminated, have been packaged, and will be sent directly to the disposal facility.

5.0 LESSONS LEARNED

5.1 Communication was one of the lessons learned during the performance of this activity. Whenever, physical work is planned, it is necessary to communicate the work planned, its expected duration, and the increased traffic near the facility to the occupants of nearby buildings.

5.2 When it is necessary to perform repetitive tasks, plumbing, sheet metal work, cutting, or burning, it is necessary to plan each evolution in its entirety to maintain schedule and achieve the most productivity.

5.3 Close coordination with the waste contractor is necessary to insure adequate containers are available to house and transport the waste materials being removed to minimize schedule impacts for the project and the waste processor.

5.4 Attention to detail is required for postings and signs that designate for work areas.