NYC BUILDINGS

NYC Department of Buildings
280 Broadway, New York, NY 10007
Patricia J. Lancaster, FAIA, Commissioner

Siun Derkhidam
Examiner, MEA Division
212.566.3271
212.566.3840 fax
suind@buildings.nyc.gov

Mr. Ghislain Beauregard
Ar Coplast, Inc.
1873 Williamstown Dr.
St Peters, MO 63376

Date: 3/17/05

Dear Applicant:

Enclosed is a **proposed** final copy of MEA acceptance of your product, MEA 414-04-M

Please review the **proposed** final copy. Let us know if you agree and/or if you have any comments. Any comments should be written on the proposed final copy and mailed to:

Department of Buildings
Material & Equipment Acceptance
280 Broadway, 7th Floor
New York, New York 10007
ATTN: Siun Derkhidam

If this office does not receive any comment within 20 days from the date of this letter, the proposed final copy of acceptance of your product will be finalized and distributed.

For immediate finalization of your acceptance notify us with a letter or FAX that you are satisfied.

All shipments and deliveries of accepted materials to the job site are required to be labeled or tagged in accordance with the format below:

Accepted For Use
City of New York
Department of Buildings
MEA - -

Company Name

Very truly yours,

Siun Derkhidam

Siun Derkhidam
Assistant Mechanical Engineer
Materials and Equipment Acceptance Division

CITY OF NEW YORK
DEPARTMENT OF BUILDINGS

Pursuant to Administrative Code Section 27-131, the following equipment or material has been found acceptable for use in accordance with the Report of the Material and Equipment Acceptance (MEA) Division.

Patricia J. Lancaster, F.A.I.A., Commissioner
MEA 414-04-M
Report of Material and Equipment Acceptance Division

Manufacturer- Arcoplast Inc., 1873 Williamstown Drive, St. Peter Missouri 63376.
Trade Name- Arcoplast.
Product- Wall and ceiling panel for interior finish acceptance.
Pertinent Code Section(s)- 27-348.
Prescribed Test(s)- RS 5-5 (ASTM E84), Toxicity.
Laboratory- Southwest Research Institute and Factory Mutual Research.
Test Report- SwRI Project No. 01.10086.01.040 dated May 2004 and FM Report No. J13010214 dated March 29, 2001.
Description- Sandwich panel with 6mm cement core substrate with fiberglass mats resin and gel coat surface. Nominal thickness .35 in (9mm) and nominal unit weight is 3.24 lb/ft^2 (15.9 kg/m^2) calculated from 20.0 g sample. Nominal Density is 110 lb/ft^3 (1.76 g/cm^3).

Flame Spread Rating – 19
Smoke Density – 278

Recommendation- That the above described wall and ceiling panel be accepted for interior finish usage, with Class A flame spread rating as indicated above. Material having a smoke developed rating in excess of 100 shall not be used in exits or corridors, Occupancy groups H-1 and H-2 or in rooms in which the net floor area per occupant is ten square feet or less. Materials for interior finish are exempt from the smoke development requirements if it does not cover more than twenty percent of the aggregate wall and ceiling area of any room, space, or corridor. Upon exposure to fire the coating did not product products of decomposition or combustible that were toxic than those given off by wood or paper when decomposing or burning under comparable conditions. All shipments and deliveries of the above material shall be accompanied by a certificate or label, certifying that the materials shipped or delivered is equivalent to those tested and accepted for use, as provided for in Section 27-131 of the Building Code.

