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POST OCCUPANCY EVALUATION OF HOUSING

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U.S. Department of Housing and Urban Development
Office of Policy Development and Research

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POST OCCUPANCY EVALUATION OF HOUSING

A Final Report On
Contract No. H-2405

December, 1978

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HOW TO READ THIS REPORT

This is not a report for the casual reader. The report is organized to fulfill the tasks outlined in the original HUD Request for Proposals. These tasks are listed in the Table of Contents. Topics of specific interest can be located as follows:

1. If you have never heard of Post Occupancy Evaluations (POEs) before or you are not sure of the definition, turn to page 188 and read as far as you need to be clear on all the elements that make up a POE.
2. If you want the main conclusions of the report, turn to page 226.
3. If you want recommendations for the next steps for HUD to take in implementing POEs, turn to page 227.
4. If you want a summary of findings of the research, turn to the Executive Summary on page 1.
4. If you want the detailed findings of each section of the report browse through each subheading and you will find the specific findings underlined in the text. If there is no underlined sentence in a section, the findings are not clear enough to summarize in a sentence.
6. If you want to know the reasons why this research was conducted, the legislative mandate, the request for proposal, the subsequent contract, and the research project on which this report is based, turn to the introduction on page 5.

EXECUTIVE SUMMARY
POST OCCUPANCY EVALUATION STUDY
HUD CONTRACT NO. H-2405

Environmental Research and Development Foundation

Post Occupancy Evaluations (POEs) are evaluations made of buildings after they have been occupied for some length of time. They are evaluations from the point of view of the people who use the building, including residents, visitors, workers, managers, and maintenance men. This report deals with post occupancy evaluations of Housing for the Department of Housing and Urban Development. The study deals with fourteen tasks as follows: (Tasks are numbered according to the original HUD contract with Roman numerals and alphabet subheadings. Task I was to approve the project schedule. Tasks began with IIa).

IIa. Task: Describe and classify building program requirements that use post occupancy evaluations.

Results: Although over one thousand professionals were surveyed throughout the United States, only 31 housing agencies had ever done POEs and of these not a single one has incorporated POEs within their program. Sweden, however, leads the world by incorporating POEs into their housing system. POEs are the basis for continually upgrading guidelines for government financed housing.

IIb. Task: Identify other individuals and organizations with POE expertise.

Results: 499 individuals and 169 organizations were uncovered with expertise in performing POEs.

IIc. Task: Do a comparative analysis of the efficiency and effectiveness of the various (POE) techniques.

Results: Of 1,305 POE studies reviewed, only 265 in the U. S. had sufficient data for analysis. An analysis of these studies revealed:

1. POEs have generally been conducted disproportionately in the northeastern states and California.
2. High rise buildings are over-represented in POE studies.
3. Elderly, blacks, and low income families were studied proportionately more than other populations.
4. Most POEs were done between 1973 and 1976.

5. The majority of POEs were conducted by university departments and most of these were not utilized. Although only twelve percent were done by housing agencies, all of these were utilized.
6. Behavior measured by POEs were preferences, attitudes, perceptions, activities, and complaints.
7. The most favored topic was the use of internal spaces.
8. Most POEs did not use statistical analysis.
9. The majority of POEs cost \$5,000 or less. Academic POEs tended to be the least expensive per unit.
10. Most POEs used three methods, structured interview, direct observation, and questionnaires. Since these were almost always used together it was not possible to separately analyse the methods for cost and efficiency.

IIId. Task: Collect and develop a bibliography.

Results: 1,305 examples of POEs were discovered throughout the world. Of these, 735 were foreign, 570 in the U. S. Twenty-one countries are represented.

IIIa. Task: Develop a model of the housing delivery system.

Results: Three models of the housing delivery system were developed, Multifamily Mortgage Insurance, Section 8 New Construction, and Turnkey Public Housing. These models represent over three-fourths of housing built by HUD programs.

IIIb. Task: Identify and discuss constraints in the building process to the use of Post Occupancy Evaluation.

Results: Lack of involvement by housing related professionals with housing after it has been built was seen as the most relevant constraint to use of POEs. Other constraints were the lack of a legal mandate to do POEs, the way fees are currently structured, and the fact that current financing would not permit either paying for POEs or the changes they would show are needed. The constraint most easily changed among those most relevant was also the lack of involvement after the housing was built.

