

Final Report

INVESTIGATION OF SELF-REPORTING QUESTIONNAIRES
FOR ENVIRONMENTAL TOBACCO SMOKE

prepared for

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COMMITMENT TO EXCELLENCE

IIT RESEARCH INSTITUTE

TI DN 000186



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April 7, 1986

Mr. William Davis
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Dear Bill:

Enclosed are four copies of the final report. We have tried to incorporate most of the comments by directly addressing it or stating in a more precise manner what is meant. We believe the data from this study emphasizes the difficulties inherent in attempts to ascribe "passive" exposure to tobacco smoke through use of questionnaires alone. Further investigations are necessary to determine practical and reliable means of assessing environmental tobacco smoke and to what extent, if any, this exposure may effect the health of nonsmokers.

I intended to submit a draft outline to you for a paper we will prepare for submission to a refereed journal. However, as with all good intentions, it will take a little longer. At that time there will be subsequent analysis of different aspects of the data. I am sure you will be interested in all further findings and I will keep you informed.

We look forward to future collaboration with you on further research.

Sincerely,

David A. Sterling
Research Chemist

DAS/ct
Enc.

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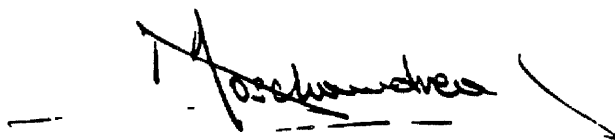
FORWARD

IIT Research Institute is pleased to submit this final report to the Council for Tobacco Research entitled "Investigation of Self-Reporting Questionnaires for Environmental Tobacco Smoke."

Respectfully submitted,



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1. INTRODUCTION

An increased number of publications and reports in the print and video media on health effects of smoking have led to the growing concern of nonsmokers on potential effects of passive exposure to cigarette smoke. To assess this potential exposure, researchers have used several scientific instruments, the most prevalent among them are individual self-reporting or interview questionnaires. Asking people how many cigarettes they smoke, or nonsmokers how many cigarettes are smoked near them, may seem to be a reasonable approach. However, discrepancies between estimated consumption through questionnaire surveys of smokers, and actual number consumed have been reported.⁽⁶⁾ It is suspected that a large portion of the discrepancy is due to the tendency of respondents to systematically underreport their behavior or events which may be perceived as undesirable such as smoking. Nonsmokers, however, may overreport what they see as undesirable behavior in others.

This investigation was based on the need for focused research to determine the reliability of using questionnaires for assessing passive exposure to cigarette smoke.

The investigation was performed in three phases: (1) literature review, (2) questionnaire development; and (3) field evaluation study. The pertinent literature was reviewed to determine the types of information sources and collection techniques presently used to determine cigarette consumption, and the methodologies used to quantify passive exposure to cigarette smoke. A self-report questionnaire was developed to illicit smoking behavior, perceived exposure, and other pertinent information. In selective office work environments a questionnaire study on perceived comfort factors was initiated. Results from this investigation are reported in this document.

2. LITERATURE AND QUESTIONNAIRE SURVEY

A survey of pertinent literature was performed to evaluate: .

- Information sources used in indoor air quality studies for evaluations of smoking behavior and exposure to environmental tobacco smoke.
- Questionnaires and questions used to assess smoking impact on nonsmokers.
- Methodologies used to estimate or quantify passive smoking exposure from responses on questionnaires.

2.1 DOCUMENT ACQUISITION

IITRI had on file, or ready access to, a substantial portion of the available literature of interest, both questionnaires and published reports. Further pertinent documents were obtained through the reference lists of material on file, and use of contacts with experts in the field.

Few documents included copies of the questionnaires or specifics of the questions used to obtain the published data. Follow-up telephone calls to the authors were used to request copies of their questionnaires. Because many unpublished studies are performed, contact with colleagues was used to obtain copies of questionnaires not readily available.

2.2 LITERATURE SURVEY

The acquired literature file was assessed specifically with regards to evaluating passive smoking. Points of interest included:

- Method of survey performance
- Environment type it was designed for
- Type of smoking behavior and exposure questions used
- Method used to estimate or quantify passive smoking exposure, if any.

2.2.1 Survey Methods Used to Evaluate Passive Smoking

Three survey methods are used for assessing frequency of smoking, and the corresponding exposure to Environmental Tobacco Smoke (ETS): Census data, sales/tax records and questionnaire surveys of samples of a population.

Census data (or National Surveys) and sales/tax records provide information for an entire population, or for a sufficiently large sample size from which stochastic conclusions can be reached regarding the population. The size and cost of census surveys prohibit their use for testing individual hypotheses. Census surveys are typically periodic national surveys (i.e., every ten years) performed to assess population characteristics, such as general health, life style, socio economic status, and preferences. From these data, inferences are made concerning particular aspects of the population and areas for further investigation.⁽⁴⁵⁾

Census survey data have been used to study cigarette consumption and exposure to ETS. The comparison of census and sales/tax records data suggest that there is potential for "involuntary smoking" exposure,^(3,4,5,6) and that smokers may tend to underreport their actual consumption. Various conclusions have been reached and carried over into other investigations:

- Census data indicate that 33 percent of the U.S. population smokes. Consequently many investigators assume that in a random gathering of people one out of every three persons smokes.⁽⁹⁾
- Reports show that 70 percent of U. S. households have at least one smoker,⁽⁹⁾ it is consequently assumed that exposure to ETS is pervasive,⁽⁹⁾
- On the average each smoker consumes 2 cigarettes per hour over a 16 hour day.⁽³⁷⁾

Little systematic information on passive smoking has been obtained from census surveys.

Population samples have been used to discern particular aspects of the population. Typically this approach is economically affordable compared with sampling of entire populations. This approach may include one or a combination of the following:

- Epidemiology studies
- Air/breath/metabolite measurements, and
- Observation/questionnaire surveys.