Final Acceptance March/31/05

Examined By S Derkhodam

SOUTHWEST RESEARCH INSTITUTE®

6220 CULEBRA RD. 78238-5166 • P.O. DRAWER 28510 78228-0510 • SAN ANTONIO, TEXAS, USA • (210) 684-5111 • WWW.SWRI.ORG
CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
DEPARTMENT OF FIRE TECHNOLOGY
NYC LICENSE NO. 011 69L
WWW.FIRE.SWRI.ORG
FAX (210) 522-3377

INVESTIGATION OF THE TOXIC POTENCY OF THE COMBUSTION PRODUCTS OF *ARCOPLAST CEMENT CORE SANDWICH PANEL* IN ACCORDANCE WITH ARTICLE 4, SECTION 27-335.1(2) AND ARTICLE 5, SECTION 27-348E OF THE BUILDING CODE OF THE CITY OF NEW YORK

FINAL REPORT
SwRI® Project No. 01.10086.01.040
May 2004
Consisting of 16 Pages

Prepared for:

Arcoplast Inc.
1873 Williamstown Drive
St. Peters, MO 63376

Submitted by:

A. Leigh Griffith, M.S.
Senior Research Scientist
Material Flammability

Approved by:

Keith R. Willson, Ph.D.
Group Leader
Department of Fire Technology

ABSTRACT

This test method is intended to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions, and should not be used to describe or appraise the fire hazard or the fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment, which takes into account all the factors that are pertinent to an assessment of the fire hazard of a particular end use.

When tested under the controlled laboratory conditions specified in this report, the LC_{50} value for *Arcoplast cement core sandwich panel* was 22.1 g. The Building Code of the City of New York requires the material to be "not more toxic than wood," which requires a passing value of greater than 19.7 g.

When tested in accordance with the combustion toxicity protocol developed at the University of Pittsburgh, the *Arcoplast cement core sandwich panel* **does meet** the requirements for interior finish material as defined by Title 27, Chapter 1, Subchapter 5, Article 5, of the Building Code of the City of New York.

TABLE OF CONTENTS

I. OBJECTIVE

The objective of this program was to obtain required data on the toxic potency of the combustion products of a test sample used for interior finish identified as *Arcoplast cement core sandwich panel* submitted for evaluation by Arcoplast Inc. of St. Peters, MO. This sample was tested in accordance with *Title 27, Chapter 1, Subchapter 5, Articles 4* and *5* of the Building Code of the City of New York (1). Article 4, Section 27-335.1(2) describes the requirements for exterior finish material. Article 5, Section 27-348(e) refers to interior finish material. The intent of this test was to evaluate the performance of the test article in relation to wood as required by both Sections 27-335.1(2) and 27-348(e) of the Building Code of the City of New York (NYC). The test procedure is a modification of the combustion toxicity protocol developed at the University of Pittsburgh.

This report contains a description of the material tested, the test procedure, and the test results. Note that the test results only apply to the specimen tested, in the manner tested, and not to the entire production of this material or similar materials, nor to the material's performance when used in combination with other materials.

II. TECHNICAL APPROACH

The major function of the University of Pittsburgh (UPitt) laboratory test method is to provide a means of evaluating the lethal toxic potency of thermal decomposition products of test materials (2).

The protocol provides for the conduct of experiments under continuously changing temperature conditions (20°C/min), and the test system generates decomposition products that continuously change in chemical composition as the temperature increases. Animals are exposed to the decomposition products starting when the test specimen loses 1% of its initial weight.

The UPitt protocol utilizes rodent (mouse) lethality as the primary toxicological endpoint in evaluating the toxicity of the combustion atmosphere produced by a material. Separate groups of animals are exposed to the combustion atmospheres generated from different initial quantities of the test material in order to establish a concentration-response relationship. From this relationship, the concentration (defined by the protocol as the weight of sample loaded into the test furnace) estimated to produce lethality in 50% of the animals within the specified time is obtained by interpolation. This concentration, commonly termed the LC_{50}, is a measure of the toxic potency of the combustion atmosphere.

Animal lethality data are supplemented with observations of the eye condition of the test animals, expressed as "all apparently normal," "some apparent damage," or "some severe damage."

III. EXPERIMENTAL DESIGN

A. Description of Test Materials

The test material was received from Arcoplast Inc. on April 19, 2004, and was described as shown in Table 1. Specimens were conditioned to equilibrium prior to testing.