IIIc. Task: Document Current Attitudes Toward POEs.

Results:

1. What should be covered in POEs? Health and safety first, suitability of housing design for occupants' needs second.
2. Primary objective of POEs should be to change future housing design for the better.

3. Who should pay for POEs? The developer should pay for private housing and HUD for public housing.
4. Who should perform POEs? An interdisciplinary team.
5. How should results of POEs be made public and available? Through existing trade journals. (But independent research shows this method will fail).
6. What methods should be used to promote POEs? Increasing awareness of POEs among professionals, developing financial incentives for POEs, and making results more accessible.
7. What specific items should be included in POEs?

For site - availability of amenities and services
 For interior space - interior layout and floor plan
 For safety and health - fire, safety, and securing systems
 For living environment - acoustic and visual privacy, and appearance and image of the building
 Cost-time related attributes - cost to operate electrical and mechanical utilities

8. What construction elements? Site work and plumbing.
9. Would use of POEs provide private firms with a competitive edge? Definitely say 45.4%, somewhat say 42.7%. Only 2% feel it would be a disadvantage or a handicap.
10. Who would benefit most from use of POEs? Designers and owner-operators.
11. How important is it that POEs be done on housing? 56.6% say important or very important, only 14% say not important.

IVa. Task: Identify, develop, and describe strategies to overcome constraints to the use of post occupancy evaluations.

Results:

First - demonstrate the design quality and financial benefit aspects of POEs.
 Second - effectively communicate these through education, training, and publication.
A clearing house strategy is proposed.

IVb. Task: Develop a model of the housing delivery system.

Results: The three models developed for Task 5 were supplemented to show various junctures at which POE information could be introduced, and the clearing house operation is shown. It is important to note that this can be accomplished fully without legislative mandate.

IVc. Task: Propose a research and demonstration strategy for HUD to test the practicability and usefulness of the POE.

Results: A five year clearing house operation is proposed to demonstrate effectiveness of POEs in three locations, a private developer, a local housing authority, and a state housing finance authority. Cost is \$959,384 over the entire five years.

IVd. Task: Develop a framework by which HUD can demonstrate the uses and effectiveness of POEs.

Results: First, the POE information now published must be summarized and made available to all housing related officials. There is a need for such information now. Second, clearing house will operate to change the procedures of the environmental impact statements to include social impact criteria, and to help change the minimum property standards as required. This is seen as a more permanent effect of the POE beyond the demonstration phase.

IVe. Task: Suggest alternate methods for evaluating and selecting POEs.

Results: A POE handbook was developed suggesting eleven steps minimally necessary to performing a POE in housing.

IVf. Task: Develop a strategy for dealing with constraints identified by professional societies representing building sciences.

Results: Working first through professional committees of the various societies, longer term strategies such as adoption of a life cycle cost requirement for housing is necessary.

IVg. Task: Develop mechanisms for continuous data collection.

Results: Housing agencies are already too overworked to collect additional data and can't make sufficient use of data already collected. Only direct intervention and change in the process as it now exists will produce useful data. An outside agency to the local housing authority, preferably national, can make best use of the data.

POST OCCUPANCY EVALUATION OF HOUSING
Final Report

INTRODUCTION

1. Background

The Housing and Community Development Act of 1974 authorizes the Secretary of Housing and Urban Development under "additional research authority" to

"... undertake special demonstrations to determine the housing design, the housing structure, and the housing related facilities, and amenities most effective or appropriate to meet the needs of groups with special housing needs including the elderly, the handicapped, the displaced, single individuals, broken families, and large households." (Sec. 507 (a) page 105).

and further,

"In carrying out his functions under this section, the Secretary shall give preferential attention to demonstrations which in his judgment involve areas of housing user needs most neglected in past and current research and demonstration efforts." (Sec. 507 (b) page 105).

If there is any doubt these instructions must include post occupancy evaluations, Section 507 (d) is added:

"In carrying out this section, the Secretary shall include, as part of any demonstration, an evaluation of the demonstration to cover the full experience involved in planning, development and occupancy."