Epidemiology investigations are attempts to establish statistical correlations or associations. The most typical studies are (1) selection of a sample study population which shows an effect (end point) and a suitable control group for assessing if there are any similar or different causal factors in their past histories (retrospective studies), and (2) selection of a study population with a cause (i.e., non-smokers exposed to cigarette smoke) and followed over time to observe effects (prospective studies).⁽⁴⁹⁾

Because of the nature of epidemiology studies, discrete effects are used as end points (i.e., morbidity or mortality). For example, the majority of epidemiology studies related to ETS exposure have used cancer cases as the study population (patient cases or death certificates).^(10-16,18,19,22,23,25) A few ETS exposure investigations have used smoking/non-smoking groups followed over time to assess cancer incidence.^(21,26,28) The majority of these latter studies (prospective) were not designed to assess ETS exposure, a subset of the study data were used for ETS exposure analysis (i.e., from the American Cancer Society⁽²⁶⁾). Another prospective study was used to assess heart disease incidence among non-smokers exposed to ETS.⁽³¹⁾ Cross sectional studies assess a selected status of a population at one point in time. For example, lung function measurements obtained over a short time period have been compared among indicated exposed and non-exposed groups to ETS.^(32,43)

Various indices have been used to measure whether exposure to ETS occurs. Such indices include indoor air carbon monoxide (CO) levels,^(2,29,30,34,42,46) nicotine,⁽²⁾ breath CO levels (and converted to COHb expected levels),⁽⁴²⁾ indoor air particulate concentrations,^(2,34,35,38,44) and cotinine metabolites.⁽⁸⁾

2.2.2. Survey Questionnaires

Few questionnaires have been designed specifically to assess ETS exposure concentrations, incidence, or duration. Consequently, the potential for bias in survey questionnaire design, performance and analysis is greater than normal. We limit this discussion primarily to questionnaire bias and some aspects of population selection and analysis factors.

Survey questionnaires for all manner of investigations obtain responses concerning an individual in a study by:

- Interview (personal and/or telephone).
- Self report (individual completes questionnaire), and proxy (through interview or self report an individual is requested to answer questions concerning another person, such as their spouse or relative).

A bias may be introduced by the wording of questions.^(4,41) In an interview it is possible to elaborate and further explain the meaning of a question to illicit a proper response. However, if the interviewer is not consistent with the elaboration for each person (i.e., such as greater prompting of smokers than nonsmokers), responses to the question will vary and a bias may be introduced. A systematic bias may be due to the respondents themselves on how a question is perceived. Some population groups are health conscious and may be more sensitive and over report⁽¹⁷⁾, while others may wish to hide the possible association and underreport⁽²⁰⁾. In studies not designed to assess ETS exposure investigators may word questions in a manner considered necessary to obtain the information of interest⁽²⁶⁾. These studies may obtain different ETS data than studies specifically designed to assess ETS or when participants are aware that ETS is a concern of the study.⁽²⁾

The validity of information obtained through self reporting or proxy questionnaires to obtain spouses, or others, smoking habits is uncertain and has been found to be a very inaccurate index of ETS exposure^(13,16). Misclassification of smoking status by participant or spouses, or others, as smoker or nonsmoker may be considerable^(16,17,41) due to recall inadequacies and personal sensitivity to the smoking issue.

Direct questions concerning incidence and duration of exposure may suffer from a number of potential biases. We have already mentioned wording of

questions, inadequate recall, misclassification or interviewer bias. The information requested for ETS assessment may vary greatly among studies. Some studies only request yes or no responses to questions of exposure, others supply ranges to be selected from (i.e., 10 to 20 cigarettes per day), while others yet ask for a specific number. Other methods obtain subjective information concerning smokiness or irritation. The location in which exposure data is obtained for varies among investigators (i.e., home, work, or other). For example, it is presently estimated that 90% of ETS exposure to Chinese women may come from the home.⁽¹²⁾ However, most often the location is not identified in the data collection.

It has been suggested that smokers may underreport their consumption, round off answers to the lowest 0 or 5 or not answer smoking questions at all. This may be greater for women than men, with estimated response errors of 20-40% common.^(4,5) However, some smokers do not smoke all of a cigarette⁽⁶⁾ and may be estimating the number of whole cigarette equivalents. Other may perceive fewer being smoked because of low tar and/or nicotine content of their chosen brand.⁽⁶⁾

Studies which utilize monitoring techniques may be measuring improper or inadequate indicators of ETS exposure. Typical indicators used are air and/or breath carbon monoxide, respirable particulates, sulfates, and cotinine metabolites^(2,8,29,30,31,34,35,37,38,42,44,46). Many of these indicators have other sources than cigarettes. Carbon monoxide and particulates are associated with combustion sources, which may be found in all environments where smoking occurs. Sulfates are associated with match use.

There have been few studies designed specifically to assess the incidence or perceived incidence of smoking in specific areas (such as an office building work area). Estimates have been assumed based on questions used in studies to assess other factors, such as comfort, air quality, or work habits. It is difficult to interpret these data. The use of data from a study designed for other objectives poses even more difficulties in interpretation.

2.2.3 Cigarette Consumption Rates from the Literature

Field and controlled study measurements, census data, and sales/tax record estimates of cigarette consumption reported by various authors are summarized in Table 1. Also shown is a calculated consumption per smoker per hour based on the reported data and a 16 hour day. A representative smoking rate calculated from these reports is 1 cigarette per smoker per hour. Various models for estimating potential ETS exposure use a cigarette consumption of two cigarettes per smoker per hour.⁽³⁷⁾ The highest smoking rate calculated from the data in Table 1 is 1.7 cigarettes per smoker per hour. This value is from a case control study of 134 female non-smoking lung cancer patients where the patients were interviewed as to their husbands smoking habits. Furthermore, this study contains major biases discussed earlier which may lead to overestimate of cigarette consumption: (1) Proxy interview of spouses smoking habits and (2) these persons are more aware of the possible relationship between ETS and cancer. The authors of this study reported an elevated cancer risk related to the number of cigarettes reported exposed to. In general, the rates calculated in the Table from published data are lower than those which have been typically assumed.

2.3 QUESTIONNAIRES AND SMOKING QUESTIONS

Thirty-four studies, performed in the past 10 years, have used 57 questionnaires to study indoor air quality. The present study focuses on cigarette smoking questions of the 57 questionnaires. A summary of the questionnaire type, method of application and inclusion of smoking questions is shown in Table 2. This representative sample shows that the use of self-report questionnaires has been the primary method for obtaining data in building studies (residential or office buildings). Questions concerning smoking habits are present in 70% of the building study questionnaires. Interestingly only 50% of the general health survey questionnaires covered smoking habits.

Tables A1 and A2 in Appendix A provides a breakdown of the components of concern for each of the questionnaires. Table A1 lists the source, title(s), environment of concern, method of application, if repeat applications were used, and if questions concerning smoking habits were included.