TABLE 1. DESCRIPTION OF MATERIAL.
ARCOPLAST INC.
SWRI PROJECT NO. 01.10086.01.040

Date Received	April 19, 2004
Date Tested	April 20, 29 – 30, 2004
Material ID [(1)]	*Arcoplast cement core sandwich panel*
Trade Name [(1)]	*Arcoplast*
Sample Description [(1)]	6 mm cement core substrate with fiberglass mats, resin and gel coat surface
Color	White gelcoat face
Nominal Thickness	0.35 in. (9 mm)
Nominal Unit Weight	3.24 lb/ft^2 (15.9 kg/m^2) (calculated from 20.0-g sample)
Nominal Density	110 lb/ft^3 (1.76 g/cm^3)
Amount Received	12 pieces

[(1)] Information provided by the client

B. Combustion

The thermal decomposition of the test material was accomplished by heating the sample in the system depicted in Figure 1. The combustion device is a Lindbergh Box Furnace (Model 51894-S-PIT) with inside dimensions of 229 × 241 × 357 mm and a volume of 19.7 liters (l). The weighed test specimens were heated, starting at a temperature no greater than 70°C, at a rate of 20 ± 2°C/min. A load cell connected to the sample specimen platform monitored continuous weight loss.

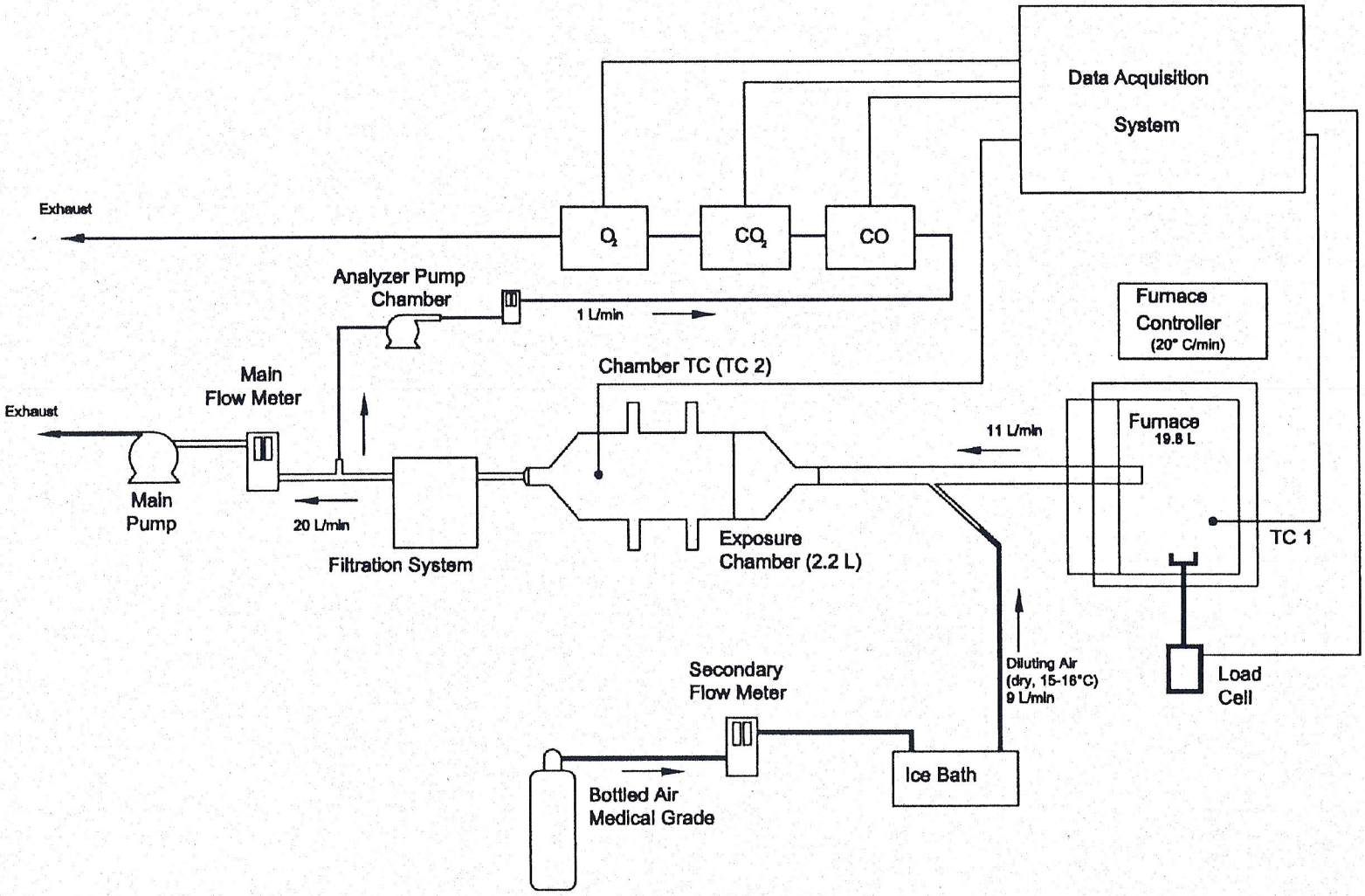

Figure 1. Schematic of the Test Apparatus.

The thermal decomposition products were transferred to the animal exposure chamber by a glass tube [1] approximately 0.80 m in length having an inside diameter of 19 mm. The furnace chamber was aspirated at a rate of 11 l/min. Furnace effluent was cooled and diluted by an additional 9 l/min of cooled medical grade breathing air, resulting in a total flow of 20 l/min through the animal chamber. The diluent air is run through coiled copper tubing (6.35 mm [0.25 in.] O.D.) immersed in an ice bath filled with ice and tap water. Prior to each test run, the accuracy of the flow meters was checked with a primary standard gas flow meter (Mini-Buck Calibrator™, Model M-30) by connecting it to the inlet of the Pyrex glass tube leading to the animal exposure chamber. Values are obtained with and without the dilution air flowing into the test chamber. During each test, both flow meters were continuously monitored visually and readjusted to their pre-test setting as necessary.