The Secretary is further authorized to

"... set aside any development, construction, design, and occupancy requirements, for the purposes of these demonstrations, if in his judgment they inhibit the testing of housing designed to meet the special housing needs." (Sec. 507 (c), page 106).

Although the language of the law directs itself to the special needs of underprivileged groups, it contains all the specifics of a true post occupancy evaluation in the "full experience involved in planning, development and occupancy" clause, for that is exactly what a post occupancy study evaluates.

Accordingly, to develop policy guidelines on how to go about post occupancy evaluations, The Department of Housing and Urban Development Office of Policy Development and Research issued a Request for Proposals on April 16 of 1976 to "define measures and methods for post construction evaluation of residential buildings and to formulate and test alternate methods for establishing performance standards which might emerge for use by state and local agencies."

A contract (H-2405) was signed with the Environmental Research and Development Foundation on June 30, 1976 with the following objectives:

- (a) Identify the state-of-the art in occupant oriented post-construction evaluations;
- (b) Specify and evaluate the content of and methods used in post-construction evaluation;
- (c) Identify the constraints to the use of information or methods derived from post-construction evaluation as identified in (a) and (b) in the process of design, construction rehabilitation, and financing of residential projects funded or assisted by HUD, state or local government housing agencies;
- (d) Develop a strategy (or strategies), by which these public agencies can adopt and continuously support post construction evaluation procedures as part of their normal program processes, with particular attention to the development of incentives at all points in the process from the originating design professionals fee schedules to the certification of cost to mortgagees and mortgage insuring agencies at the completion of the feedback loop.
- (e) Develop and justify a method whereby Regional and Federal HUD offices can periodically evaluate the usefulness of post-construction evaluation and the continuous feedback procedures relative to state and local housing agencies.
- (f) Provide a demonstration design for a follow-on test of the method developed in (d) and (e).

These objectives were divided into three major tasks with various sub-tasks amounting to fourteen specific tasks to perform (see Table of Contents for list of tasks).

The RFP and the response to it were written largely in ignorance of the field of post occupancy evaluation both as it existed in the field and in the literature. Thus, in the final outcome some expectations were not met while others were exceeded. The results were often quite different from those anticipated by the original RFP. Hence, while this report will

adhere to the original list of tasks, it will also take advantage of the new discoveries uncovered by the research, sometimes in preference to the original intent of the RFP.

2. The Place of Post Occupancy Studies in Housing Policy Research

In January of 1975, Cogen, Holt and Associates* presented their report to the National Science Foundation on policy-related research in the field of Municipal Housing Services. The report covered the full range of housing research including Housing Plans, Urban Renewal Programs, Information Systems, Codes and Regulations, Real Property Taxation, and Housing Assistance Programs. The report divides all of housing research into three areas, 1) those that deal with problems of housing quality, 2) those that deal with problems of housing quantity, and 3) those that deal with problems of cost and distribution.

Post Occupancy Evaluation (POE) deals directly with the problems of housing quality and how the quality can be improved by a continuous monitoring of the housing system. The specific aspect of quality that the POE addresses is housing design. "Design" covers not only the design as conceived by an architect but the design as it is executed by the builder, influenced by other actors in the housing system and as it is managed and lived in by the resident and/or manager. The concept of design as measured by the POE is a performance criteria. In the broadest sense, how does the housing perform for the residents, management, visitors, maintenance men -- all the people who use it? The POE seeks to establish an optimum performance criteria for housing by the use of empirical data. Indirectly, however, the POE also deals with the problems of housing cost. One of the frequent findings is that poor design contributes to the social problems of vandalism, accidents, crime, and excessive wear. At the same time good design, while it may not remove these problems, can certainly help alleviate them. But the POE is of no use unless it is used in the housing system itself, and part of the study is to learn why POEs haven't been adopted although they have been around for some time.

Some of the reasons are already evident from the Cogen, Holt Study (although they did not deal with POEs). Policy-related research in housing of any kind has "failed to play a significant role in the formulation and execution of local housing policy for at least four reasons:

- its quality is poor in overall scope and reliability;
- its utility is marred by the fact that it does not consider the critical constraints on the local policy maker;
- it is inadequately disseminated; and the local decisionmaker tends to rely on his own training and experience in the housing field."

*Housing and Local Government, Cogen, Holt Associates, 1975 Report to the National Science Foundation, Research Applied to National Needs.