Table 1. CIGARETTE CONSUMPTION RATES

Reference	Location	Reported Data	Calculated* Consumption cig/smokes/hr	Comments
Bridge et.al. (1972) ⁴⁶	Party	1.3 cig/smoker/hr	1.3	Staged experiments
	Party	1.2 cig/smoker/hr	1.2	
Pellizzeri (1983) ⁴⁴	Lounge	7 cig/2.17 hrs/3 smokers	1.1	Field studies
	Lounge	2 cig/4.4 hrs/13 smokers	.03	
NHIS (1985) ⁴⁵	USA	<15 cig/day by 31% of population 15-24 cig/day by 41% of population 25+ cig/day by 27% of population	1.4	National Survey -Calc. from highest # of average range per day and % of pop. in the given range $[(15 \times .31) + (24 \times .41) + (25 \times .27)] / 16$
Todd (1978) ⁴	<u>Age Average No. of cig/smoker/year</u>			
	Australia (1976)	16+ 2333	.5	National Survey Census data Calculated by $1(\text{No.}/\text{yr})(365) / (16)$
	Canada (1974)	15+ 2441	.4	
	Denmark (1954)	15+ 952	.2	
	Rep. of Ireland (1975)	16+ 3260	.5	
	Japan (1974)	20+ 3334	.6	
	Sweden (1963)	18-69 1186	.2	
	USA (1966)	18+ 2990	.5	
Hay et.al. (1984) ³	<u>Average No. of cig/ smoker/day</u>			
	New Zealand	<u>Male</u> <u>Female</u>	<u>Male</u> <u>Female</u> <u>Combined</u>	
	Census 1976	20 16	1.3 1 1.1	
	Census 1981	18 14	1.1 .9 1	
Jackson et.al. (1985) ⁵	New Zealand	<u>Average No. of cig/smoker/day</u>		
	Census 1976	16.5	1	-Census data only includes people who specified they regularly smoke and specified number
	Sales 1976	22.6	1.4	
	Census 1981	16	1	
	Sales 1981	23	1.4	
Garfinkel et.al. (1985) ¹⁸	Case Control Study of 134 lung cancer patients by Questionnaire	<u>Husbands/(Average cig/smoker/day)</u> 27/day	<u>Husband (Male)</u> 1.7	-Based on proxy survey of non/smoking spouses whose husbands smoke.

*Based on 16 hour day

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TABLE 2. SUMMARY OF REPRESENTATIVE INDOOR AIR QUALITY QUESTIONNAIRES

Environment of Concern	Number of Studies	Number of Questionnaires*	Method of Application				Smoking Habit Questions Included
			Self Report	Technician	Interview	Telephone	
Residential	13	26	12	5	7	2	18
Office Buildings	18	21	15	4	1	1	14
General Health	7	17	3	-	14	-	9

* Some studies are concerned with more than one environment and may utilize more than one type of questionnaire. So, the number of questionnaires are not indicative of the number of studies for each environment.

Table A2 shows the type of smoking habit questions used in the 28 questionnaire sets (studies) which contained these questions. The questions asked are categorized according to the type of responses which could be made for each individual completing the questionnaires, such as:

- yes/no
- selection from supplied ranges
- numerical amount.

These categories are further segregated into locations of concern. For example, the table indicates that for Questionnaire 1 the individual is asked if he/she smokes (yes or no) and, if yes, the typical amount smoked during an entire day selected from given ranges. The individual is also asked if they work near other people who smoke (yes or no).

Perusal of the note comments for Tables A1 and A2 show that there are many variations for each type of smoking question. While most questionnaires obtain smoking data in terms of number of cigarettes smoked or exposed to as yes/no, ranges, specific numbers or packs, other questionnaires will illicit answers in terms of smell, hours exposed, or extremely subjective responses of how bothersome or air quality rating. Without a systematic data collection method, or reliable relationship between the various exposure indices used, no quantitative comparisons between different studies are possible.

3. COMFORT AND ENVIRONMENT FIELD STUDY DESIGN AND PERFORMANCE

The objective of the field study was to obtain estimates of concordance between self reports on smoking habits of smokers and perceived smoking habits of others, reported by smokers and nonsmokers, in an office environment. Concordance statistics also provide averages, variance, and distributions of the factors analyzed. The study was designed to measure a subjects' recall and perception of environmental conditions and smoking habits on a weekly and daily basis. As recall is requested continually, an individual becomes "sensitized" to the survey questions. Consequently, the study tested two null hypotheses:

- H_{01} : There is no association between smoker and nonsmoker smoking habit perception.
- H_{02} : The relationship between smoker and nonsmoker smoking habit perception is the same between sensitization conditions (state of awareness of questions on questionnaire - or time interaction).

Rejection of the first null hypothesis (H_{01}) will reveal the degree to which smokers' and nonsmokers' perception of habits is concordant. Rejection of the second null hypothesis (H_{02}) will reveal the degree of this concordance depends on sensitization conditions.

3.1 FIELD STUDY QUESTIONNAIRE

An IITRI self report comfort and environment questionnaire was modified following conversations with possible participants, with our consultant, with representatives from the Council for Tobacco Research, and field trials of draft versions. The final version of the questionnaire used is shown in Figure 1. The questionnaire was designed to obtain the data for individual perception of cigarette smoking and exposure while not focusing attention on this topic.

**IIT RESEARCH INSTITUTE
COMFORT AND ENVIRONMENT PERCEPTION SURVEY**

- Please respond to ALL Questions as accurately as possible.
- Your answers should describe your designated work area.

THIS IS A RESEARCH STUDY - ALL DATA ARE CONFIDENTIAL.

Initials _____ Date _____ Time _____

Sex ☐ Male ☐ Female

Age ☐ Less than 20 ☐ 20-29 ☐ 30-39 ☐ 40 or more

Please rate each of the following conditions for your primary work area.

Circle the number for each pair of terms below which best describes how you perceive your work area today. The higher the number the better the condition. For example, the answer given below indicated that today you sometimes perceived your designated work area as being too crowded:

Worst —————> Best <———— Worst
Too Crowded 1 ② 3 4 3 2 1 Too Empty

Worst —————> Best <———— Worst

Too Cold	1	2	3	4	3	2	1	Too Hot
Too Dry	1	2	3	4	3	2	1	Too Humid
No Air Movement	1	2	3	4	3	2	1	Too Drafty
Too Quiet	1	2	3	4	3	2	1	Too Noisy
Lights Too Dim	1	2	3	4	3	2	1	Lights Too Bright

Worst —————> Best

Stuffy Air	1	2	3	4	5	6	7	Fresh Air
Air Very Smoky	1	2	3	4	5	6	7	Clear Air
Bad Odor	1	2	3	4	5	6	7	None or Good Odor

If odor present please specify type _____

Please answer the following questions.

How many cigarettes were smoked in your primary work area today?

By you?

By others?

How many hours were you away from your work area on another work assignment or breaks?

How would you rate the overall comfort of your work area on a scale of 1 to 7; from extremely uncomfortable 1 to extremely comfortable 7?