C. Animals

Male Swiss Webster mice, weighing from 22 to 30 grams on the day of exposure, were used in these experiments. No formal randomization procedure was utilized in the selection of animals for each test group; animals were selected on the basis of appropriate body weight and obvious signs of good health.

Test animals 5 to 7 weeks old were ordered from a registered USDA supplier (Hilltop Laboratories, Scottsdale, Pennsylvania). Upon receipt, the animals were individually identified by number and housed not more than eight to a cage. Group number and individual assigned number identified animals on their cages. Color-coded indelible ink markings on the fur on the back of the animals were used for identification purposes. The cages were of the polycarbonate "shoe-box" type, 18 in. long, 9.5 in. wide, and 5 in. deep with commercial corncob bedding used as litter.

Prior to testing, the animals were placed in a separate quarantine room for a minimum of 1 week. The quarantine room conditions were maintained at temperatures between 18 and 26°C and 40 to 70% relative humidity. Those animals that were unsuitable by reason of size, health, or other criteria were discarded. Animals were allowed free access to water and standard formula Purina® Laboratory Rodent Chow. The test animals were housed and cared for following standard procedures (3). Facilities for housing and care of animals are accredited under the rules and regulations of the American Association for Laboratory Animal Sciences and are licensed by the USDA according to Public Law 91-579 (Animal Welfare Act of 1970).

---

[1] As depicted in Figure 1, the glass *tube* is composed of two sections. The first section is manufactured of quartz and is inserted into the center region of the furnace chamber. The second section is manufactured of Pyrex® and has a sidearm for the connection of the diluting air supply. Ground glass ball joints and clamps provide airtight containment.