Thus, with a generally poor track record for housing research in general, the POE alone could not be expected to overcome the obstacles of lack of training and experience of housing officials in the field nor the barriers of communication that exist for research in general. Ways must be found to communicate the use of POEs to the people who most need it, the local housing officials.

3. Limitations of Data

The findings of this report came from three sources, 1) a survey of eight professional groups who deal with the housing system, 2) hired consultants who are experts in the field as well as a board of advisors with similar expertise, 3) interviews with housing officials in the field.

The survey did not receive a majority of responses (see below for a discussion of the survey methods). Some of the reasons are that not all persons surveyed were directly concerned with housing and tended not to respond. There was no way to determine involvement with housing in cases of the professionals without doing a preliminary survey, so sampling had to be large in order to get sufficient numbers in housing.

Certain professionals, i.e. bankers, were largely uncooperative.

4. Survey of Housing Officials and Professional Groups

a. The survey sample and rationale

Several tasks in the study required collecting data that could best be done through a written survey. Task IIa required identifying current programs that use POEs. An attempt was made to identify such programs by sampling from all the local housing authorities in the country. At the same time, Task IIIb required identifying constraints to the use of POEs that exist in the housing system. The same housing officials and seven groups of professionals were asked to identify constraints. Task IIIc required assessing the attitudes of professionals in the housing system toward the use of POEs. These three tasks were accomplished by the use of a single survey.

The survey covered housing officials listed in the Directory of Public Housing Agencies, February 1, 1976. Of the 3,213 agencies listed, a majority (2,912) were found to be small agencies with less than 500 housing units. Since larger agencies had a disproportionate share of the housing units, a divided sample was taken of agencies with 500 units and above (N=165) vs agencies with fewer than 500 units (N=153). The larger agencies were further subdivided into those with more than 1,250 units and those with 500 to 1,250 units. State Housing and finance agencies were also sent questionnaires (N=37), but responses were so few they were dropped in analysis of results. Housing agencies sampled (N=318) were sent a letter requesting they identify some person on their staff as likely to be most knowledgeable about POEs to

receive the questionnaire. Replies were received from 74 agencies with more than 1,250 units, 69 agencies with 500 to 1,250 units and 153 agencies with fewer than 500 units (Total N=296). These were sent questionnaires.

Professional groups surveyed were the American Institute of Architects (AIA), the American Institute of Planners (AIP), the American Society of Landscape Architects (ASLA), Federal Employees engaged in some form of POEs, the National Association of Home Builders (NAHB), the American Society of Interior Designers (ASID), and members of the Federal Home Loan Bank Board System (FHLBB). There were found to be so few members of the American Society of Civil Engineers (ASCE) directly involved in housing that they were not sampled. Instead, their housing committee agreed to review this report. Each society was sampled so that approximately 100 members would receive questionnaires as follows:

TABLE I-1

Sample Sizes of Professional Groups

Society	Sample	Membership
ASLA	97	3,399
ASID	97	460*
AIA	99	990*
AIP	102	1,530**
NAHB	98	?
FHLBB	99	4,069

For the ASLA, all members were sampled. For the ASID, only officers of local chapters were sampled since it was felt these would be the most active. Officials at ASID headquarters felt the returns from a total membership sample would be poor. AIA was, similarly, a sample of officers of local chapters of the AIA. The AIP list was only of the directors of planning agencies, not the membership at large. Considering the purposes of the survey, the national AIP staff felt these would be the most relevant members to answer the questionnaire. The NAHB national staff offered to do the sampling of members and send out the questionnaires from their headquarters. All sampling was done in consultation with the national staff of each society.

*Officers of Local Chapters

**Directors of Planning Agencies

All of the associations and societies, with the exception of the FHLBB sent letters from their presidents encouraging members to answer the questionnaire.

Since only 59 federal employees could be found with a knowledge of POEs in their agencies, each one was sent a questionnaire.