CODE

Please DO NOT write in this section

1 _____

6 _____

9 _____

13 _____

17 _____

18 _____

19 _____

21 _____

23 _____

25 _____

27 _____

29 _____

30 _____

31 _____

32 _____

43 _____

47 _____

48 _____

49 _____

Coding of the data is done on the right hand side of the form. The first line of coding was used to signify the work area number, the individual within the work area, and questionnaire number. The bottom line of coding was used to record whether the respondent was a smoker.

A cover letter for each questionnaire was used to repeat instructions for completing the questionnaire. The cover letter changed to accommodate the different groups who participated; an example is shown in Appendix B, Figure B1.

3.2 WORK AREA SELECTION

Office work areas for inclusion in the study were obtained through three methods:

- Letter and telephone contacts to selected personnel managers, heads of companies which operate in office buildings, and unions which represent office technical and professional employees.
- Letters and telephone contacts to friends and colleagues who work in the type of buildings of interest.
- Requests to friends and colleagues for names of potential survey participants.

Contacted persons who were interested in participation or obtaining further information were requested to contact either David Sterling or Demetrios Moschandreas (Figure B2). If further information was requested, participation in the study was discussed with the contact individual over the telephone, in person, or through the mail. Potential participants were not included into the study until after a site visit by either of the principal investigators was performed, to ensure the proper criteria were met.

Selection of study work areas were based on the objectives and statistical design of the study. A sample of approximately 50 work areas among Chicago office workers were to be selected. Selection criteria was based on a "work area" concept because the data analysis is a comparison of responses between individuals within each work area. A work area for the study was defined as the space two or more people use (spend the largest portion of their time) in performing the primary activities of their job. The actual

type of work performed, whether clerical, secretarial, or managerial was not important, nor was the type of building or work area.

In all situations the potential sample site had to meet the pre-requisite criteria:

- Smoking was allowed within the work area.
- Two or more individuals use the work area in performance of their duties and spend the majority of each work day in the area.
- The individuals in the work area work a typical day (approximately eight hours from 7-9 am to 3-5 pm).
- All individuals in the work area are willing to participate in a comfort and environmental perception survey. No indication that the study concerns smoking is given.
- All individuals are expected to be working the planned week of the survey (i.e., no planned vacations or other absences).

Each potential study site was not included for selection until a site visit had been performed. The site visit took a minimum of 20 minutes and was used to:

- Ensure selection criteria had been met and the persons in the work area are participating voluntarily.
- Answer questions the participants may have.
- Assign a work area study number and obtain participant initials for coding and matching of individual questionnaire (Figure B3).
- Designate to the participants the work area boundaries to be considered in completing the questionnaire for the study needs (i.e., walkways, corridors, partitions, whole room, etc.).
- Obtain site information which may be necessary for completion or enhancement of the study (Figure B4).

Initial selection of study work areas and survey performance dates were not initiated until approximately one-third of the number of necessary sites were acquired. As subsequent study sites were acquired survey performance dates were set.

During the site visit, if an IITRI investigator was not to perform the survey, a responsible individual was appointed by the person in charge as a project representative to perform the distribution and collection of questionnaires. The IITRI investigator or project representative informed the participants on the first day of the survey how the survey was to be performed, the assigned work area boundaries, and particulars regarding completion of the questionnaire. A handout was given to the project representative for supplemental instructions and for answering participant inquiries, shown in Figure B5.

3.3 FIELD STUDY PERFORMANCE

Performance dates for the survey were set to span a one week period, from a Friday to Friday, and again one week later on a Friday, in which no holiday occurs and all of the participants were expected to be present (Figure B6). The questionnaires were handed out by an IITRI investigator or project representative each day between 3 and 5 pm (time arranged during site visit to meet the work hours of the office), and collected after completion. If a participant were to leave early a questionnaire was made available to this subject for early completion.

If the survey were performed by a project representative a daily telephone call was used to remind the representative to perform the survey, and any questions were answered at that time. If multiple telephone calls were not allowed, at least one telephone call was made near the beginning of the survey to insure that there were no problems being encountered. The questionnaires were collected at the site or delivered to IITRI in person at the end of each site survey period.

3.4 DATA CODING

All coding of the questionnaires was done at IITRI on the right-hand side of the survey form. Only the data to be analyzed in the study was entered into the database. The data entered from each questionnaire (Figure 1) were:

- Building and work area identification number
- Individual identification number
- Questionnaire day number

- Sex
- Age group
- Lighting perception question (used as a quality control question)
- Cigarette smoking and perception data (number smoked by yourself or others)
- Total comfort perception question
- Is the individual a smoker.

3.5 DATA QUALITY ASSURANCE/CONTROL

Quality assurance/control procedures for the field study covered data collection, data coding and computer data entry.

3.5.1 Data Collection

Quality assurance/quality control (QA/QC) was implemented in a number of ways to cover the different circumstances in which data were collected. The procedures insure that the site surveyed fulfill the necessary conditions, all participants were supplied the same instructions, and that the maximum amount of reliable data was obtained for each site. Data collection QA/QC was maintained by site visits assuring proper criteria were met, answering of questions, supplying question/answer packets, and through consistent contact with project representatives when necessary.

3.5.2 Data Coding and Computer Entry

The survey form question concerning lighting was used for quality control. Prior investigations have determined that perceptions of lighting do not change on a day-by-day basis. A large variation in response to the lighting question from one day to the next was assumed to indicate a miss coding, a substantial change in the work area environment or inaccurate response by the subject. The question for lighting was analyzed for each person to detect if a large daily variation had occurred. A large variation was considered to be a change in response on the questionnaire of more than one perception value from one day to the next. For example, a perception response of 3 for "Too Dim" on day 1, to a response of 3 for "Too Bright" on day 2 would be checked as a large variation. If a large variation in the lighting question was observed from one day to the next the original

questionnaire was checked for coding error, data entry error, or indications of work area changes (indicated by a change in perception to lighting which was consistent for the remainder of the survey). If the variation was determined to be due to random answering of the form, the data was not to be used in the analysis. Only three participants were eliminated from the database for this reason, which resulted in the loss of one work area due to insufficient data.

All coding of the questionnaires took place at IITRI by a single investigator. A random sample of 20% of the questionnaires were checked against a computer printout of the entered data. If greater than 5% of the data was found in error, another sample of 20% were to be checked.

Each data entry was given an expected value range. If the value of any entry in the database exceeded the expected range, then that questionnaire data was to be checked.

