

**TESTS OF PCB RELEASES DURING BURNING ACTIVITIES AT
RAVENNA ARMY AMMUNITION PLANT
DRAFT PHASE 1 TEST PLAN**

Introduction

Ravenna Army Ammunition Plant (RVAAP) has applied to the U.S. Environmental Protection Agency (EPA) for permission to subject the surfaces of certain buildings and other materials of construction at the RVAAP to high-temperature flames (commonly referred to as open burning). The purpose of burning is to deactivate any residual explosives that may remain from ammunition loading operations and thereby allowing safe demolition of the structures.

EPA permission is required to perform this open burn because some of the building interiors have paint that contain polychlorinated biphenyls (PCBs) above the threshold level of 50 parts per million (ppm). The EPA will issue its approval only after they are satisfied that the proposed operation will ensure the safety of the surrounding community and environment.

The need to safely demolish the structures at the RVAAP facilities has led the EPA to the position that it must either 1) advance its knowledge of open burning and the mechanisms and impacts of potential PCB releases, or 2) gain additional knowledge of other alternatives. RVAAP officials have already prepared an analysis of alternatives to open burning and submitted it to the EPA for consideration. The analysis essentially concludes that there is no safe alternative to open burning.

RVAAP plans to conduct tests to advance the knowledge of open burning and its impact on potential PCB releases and/or related by-products. The proposed tests will be conducted in phases. Phase 1 will be conducted in a laboratory under controlled conditions. Phase 2 will be conducted under conditions designed to simulate actual field conditions.

This document is limited to the technical aspects of Phase 1.

Objective

The proposed Phase 1 tests will consist of subjecting several paint samples to elevated temperatures using a radiant heat source to study the rate of PCB volatilization and potential decomposition. The temperatures chosen during Phase 1 will represent the range of temperatures that the PCBs will be subjected to during actual field-burning conditions.

The Phase 1 test results should provide information about the temperatures needed to cause PCBs to be released from the paint, if any, and determine if any destruction of PCBs occurs. The information should define the upper limit of the quantity of PCB released from the painted surfaces. The Badger Army Ammunition Plant plans to use radiant heat to destroy explosive residue on piping and equipment coated with similar PCB containing paints. The results of this phase should be able to be used to predict if any PCBs will be emitted during the Badger process.

Phase 1 testing will not attempt to simulate conditions that are expected during actual field burn conditions. However, using the controlled laboratory conditions as a starting point, Phase 1 results should also provide data on the detection levels needed when progressing to Phase 2, which will be conducted under simulated field conditions. The results ultimately obtained during Phase 2 will be used to validate the dispersion modeling tests submitted to EPA.

Experimental Design

The experimental design proposed for Phase 1 testing includes performing a series of tests under controlled temperature conditions on several paint samples. To ensure that the PCB emission rates are adequately characterized each test will be performed in triplicate. Testing in triplicate provides a measure of statistical precision for the emission measurements. Battelle laboratories will be provided with samples from RVAAP of predetermined PCB content that have been pulverized to assure uniformity. Each paint sample has at least 50 grams of material that will be split into fractions of at least 10 grams for testing with the remainder being preserved for possible future use. The samples will be selected so that the PCB content exceeds 10,000 ppm. At least two samples with high PCB concentration (greater than 15,000 ppm) and at least two samples with mid-range PCB concentrations (10,000 to 15,000 ppm) will be used to assess the degree to which PCB concentration affects emission rates.

Test Conditions

Table 1 presents a summary of the proposed Phase 1 test conditions. For each test run, the sample of paint to be analyzed will be spread in a uniform thin layer. The samples will be heated to an initial temperature of 400° F and maintained at that temperature for a period of 20 minutes during which time a gas sample will be collected. After 20 minutes, the temperature of the oven will be increased in steps to 800°, 1200°, and 1600° F. The temperature at each step will be maintained for a period of 20 minutes while gas samples are collected. After collection of the sample at 1600° F, the temperature will be lowered to 1200° F and maintained for 20 minutes while an additional sample is collected. Testing will be conducted in an ambient air environment.

Equipment

The furnace will be of radiant tube design with temperature control. Samples will be placed in a ceramic or quartz crucible and heated under controlled conditions. Sampling of the emissions will conform to EPA Method 23. Modifications to the method may be implemented as needed to ensure that sample integrity is maintained. Multiple samplers will be used to allow for discrete collection of gaseous samples at each of the target temperatures. Gas samples will be collected on XAD resin and sent to the analytical laboratory for extraction and analysis.

Analysis

Samples of the paints will be collected prior to and after each of the test runs and the PCB will be extracted in methylene chloride. Similarly, a total of five gas samples will be collected for

each test run and extracted using methylene chloride by the Soxhlet extraction technique. After extraction, the samples will be split and analyzed by gas chromatography/high resolution mass spectrometry (CG/HRMS) to quantify all 209 PCB congeners and the 17 dioxins/furans with published toxic equivalency factors (TEFs).

Between each set of triplicate test runs (i.e., of a given paint sample) blank samples will be collected by running through the temperature/time sequence and collecting a single gas sample. These blank samples will establish if any contamination of the testing apparatus has occurred. Additional quality assurance/quality control samples will be collected to ensure that there is no contamination of the sampling media or of the analytical apparatus. Isotopically labeled standards will be used to establish the effectiveness of the sample collection procedures and the accuracy of the sample analysis procedures.

Reporting

The mass of available PCB in the paint sample will be calculated and compared to the mass of PCB collected in the gas samples. If possible, a mass balance will be developed. PCB and dioxin/furan in the gas samples will be reported as total mass of individual congeners and isomers. In addition, the TEFs will be used to calculate and report the total toxicity equivalents (TEQ) of dioxin/furans and PCBs.

Table 1. Proposed Phase 1 Test Conditions

Test Run	PCB concentration, ppm	Furnace Temperature, °F	Elapsed Time, minutes	Number of Samples
1a, 1b, 1c	10,000 to 15,000	400	20	1 each
		800	40	1 each
		1,200	60	1 each
		1,600	80	1 each
		1,200	100	1 each
2a, 2b, 2c	>15,000	400	20	1 each
		800	40	1 each
		1,200	60	1 each
		1,600	80	1 each
		1,200	100	1 each

For more information, contact:

Citizens for Safe Water Around Badger
 E12629 Weigand's Bay South
 Merrimac, WI 53561
 (608) 643-3124 phone
 (608) 643-0005 fax
info@cswab.org
www.cswab.org