D. Exposure

The weighed test specimen was placed on a noncombustible substrate resting on the pedestal within the furnace. The starting point for exposure of animals was established during an initial experiment with 20.0 grams of the test material by recording the temperature at which 1% of the sample weight was consumed ($T_{1\%}$). This temperature (192°C) was used in ensuing runs as the temperature at which animal exposures were initiated. Animal exposures were conducted for 30 min from the point of $T_{1\%}$. If all animals expired prior to 30 min, the test was terminated when recorded CO levels returned to baseline. Prior to the initiation of an animal exposure experiment, the animals were positioned with their heads protruding through the latex dams (reinforced with duct tape) into the exposure chamber. Rubber stoppers sealed the open end of the animal ports and assisted in preventing the mice from backing out of the neck restraint. At the same time, a continuous flow of room air was maintained at a rate of 20 l/min through the animal exposure chamber.

After the animals were allowed a brief acclimation period, the experiment was initiated by starting the furnace controller and activating the data logging system. At $T_{1\%}$, the animal exposure chamber was quickly connected to the furnace and the 30-min exposure run initiated. Exposure chamber and furnace temperatures were monitored by thermocouples throughout the test period. All glassware was cleaned and dried between each test run. As necessary, stubborn residues in the quartz tube were treated with commercial oven cleaner and burned off with a torch. Ammonia-based cleanser, soap and water, and ethanol were employed in the cleaning of the chamber and connecting glassware.

E. Biological Measurements

A sufficient number of experiments are typically conducted with varying amounts of sample weight to enable the development of the concentration-response relationship and the derivation of the LC_{50} and 95% confidence limits by the moving averages method of Weil (4). Each experiment is followed by a 10-min recovery period, during which time the animals are observed for lethality and examined for the presence of eye damage (corneal opacity). As required by the referenced test method, the eye condition is scored as "no apparent damage," "some apparent damage," or "some severe damage."

F. Combustion Atmosphere Analysis

Analysis for O_2, CO, and CO_2 was made continuously at a sampling rate of 0.5 to 1.0 l/min with the following instrumentation: Servomex Oxygen Analyzer (O_2) and Siemens Ultra Mat 23 (CO and CO_2). The experimental setup for the analysis of CO, CO_2, and O_2 is also shown in Figure 1. Routine

calibration of the CO and CO_2 analyzers was performed prior to each day's testing. Calibration gases (0.7% CO, 3.5% CO_2, certified by Specialty Gas Products.) were metered into the analyzers in the same way that unknown samples were introduced. The O_2 analyzer was calibrated with room air. Calibration of the analyzers was established to within 1% of full scale.

IV. TEST RESULTS

The combustion experiments with the test article were conducted April 20 and April 29 - 30, 2004, at the Department of Fire Technology at Southwest Research Institute. A summary of the test results presented in a manner consistent with the Building Code of NYC filing format (Section 27-131) is provided in Table 2 [(2)], and a tabular summary of the individual test runs is included in Appendix A. Performance characteristics of the test materials during thermal decomposition at the representative LC_{50} weight is provided graphically in Figure 2 [(2)], showing continuous mass loss ($T_{1\%}$) and CO, CO_2, and O_2 levels as a function of furnace temperature. Additional curves depicting exposure chamber and furnace temperatures are provided in Appendix B.

When tested under the controlled laboratory conditions specified in this report, the LC_{50} value for *Arcoplast cement core sandwich panel* was 22.10 g, with a 95% confidence interval of 16.14 to 30.26 g. The Building Code of the City of New York requires the material to be "not more toxic than wood," which has been established to require a passing value of greater than 19.7 g.

V. DISCUSSION

When tested in accordance with the combustion toxicity protocol developed at the University of Pittsburgh, the *Arcoplast cement core sandwich panel* **does meet** the requirements for interior finish material as defined by Title 27, Chapter 1, Subchapter 5, Article 5, of the Building Code of the City of New York.

[(2)] Table 2 and Figure 2 may be found on the following pages.