4. COMFORT AND ENVIRONMENTAL FIELD STUDY ANALYSIS

Smoker reported cigarette consumption, and smokers' and nonsmokers' perceived consumption values within each work area (the work area being the unit of study) were used to represent smoking incidence for analysis. The following definitions were used:

$$1) \text{ Smokers perception of cig. consumption} = \frac{\sum_{i=1}^n (\text{no. of perceived cigs. smoked by others})_i + (\text{no of cigs. reported smoked by subject})_i}{n}$$

where i = the i th smoker in the work area
 n = the total no. of smokers in the work area

$$2) \text{ Smokers reported cig. consumption} = \sum_{i=1}^n (\text{no. of cigs. reported smoked by subject})_i$$

where i = the i th smoker in the work area
 n = the total no. of smokers in the work area

$$3) \text{ Non-smokers perception of cig. consumption} = \frac{\sum_{j=1}^k (\text{no of perceived cigs. smoked by other})_j}{k}$$

where j = the j th non-smoker in the work area
 k = the total no. of non-smokers in the work area.

A three factor mixed model analysis of variance was computed^(47,48) to determine the main effect of smoking (smoker vs. nonsmoker) and the smoking by time interaction (increased sensitization to the smoking questions from repeated application from day 1 through day 7) in terms of:

- (1) Smoker and nonsmoker perception of cigarettes consumption in a work area.
- (2) Nonsmoker perception and self reported number of cigarettes smoked by smokers in a work area.
- (3) Smokers perceptions and self reported number of cigarettes smoked by smokers in a work area.

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To eliminate the problem of different periods of time spent away from the work area by each person, weighted hourly cigarette consumption values were determined. For each person the total time spent within the work area (the time period over which questionnaire responses were based) was computed as the difference between the time the questionnaire was completed (from an assumed work start time of 8 AM), and the number of hours spent away from the work area as indicated in their questionnaire response. Analyses were conducted both for daily figures and hourly smoking rates.

4.1 STUDY POPULATION CHARACTERISTICS

After quality assurance/control procedures were completed, 58 work areas totalling 227 participants surveyed were in the database. Participants who did not complete the smoking question (36 persons) and work areas where no smokers were present were dropped (9 work areas comprising 28 non-smoking participants). Data from all work areas with smokers present were analyzed. The database for final analysis consisted of 49 work areas with a total of 163 participants. This complies with the sample size considered most appropriate in the study design of approximately 50 work areas with 150 persons.

Table 3 shows the sample sizes of the surveyed population and the number available for use in subsequent analysis. The overall participant response rate of 82% for a self report survey questionnaire is very good. However, the response rate to the smoking questions between smokers and nonsmokers differed greatly, 97% and 74%, respectively. The percent distribution of smokers and nonsmokers is shown in Table 4. Smokers comprised 41% of the study population, with 19% of the smokers male and 81% female. Nonsmokers comprised 59%, and consisted of 40% male and 60% female.

The sex and age distribution of the study population is shown in Table 5. Eighty percent of the study population were age 30 or over. The distribution by male and female were 31% and 69% respectively

4.2 ANALYSIS OF SMOKING RESPONSE DATA

Summary statistics for both total daily and weighted hourly smoking rates calculated per smoker are presented in Tables 6 and 7.

4.2.1 NONSMOKER PERCEPTION AND SMOKER REPORTED CONSUMPTION

A significant difference between nonsmoker perceptions and the number of cigarettes reported smoked by smokers group was found for both daily rates ($F=52.95$, $df=1,516$, $p<.0001$) and for hourly rates ($F=46.60$, $df=1,516$, $p<.0001$). Nonsmokers perceptions were significantly lower than the number of cigarettes reported to be smoked by smokers. The time interaction (effect of repeated application) was not significant for either daily or hourly rates ($F=.79$, $df=6,516$, $p<.578$ and $F=.79$, $df=6,516$, $p<.578$, respectively) indicating that the difference between smokers and non smokers for each questionnaire day (over time) was statistically consistent.

4.2.2 SMOKER AND NONSMOKERS PERCEPTION

The difference between perceptions of smokers and nonsmokers, was found to be significant ($F=29.78$, $df=1,454$, $p<.0001$) for daily rates and ($F=25.22$, $df=1,454$, $p<.0001$) for hourly rates. Nonsmokers perceptions were significantly lower than the perceptions of smokers. The time interactions were non-significant for daily rates ($F=0.39$, $df=6,454$, $p<.888$) and for hourly rates ($F=0.61$, $df=6,454$, $p<.723$) indicating again that the difference between smokers and nonsmokers was consistent over time.

4.2.3 SMOKER PERCEPTION AND REPORTED CONSUMPTION

No significant main effect or interaction were found for either daily or hourly rates for the difference between the perception of smokers and the number of cigarettes reported consumed by the smokers. This indicates that the overall perception of smokers are consistent with their own reported smoking habits.

4.2.4 SMOKING AND PERCEIVED COMFORT

Finally, smokers and nonsmokers exhibited no significant differences in overall comfort ratings on any occasion.

TABLE 3. TOTAL STUDY SAMPLE SIZE AND SAMPLE SIZE OF ANALYZED DATA¹

	Work Areas	Participants		Total
		Smokers	Nonsmokers	
Total sample size ²	58	69	158	227
Sample size in work areas with smokers present	49	69	130	199
Number in which response sufficient for analysis in smoking work areas	49	67	96	163
Percent used from total smoking work area sample in analysis	100	97	74	82

¹ Sample size of analyzed data based on proper questionnaire response.

² Includes work areas in which smoking was allowed but no smokers were present.

TABLE 4. PERCENT OF SMOKERS AND NONSMOKERS BY SEX

	Smoker	Nonsmoker	Combined Smoking Status
Male	19	40	31
Female	81	60	69
Combined Sex	41	59	

TABLE 5. SEX AND AGE GROUP DISTRIBUTION BY SMOKING CATEGORY

Age Group	Male		Female		Total by Age
	Smoker	Nonsmoker	Smoker	Nonsmoker	
less than 20	0	1	1	0	2
20-29	2	6	10	13	31
30-39	4	14	25	25	68
40 or more	7	17	17	19	60
unknown	0	0	1	1	2
Total by Sex/Smoking Category	13	38	54	58	
Total by Sex	51		112		163

TABLE 6. SUMMARY STATISTICS FOR CALCULATED DAILY RATES PER SMOKER

Questionnaire Day #	Nonsmoker Perception			Smoker Reported Cig. Consumption			Smoker Perception		
	\bar{x}	sd	n	\bar{x}	sd	n	\bar{x}	sd	n
1	9.97	11.94	45	16.43	12.06	35	17.15	11.12	26
2	8.32	10.59	48	18.38	13.31	39	15.65	11.45	28
3	8.68	11.34	49	17.45	13.31	37	14.86	10.06	29
4	8.78	11.76	46	17.65	14.95	37	13.90	9.53	29
5	8.70	11.28	47	17.44	14.15	36	15.04	10.95	26
6	7.09	11.99	36	17.52	14.82	25	15.81	10.31	18
7	12.47	16.67	30	13.83	13.47	23	14.75	12.71	16

