

State of California  
AIR RESOURCES BOARD

Resolution 04-3

January 22, 2004

Agenda Item No.: 04-1-3

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," has been submitted by the University of California, Berkeley;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

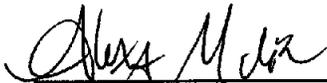
Proposal Number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," submitted by the University of California, Berkeley, for a total amount not to exceed \$445,864.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2547-233 entitled "Survey of Ventilation Practices and Housing Characteristics in New California Homes," submitted by the University of California, Berkeley, for a total amount not to exceed \$445,864.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$445,864.

I hereby certify that the above is a true  
and correct copy of Resolution 04-3, as  
adopted by the Air Resources Board.

  
for Stacey Dorais, Clerk of the Board

## **ATTACHMENT A**

### **“Survey of Ventilation Practices and Housing Characteristics in New California Homes”**

#### **Background**

The California Energy Commission (Commission) sets energy efficiency standards for new California homes that reduce building air leakage in order to conserve energy. These standards assume that acceptable indoor air quality is maintained by certain levels of air exchange between indoor and outdoor air due to occupant window-opening habits and other activities. Concerns have been raised that occupants do not use windows, doors, exhaust fans, and other mechanical ventilation devices sufficiently to remove formaldehyde and other indoor contaminants, such as emissions from heating and cooking. To determine whether revisions are needed in the next update of the state building energy standards to address these concerns, the Commission needs information on ventilation practices in new California homes. In addition, ARB needs information about materials and activities that emit formaldehyde and other Toxic Air Contaminants in new homes. This information is needed to assess Californians' exposures to toxic air contaminants as required by Health and Safety Code Section 39660.5, and to help design a field study of indoor air quality in new homes.

There is no information currently available on ventilation practices in new California homes and the reasons for these practices. In addition, there is little information available regarding the mix of building materials, appliances, and other potential pollutant sources currently used in constructing new California homes. The Commission is funding this study, and will fund a follow-on field study of indoor air quality and ventilation in new homes.

#### **Objectives**

The goals of this study are to obtain information needed to guide the development of future building standards that protect indoor air quality in California homes, and to obtain information useful for updating and improving exposure and risk assessments for indoor and outdoor air pollutants in California. The objectives of this study are to:

- 1) Determine the extent to which occupants use windows, doors, and mechanical ventilation devices in new single-family homes in California.
- 2) Determine the occupants' perceptions of and satisfaction with indoor air quality in their homes.
- 3) Determine the relationships among ventilation practices, indoor air quality indicators, house characteristics, and household factors.
- 4) Identify barriers to occupant use of natural and mechanical ventilation to achieve adequate air exchange in their homes.

#### **Methods**

Investigators will conduct a mail survey of about 1,000 owner-occupants of new California homes in three different climate zones over at least two seasons. The investigators will first develop and pre-test a questionnaire on building characteristics

and appliances, ventilation practices, occupant satisfaction with indoor air quality and environmental conditions, indoor pollutant sources, occupant activities, occupant health status, and household socioeconomic factors. The questionnaire will then be mailed to a random selection of owner-residents of new homes. A sub-group of homes with "whole-house" mechanical ventilation systems that are designed to increase outdoor air exchange rates will also be targeted. The investigators will conduct basic statistical analyses of the survey responses, and analyze the relationships among ventilation practices, perceptions and indicators of indoor air quality, house characteristics, and household socioeconomic factors.

### **Expected Results**

The study will produce high-quality, representative data on factors that determine ventilation sufficiency and indoor air quality in new homes, and the relationships among those factors. The study will also provide information needed for designing and conducting a companion field study, as well as potential participants for the field study.

### **Significance to the Board**

This proposed study would be the first major study of ventilation practices and other factors affecting indoor air quality in new California homes. The results would help ARB to identify the types and use of pollutant sources in new homes, such as new carpets, paint, cabinetry, and heating and cooking appliances. ARB would use the study results to: 1) assess Californians' exposures to toxic air contaminants and guide possible future regulations; 2) obtain a sample and refine the study design for a field study of indoor air quality in new homes, and 3) develop recommendations to the public for achieving good indoor air quality in their homes. In addition, ARB and the Commission will use the results to determine the need for changes to the Commission's building design and construction standards for ventilation of new homes in order to provide acceptable indoor air quality.

### **Contractor:**

University of California, Berkeley

### **Contract Period:**

24 months

### **Principal Investigator (PI):**

Dr. Thomas Piazza

### **Contract Amount:**

\$445,864

### **Cofunding:**

The California Energy Commission is providing contract funding from the Public Interest Energy Research program, through an interagency agreement with ARB.

**Basis for Indirect Cost Rate:**

The State and UC System have agreed to a ten percent indirect cost rate.

**Past Experience with this Principal Investigator:**

The Survey Research Center successfully completed two landmark surveys of human activity patterns that were conducted for ARB in the late 1980's. The Principal Investigator was a key member of the research teams for those studies and performed well.

**Prior Research Division Funding to UCB:**

Year	2002	2001	2000
Funding	\$2,302,154	\$1,091,907	\$16,895

## BUDGET SUMMARY

Survey Research Center, University of California, Berkeley

### **“Survey of Ventilation Practices and Housing Characteristics in New California Homes”**

#### **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$	166,984
2.	Subcontractors	\$	161,000
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	1,148
5.	Electronic Data Processing	\$	5,363
6.	Reproduction/Publication	\$	19,617
7.	Mail and Phone	\$	18,719
8.	Supplies	\$	822
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>46,314<sup>1</sup></u>

Total Direct Costs \$419,967

#### **INDIRECT COSTS**

1.	Overhead	\$	25,897
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>

Total Indirect Costs \$ 25,897

**TOTAL PROJECT COSTS** **\$445,864**

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<sup>1</sup> Miscellaneous costs include participant incentives, which have been found to be effective in increasing response rates in hard-to-reach population groups: cash incentives for focus group participants (\$600), a small gift such as post-it notes (\$5,715), and cash incentives for returned questionnaires (\$40,000). Depending on the feedback from focus groups, this questionnaire incentive may be reduced.

**SUBCONTRACTORS' BUDGET SUMMARY**

Subcontractor: Lawrence Berkeley National Laboratory

Literature Review, Questionnaire Development, Data Analysis, Report Preparation, and Seminar Delivery

**DIRECT COSTS AND BENEFITS**

1. Labor and Employee Fringe Benefits	\$	76,929
2. Subcontractors	\$	0
3. Equipment	\$	0
4. Travel and Subsistence	\$	2,325
5. Electronic Data Processing	\$	0
6. Reproduction/Publication	\$	1,000
7. Mail and Phone	\$	500
8. Supplies	\$	1,050
9. Analyses	\$	0
10. Miscellaneous	\$	<u>28,638</u>

Total Direct Costs

\$ 110,442**INDIRECT COSTS**

1. Overhead	\$	49,249
2. General and Administrative Expenses	\$	0
3. Other Indirect Costs	\$	1,309
4. Fee or Profit	\$	<u>0</u>

Total Indirect Costs

\$ 50,558**TOTAL PROJECT COSTS**\$161,000