TABLE 2. SUMMARY OF UPITT/NYC TESTING.
ARCOPLAST CEMENT CORE SANDWICH PANEL
SWRI PROJECT NO. 01.10086.01.040

PERFORMANCE PARAMETER	RESULTS
LC_{50}	22.10 g
95% Confidence Limits	16.14 – 30.26 g
LA_{50}	–
95% Confidence Limits	–
Mean Percent Sample Residue	67.32 g
Furnace Temperature at 1% Weight Loss *	192°C
Temperature Range at Major Decomposition**	302 – 393
Temperature at Ignition**	335°C
Peak CO**	8064 ppm
Temperature at Peak CO**	352°C
Peak CO_2**	1.63 %
Temperature at Peak CO_2**	335°C
Minimum O_2**	19.05 %
Temperature at Minimum O_2**	342°C
Number of Times the Exposure Chamber Temperature Exceeded 45°C**	1
Average Duration of Temperature Excursion (sec)	725
Eye Condition of Test Animals*** (from LC_{50} test)	A
Number of Tests Conducted	4

* From test conducted at 20.0 grams
** From test conducted at LC_{50} weight
*** Eye condition characterized as:
A) All apparently normal
B) Some apparently damage
C) Some severe damage (from representative LC_{50} test)

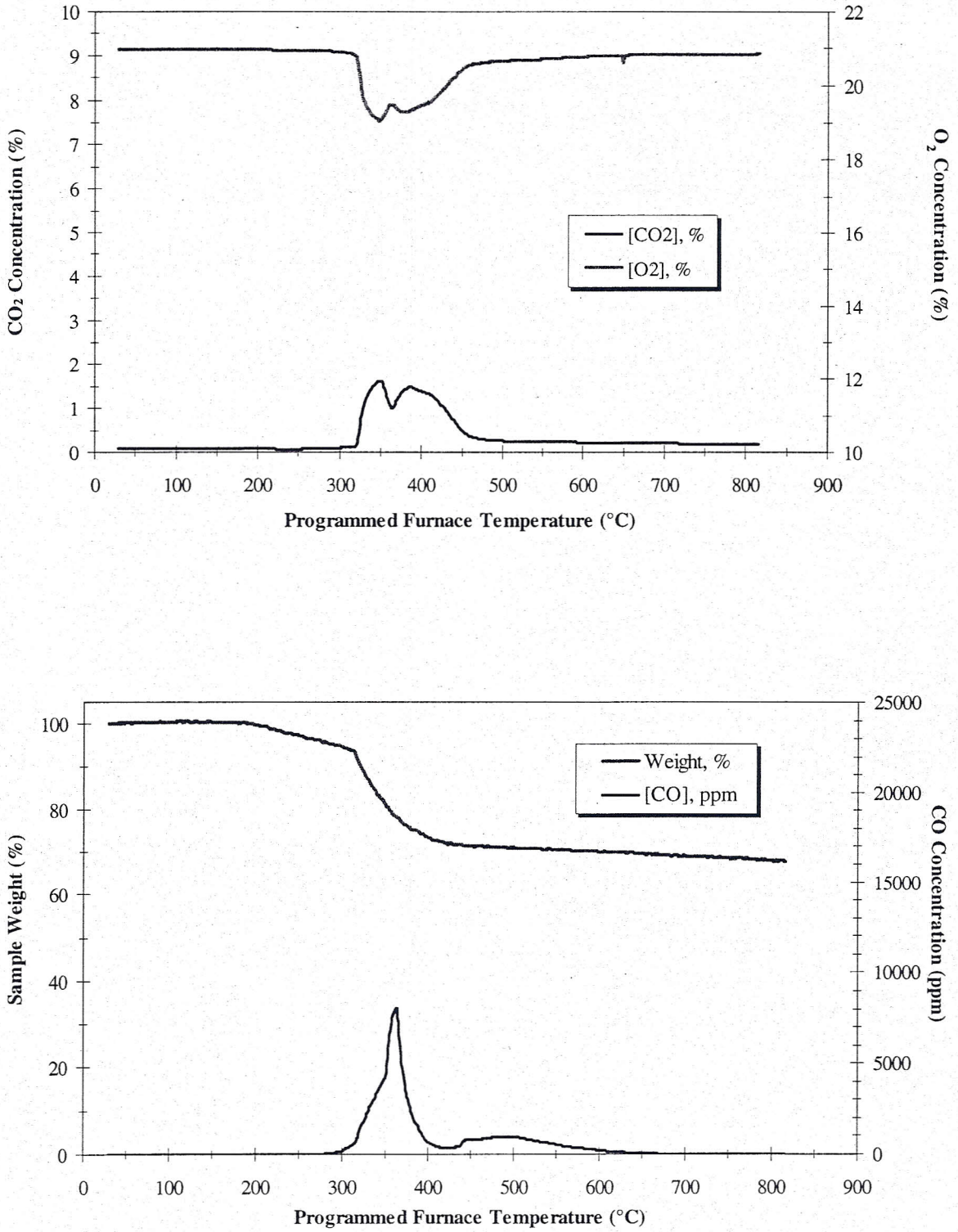

Figure 2. Physical Performance Characteristics During Decomposition at the Representative LC_{50} Weight.

VI. REFERENCES

1. "Title 27 Construction and Maintenance, Chapter 1 - Building Code, Subchapter 5 - Fire Protection Construction Requirements," Building Code of the City of New York (1990-1991).

2. Alarie, Y. and Anderson, R.C. "Toxicology and acute lethal hazard evaluation of thermal decomposition products of synthetic and natural polymers," Toxicology and Applied Pharmacology, Vol. 51, 1979, pp. 341-362.

3. Guide for the Care and Use of Laboratory Animals, DHHS Publications No. (NIH) 85-23.