TABLE 7. SUMMARY STATISTICS FOR CALCULATED HOURLY RATE PER SMOKER

Questionnaire Day #	Nonsmoker Perception			Smoker Reported Cig. Consumption			Smoker Perception		
	\bar{x}	sd	n	\bar{x}	sd	n	\bar{x}	sd	n
1	1.60	1.99	45	2.78	2.16	45	2.97	1.97	25
2	1.57	2.28	48	3.15	2.34	48	2.45	1.36	27
3	1.58	2.36	49	3.10	2.55	49	2.64	1.84	29
4	1.44	1.85	46	2.89	2.39	46	2.20	1.34	28
5	1.49	2.15	47	2.70	2.14	47	2.18	1.47	26
6	1.12	1.84	36	3.09	2.70	36	2.77	1.85	18
7	1.90	2.71	28	2.14	2.24	28	2.23	1.76	16

5. DISCUSSION AND CONCLUSION

For this investigation the two study premises were: (1) non-smokers may over report the number of cigarettes they perceive being smoked around them in their office work area, and (2) more accurate reporting of cigarette consumption by self report questionnaires may be obtained by sensitizing the participants to the study questions by repeated daily use of the questionnaire.

Testing of the first premise showed a statistically significant difference between the perception of non-smokers to both the perception and reported consumption of smokers. Furthermore, the non-smokers perception of the number of cigarettes smoked within their office work area was found to be significantly and consistently lower than either the perception indicated by smokers and the number reported consumed by smokers.

The response rate of non-smokers to the smoking question was 74 percent. One may be inclined to think that the non-smokers who responded were more environmentally "aware" and sensitive to those smoking near them. Coupled with the assumption that smokers under report, it was expected that non-smokers would perceive a greater frequency of cigarette smoking than smokers. For the study sample, the lower smoking frequency perceived by non-smokers may indicate a lesser concern of the environmental tobacco smoke issue than is generally assumed. Interestingly, non-smokers and smokers showed no difference in their overall comfort perception of their work environment.

The assumption that smokers tend to avoid answering questions regarding smoking habits is contradicted by the study data. Although the study was promoted as a comfort and environment perception study, it was obvious that smoking was a component. Yet smokers in the study showed a 97% response rate for answering the smoking question, while only a 74 percent response rate was found for non-smokers.

The number of cigarettes smoked per hour (between 2 to 3 cig/smoker/hour) and the percent of smokers 41% are higher than values typically assumed from census data: of 2 cigarettes per smoker per hour and 33% smokers. Also, among

females alone the distribution of smokers to nonsmokers is 48 to 52 percent, respectively. This difference is most likely due to study factors of:

- Smoking areas were actively collected and often indicated by managers of the office as high smoking areas. This may have resulted in a greater proportion of smokers and heavy smokers than a random sampling would produce.
- The poor response rate of non-smokers in comparison to the response rate of smokers. Although, for a self-report questionnaire, the response rate of 74 percent for non-smokers is considered good.

Both of these factors suggest that the values obtained for smoking rate and frequency are biased towards the upper limits.

Smokers perception and smokers reported consumption rate were not significantly different. Smokers appear to be more perceptive to the number of cigarettes smoked around them. Since the work areas focused on contained active smokers and analysis has shown a high frequency of smoking in these work areas these values may be estimates of the upper limit of smoking incidence in office work areas.

Testing of the second premise indicates that sensitization (repeated application of the questionnaire over a short time period) has no effect on the overall response (ie. perceived smoking incidence). If one assumes the response to the first questionnaire is accurate the reliability of performing one time questionnaire/self report survey studies for these type of data is increased.

Two unexpected findings surfaced from the performance of this study: (1) It is generally assumed that smokers underestimate their consumption of cigarettes. Yet we find that smokers report higher cigarette consumption than that reported by non-smoking co-workers; and (2) Generally expected hesitation by smokers to report on their smoking habits did not materialize in this study. The response rate of smokers was higher than for non-smokers.

It is evident that the popular assumptions are not verified by our study. It is also evident that these and other assumptions (ie. hourly smoking rate) can only be studied by investigations that measure the actual cigarettes smoked in areas where both smokers and non-smokers work. Such a study must be implemented in office buildings and such public access areas at

A properly designed study will determine the hourly cigarette consumption in work area environments and public areas and will determine conclusively whether popular assumptions of smoking habits or the findings of our study are correct.

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APPENDIX A
Tables of Representative Indoor Air
Survey Questionnaires

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APPENDIX A.

Table A1. Representative Indoor Air Quality Survey Questionnaires

Study Number	Source	Title	Environment of Concern	Method of Application	Repeated Application	Smoking Habit Questions Included
1	TDS Ltd., Vancouver, B.C.	Office Work Environment	Office Buildings	Self report	No	Yes
2	Carnow, Connibear & Ass., Ltd., Chicago, IL	An Office Environment Symptomology and Associated Factors	Office Building ²	Self report	No	Yes
3	University of Arizona College of Medicine/ PIMA County Dept. of Health Services, Tucson, AZ	a) Draft Adult Health Questionnaire	Office Building	Self report	No	Yes
		b) Draft Environmental Inventory - Household - Stage 2.1	Residential	Self report	No	No
4	Harvard University Boston, MA	Draft Home Characteristic Survey	Residential	Technician	No	Yes
5	Amer. Health Found.	7 ³	Health	Self report	No	Yes
6	Amer. Cancer. Soc.	Cancer Prevention Study II, Questionnaire for women	Health	Self report	No	Yes
7	NIOSH, Atlanta, GA	CDC Office Building Questionnaire	Office Building ²	Self report	No	Yes
8	University of Missouri/Columbia, MO	a) Indoor Air Pollution Questionnaire	Office Building	Self report	No	No
		b) Indoor Air Pollution - Building Evaluation	Office Building	Technician	No	No
9	University of Michigan, MI	Federal Building Occupants Questionnaire	Office Building ²	Self report	No	No

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Table A1. Representative Indoor Air Quality Survey Questionnaires (Continued)

Study Number	Source	Title	Environment of Concern	Method of Application	Repeated Application	Smoking Habit Questions Included
10	Columbia University, New York, NY	a) Officer Workers-Health and Well Being - Architectural office characteristics	Office Building	Self Report	No	No
		b) Physical Office Characteristics	Office Building	Technician	No	Yes
		c) Experience and Office Environment	Office Building	Self report	No	Yes
11	Behavioral Team, Totonto, Ontario	Design of Office	Office Building	Interview	No	No
12	Canadian Labor Congress	Working Conditions in Canada: A Survey of Office Workers, VDT users and VDT technicians	Office Building	Self report	No	No
13	Columbia University, New York, NY	a) Health Interview	Health	Interview	No	No
		b) Housing and Environmental Conditions	Residential	Interview	No	Yes
		c) Daily household conditions	Residential	Self report	No	Yes
		d) Daily activity schedule	Residential	Self report	No	Yes
14	Cornerstone Planning Group, Vancouver, BC	Work Environment Survey	Office Building	Self report	No	Yes
15	OPEIU, NY, NY	Health and Work Environment Survey	Office Building	Self report	No	Yes
16	Retail Clerks Union, Vancouver, B.C.	Work Environment Survey	Office Building	Self report	No	Yes

Table A1. Representative Indoor Air Quality Survey Questionnaires (Continued)

Study Number	Source	Title	Environment of Concern	Method of Application	Repeated Application	Smoking Habit Questions Included
17	Yale University (Kerosene Heater Study)	a) Initial Questionnaire b) Heating Questionnaire c) Health and Heating Survey	Residential Residential Residential	Interview Telephone Inter. Self report	No Yes - biweekly Yes - daily for 14 days	Yes No No
18	Univ. of Michigan, MI	Specific Bldg. Study, ²⁻¹¹	Office Building	Self report	No	Yes
19	LBL/BPA Survey	a) Indoor Air Quality Daily Activity Record b) Housing Structure Survey c) Commercial and Institutional Building Survey Checklist	Residential Residential Office Building	Self report Technician Technician	No No No	Yes No Yes
20	CDC, Atlanta, GA	Indoor Air Quality Investigation Report Form	Office Buildings	Technician	No	Yes
21	B.C. Government Employees Union, Victoria, B.C.	A Survey of Office Workers	Office Buildings	Self report	No	Yes
22	National Radiologic Protection Board, Great Britain	National Radiation Survey Questionnaire	Residential	Interview	No	No
23	Univ. of Wisconsin, WI	a) Home Characteristics Quest. b) Stove Use Diary c) 24-Hour Daily Activity	Residential Residential Residential	Self report? Self report Self report	No No No	Yes No Yes
24	Univ. of Arizona, AZ	Household Char. Quest.	Residential	Self report	No	Yes

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Table A1. Representative Indoor Air Quality Survey Questionnaires (Continued)

Study Number	Source	Title	Environment of Concern	Method of Application	Repeated Application	Smoking Habit Questions Included
25	Harbicht Research Inc.	a) IAQ Residence Char.	Residential	Telephone Inter.	No	Yes
		b) Characterization in Residences	Residential	Technical	No	No
		c) IAQ Customer Data Sheet	Residential	Technician	No	No
		d) Occupants Daily Log	Residential	Self report	Yes-8 cont. days	Yes
26	California Dept. of Health Services, CA	Occupant Quest.	Residential	Self report	No	Yes
27	Tennessee Valley Authority (TVA)	a) Customers of local Electric Utilities	Residential	Self report	No	Yes
		b) Commercial & Ind. Surv.	Office Building	Self report	No	No
28	GEOMET Techn. Inc.	a) Convessing Instrument	Residential	Interview	No	No
		b) Screening Quest.	Residential	Interview	No	Yes
		c) Technician Quest.	Residential	Technician	No	Yes
29	Honeywell Tech.	IAQ: A National Survey of Office Workers	Office Buildings	Telephone Inter.	No	Yes
30	Hirayama et. al. (See Literature Reference No. 28)	a) Form 1 - Initial Survey	Residential (Japan)	Interview	Yes - once	Yes
		b) Form 2 - Second Survey	Residential (Japan)	Interview	(Repeat survey)	Yes
31	Kaiser-Permanente Medical Care Program, San Francisco, CA	No title given	Health	Self report	No	Yes
32	National Health Interview Survey	a) National Longitudinal Health Survey, 1980	Health	Interview	Yes-once, 6 months later	Yes

Table A1. Representative Indoor Air Quality Survey Questionnaires (Continued)

Study Number	Source	Title	Environment of Concern	Method of Application	Repeated Application	Smoking Habit Questions Included
	National Center for Health Statistics (USDHHS)	b) Smoking Supplement, 1980	Health	Interview	No	Yes
		c) Supplement Booklet, 1983	Health	Interview	No	Yes
		d) Health Promotion and Disease Supplement Booklet, 1985	Health	Interview	No	Yes
33	Second National Health and Nutrition Examination Survey 1976-1980 National Center for Health Statistics (USDHHS) (See Literature Reference No. 20)	A medical history questionnaire for (Ages 12-74) (Note - this is one out of eight questionnaires)	Health	Interview	No	Yes
34	American Health ²³ Foundation (See Literature Reference No. 23)	Passive smoking exposure questionnaire	Health	Interview	No	Yes

Table A2. Smoking Data Responses for Representative Indoor Air Quality Questionnaires

Study Number	By You	By Others	Yes/No Type Only				Selected Ranges				Specific Amounts			
			Do you smoke Yes/No	Location			Total	Location			Total	Location		
				Home	Office	Other		Home	Office	Other		Home	Office	Other
1	X		X				X							
		X			X ¹									
2	X		X											
3a	X		X								X			
4	X	X		X								X		
5 ³		X	X	X	X	X		X ⁴		X ⁵				
6	X		X								X			
		X										X ⁵	X ⁵	X ⁵
7		X			X									
	X		X								X			
10b		X	X ⁶											
c	X		X				X ⁷							

Table A2. Smoking Data Responses for Representative Indoor Air Quality Questionnaires (Continued)

Study Number	By You	By Others	Yes/No Type Only				Selected Ranges				Specific Amounts			
			Do you smoke Yes/No	Location			Total	Location			Total	Location		
				Home	Office	Other		Home	Office	Other		Home	Office	Other
13b	X	X		X								x ⁸		
c	X	X										x ⁸		
d	X	X									x			
14	X										x			
15	X										x		x	
16	X		x				x ⁹							
17a	X	X	x				x ⁷	x ⁷					x ¹⁰	
18		X			X					x ¹²				
	X				X									
19a	X	X										x ¹³		
20														

Table A2. Smoking Data Responses for Representative Indoor Air Quality Questionnaires (Continued)

Study Number	By You	By Others	Yes/No Type Only				Selected Ranges				Specific Amounts			
			Do you smoke Yes/No	Location			Total	Location			Total	Location		
				Home	Office	Other		Home	Office	Other		Home	Office	Other
21	X		X								X			
23a												X		
c												X		
24												X		
25a												x16		
d														
						x18								
26	X	X	X									x17		
28b												x18		
c												X		
29	X									x19				
30a	X		X									X		
b	X		X									X		