4. Weil, C. S., "Tables for Convenient Calculation of Median-Effective Dose (LD_{50} or ED_{50}) and Instrumentation for Their Use," Biometrics, Volume 8, pp. 249-261 (1952).

APPENDIX A

INDIVIDUAL SUMMARIES OF ANIMAL EXPOSURE DATA, ANALYTICAL DATA, AND MATERIAL PERFORMANCE CHARACTERISTICS

(Consisting of 1 Page)

TABLE A-1. SUMMARY OF ANIMAL EXPOSURE DATA, ANALYTICAL DATA, AND MATERIAL PERFORMANCE CHARACTERISTICS
SWRI PROJECT NO. 01.10086.01.040
ARCOPLAST INC.
SAMPLE: *ARCOPLAST CEMENT CORE SANDWICH PANEL*
LC_{50}: 22.10 (16.14 – 30.26) GRAMS
STARTING TEMPERATURE OF EXPOSURE: 192°C

	1214-A-4	1114-A-1	1204-A-2	1204-A-3
Sample Weight (g)	16.40	20.0	24.4	29.77
Percent Weight Loss	32.6	32.1	34.0	32.0
Flaming Temp. (°C)	327	335	326	328
Temp. Range at Most Rapid Weight Loss (°C)	290 – 387	302 – 393	290 – 396	307 – 410
Number Responding/Number Exposed	1/4	1/4	3/4	3/4
Percent Response	25	25	75	75
Maximum CO (ppm)	9,327	8,064	11,913	14,339
Total CO (Ct)(ppm-min)	32,015	21,228	51,931	48,123
Temperature at CO Maximum (°C)	352	352	345	370
Maximum CO_2 Concentration (%)	1.71	1.63	2.56	2.59
Total CO_2, (Ct)(percent-min)	13.20	13.00	18.05	22.29
Temperature at CO_2 Maximum (°C)	317	335	326	400
Minimum O_2 (%)	18.88	19.05	17.94	17.92
Temperature at O_2 Minimum (°C)	320	342	333	405
Eye Condition [1]	A	A	A	B

1) Eye Condition of Surviving Animals:

(A) All apparently normal;
(B) Some apparent damage;
(C) Some severe damage.

N/A= Not Applicable

Mean Furnace Temp at Spontaneous Ignition: 329°C
Residue (Sample Avg.): 67.3 %

APPENDIX B

EXPOSURE CHAMBER AND FURNACE TEMPERATURES

(Consisting of 1 Page)

Arcoplast Inc.
01.10086.01.040 1114-A-1