Table A2. Smoking Data Responses for Representative Indoor Air Quality Questionnaires (Continued)

Study Number	By You	By Others	Yes/No Type Only				Selected Ranges				Specific Amounts			
			Do you smoke Yes/No	Location			Total	Location			Total	Location		
				Home	Office	Other		Home	Office	Other		Home	Office	Other
31			X									X ⁵	X ⁵	X ⁵
32a	X										X			
b	X										X			
c	X										X			
d	X										X			
33a	X										X			
34		X										X ⁴ + 21 + 22	X ¹ + 5 + 16	X ⁵

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Notes for Tables A1 and A2

- 1 - Work near people who smoke
- 2 - For specific location/study
- 3 - Do not have entire questionnaire, only passive smoking section
- 4 - Rate in terms of perceived smell (no smoke to heavy smoke)
- 5 - Rate in terms of hours of exposure
- 6 - Number of smokers at time of survey
- 7 - Total (by 1/2 packs) for average work day
- 8 - By room
- 9 - By less or more than 1 pack/day
- 10 - Number of people near you who smoke
- 11 - Random sample of people in building asked to complete form
- 12 - Rate in terms of bothersome (not at all to very bothersome)
- 13 - Total number smoked at home in time groups (3a-9a, 9a-3p, 3p-9p-9p-3a)
- 14 - Smoking policy of office (verbal description)
- 15 - Are there designated smoking or/and non-smoking areas
- 16 - Number of people who smoke
- 17 - At time of sampling for entire week
- 18 - Number smoked in the home on weekdays/weekends
- 19 - Rate in terms of air quality (excellent + poor) - also asks for participants to state reason and how serious
- 20 - The NHANES II Survey is composed of 8 main questionnaires. The questionnaire listed here is the only one concerned with cigarette consumption.
- 21 - Rate in terms of hours of exposure and number of cigarettes smoked in presence
- 22 - Does spouse smoke in the bedroom
- 23 - Questionnaire only concerns passive exposure from childhood, work, home(s), and other

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APPENDIX B
FIELD STUDY SURVEY FORMS

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FIGURE B1

COMFORT AND ENVIRONMENT PERCEPTION SURVEY

The IIT Research Institute is evaluating comfort and environmental conditions among persons who work in office buildings. To this end, we are surveying occupants for their feelings concerning the environment and comfort of their work area. A one page questionnaire will be handed out each day for six consecutive days and again two weeks later.

WE NEED YOUR COOPERATION

All participants are being asked to read and fill out the attached questionnaire. Please complete the attached form at the end of your work day. Your answers should be in reference to your feelings about your designated work area today. If you are not sure of the area designated or have any other questions please ask your project representative.

I appreciate your taking the time necessary to complete the questionnaire and returning it to your project representative.

I wish to assure you that your answers to the questionnaire will be treated in strict confidence.

Thank you very much

David A. Sterling
Program Manager
Co-Principal Investigator

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FIGURE 82

PARTICIPANT CONTACT FORM

Contact Date:

Contact Name

Address:

Phone Number:

Initial method of contact:
(i.e., phone, letter, colleague)

Further information requested: Yes No

If yes, what type:

Number of possible study sites (description)

Other:

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FIGURE B3

STUDY WORK AREA NUMBER _____

<u>Participant Initials</u>	<u>Assigned Number</u>
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8	
9.	
10.	

Comments:

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Figure B4

WORK AREA DESCRIPTIONS

Date Performed: _____ Work Area No.: _____

Performed by: _____

Building

- Location (urban, suburban, rural, etc.):
- Size (no. of floors)
- Use (commercial, residential, warehouse, combination):
- Other:

Work Area (draw diagram on back)

- (floor no. and location on floor)
- Approximate size (show approximate dimensions on diagram):
- Number of people (show location on diagram, indicate people who smoke if possible):
- Type of work performed (clerical, secretarial, management, etc.):
- Type of enclosure or separation (walls, partitions, corridor, etc.) - If work area not enclosed, describe surrounding area:
- Can environment be controlled (temperature settings, windows opened, people have separate fans, heaters or extra clothes, etc.):

Activity level (is there much thoroughfare, do workers in area move around much, etc.):

Other:

Other Comments:

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COMFORT AND ENVIRONMENT PERCEPTION QUESTIONNAIRE

Distribution and Collection

- The one page questionnaire should be distributed to every person in each work area between 4 p.m. and 5 p.m. each day. A total of seven questionnaires will be given to each person; from Friday through the following Friday and again two weeks later on a Friday.
- All questions should be answered based on the overall daily perception. Please answer all questions.
- There should be only one answer indicated for each question. After first answering the question, comments may be written at the bottom or on the back of the form if necessary.
- The questionnaire should be collected from each person before they leave each day.
- In the case of a person leaving work before 4 p.m., the questionnaire should first be completed. The number of hours to be missed should be included in the questionnaire as "hours away from work area".
- Questionnaires from each work area should be kept together and placed in a folder indicated for the work area.

Answers to Typical Questions

- Q. What time period should the questionnaire be filled out for?
- A. The questionnaire should be completed in terms of your overall impression/perceptions for the entire day on which you were given the questionnaire.
- Q. I filled out a questionnaire yesterday, do I need to do another?
- A. Yes, there will be a total of seven questionnaires; from a Friday through the next Friday there will be six continuous days the questionnaire is to be completed, and then a seventh one on a Friday two weeks later.

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Q. What is considered my "work area"?

A. Your work area is defined as "the space two or more people use (spend the largest portion of their time) in performing the primary activities of their job". The work area is usually bordered by walls, corridors, filing cabinets or other separation. You will be informed of the set boundaries of your work area by the person giving you the questionnaire. If you are not sure of your work area please ask the person handling the questionnaire or call the number indicated at the end of the directions.

Q. Some of these questions concern other people, can I talk to them about it?

A. No, please do not talk to others until the questionnaire has been completed by you and them. We are interested in your perceptions.

Q. Do I only consider the people who are included in my work area?

A. If other people are present during the day (such as walk through or perform work in your area) and they have an effect on the answer you may give, they are to be considered. However, if you are out of your work area, do not include actions by other people you observe (such as smoking).

If there are any questions concerning the questionnaire please do not hesitate to call David Sterling at 567-4236 or Demetrious Moschandreas at 567-4310.

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PERFORMANCE SCHEDULE COMFORT AND ENVIRONMENTAL PERCEPTION SURVEY

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