TABLE I-2

Questionnaire Response Levels for Professional Groups

Professional Group	Sent	Completed	Per Cent
Large Housing Agencies	74	47	63.5
Medium Housing Agencies	69	48	69.5
Small Housing Agencies	153	67	43.8
Interior Designers	97	25	25.8
Architects	99	49	49.5
Bankers	99	22	22.2
Federal Employees	59	33	55.9
Builders	98	31	31.6
Landscape Architects	97	36	37.1
Planners	102	43	42.1
TOTAL	947	401	42.3

As can be seen from the above table, the best level of response came from the medium sized housing agencies and the lowest level of response from bankers. Bankers were the only group which did not receive a letter of support from their society president. The overall return rate of 42.3% is comparable for mail questionnaires of this sort. In fact, considering the difficulty of the questionnaire and the large numbers who returned the questionnaire unanswered because they were not involved in housing, the rate was very good. The Housing Research and Development Program at the University of Illinois got a 32% return on a questionnaire mailed to residents (see Francescato, Weidemann, Anderson and Chenoweth, 1975). Janet Reizenstein (1975) got an overall return of 48% from AIA and AIP members on a much shorter and less difficult mailed questionnaire.

b. Development of the questionnaire

The questionnaire was developed to answer the following questions:

1. Did the respondent do or know of anyone who had done POEs? (Task IIa) If the answer was positive, names and addresses were asked.
2. What are the existing constraints against the use of POEs in the housing system today? (Task IIIb)

3. What are the prevalent attitudes toward POEs among professionals? (Task IIIc)

A list of constraints and attitudes could be endless, but these were determined from several sources. First, interviews were conducted with housing field personnel, builders, developers, financiers, and architects to get an initial list of constraints and attitudes. It turned out, of course, that the list was not infinite, there were some reasonably agreed upon common constraints seen and attitudes shared. The lists derived from these interviews were then given to consultants to criticize. Finally, the lists were pretested as a questionnaire.

When the number of constraints and the kinds of attitudes seemed to be fairly stable, they were made into a questionnaire that remained open-ended, allowing any new attitudes or constraints to be added. As it turned out, any additions were insignificant, amounting to less than one percent of total responses in nearly all cases.

The purpose of the questionnaire was to evaluate which items on the list were the most important. The list was fairly long amounting to 15 pages. Pretesting showed, however, that respondents could complete the questionnaire within OMB time limits (30 minutes). Based on responses in the pretesting, a ranking method was chosen. As it turned out, this was an unfortunate choice because often not all items were ranked. For final analysis, those items not ranked were coded at the low end of the ranking scale. This alleviated the problem of missing data, but a 1-5 rating scale would have been a wiser choice. Nevertheless, data were serviceable for statistical analysis.

The questionnaire in its final form is contained in Appendix III. As each of the tasks is described, answers from items on the questionnaire related to that task will be analyzed.

c. Questionnaire Analysis

In the original proposal it was stated that a BC TRY analysis would be done of the constraints and attitudes. The BC TRY system would have permitted a classification of constraints and attitudes that would give a more searching view of differences among the professions. As it turned out, the data did not suggest that the professions were really divided enough on either constraints or attitudes to produce a clean classification process. It was decided to use a discriminant function analysis instead of the BC TRY in order to statistically test the differences that did occur. The discriminant function analysis confirmed that only 17 to 44 percent of the professional groups could be classified separately by their answers. Thus, the professional groups did not differ markedly on their attitudes toward the POE.

Discriminant function analysis is a statistical method for taking many measures from several groups of subjects and statistically testing which measures make the greatest differences among the groups.

The discriminant analysis used was the one developed for the SPSS (Statistical Package for the Social Sciences) by Tuccy and Klecka of Northwestern University (see Statistical Package for the Social Sciences, Second Edition, Nie, Hull, Jenkins, Steinbrenner, and Bent, McGraw Hill, 1975, pages 434-467).

TASK IIa

Describe and Classify Building Program Requirements that Use Post Occupancy Evaluation.

As part of Tasks IIc, IIIb, and IIIc housing officials and seven professional groups connected with housing were asked to identify programs that used post occupancy evaluations. From these and other sources 31 housing agencies were located that had done post occupancy evaluations. Each of the 31 was contacted and not one had performed the POE as part of a program. Each POE was a one-time operation that would not be continued. Nor did any of the agencies that did these 31 POEs know of any others that had done POEs. Therefore, it is not possible with the present data to describe and classify building program requirements in the United States that use post occupancy evaluations as defined in this study.

An examination of the POE process in other countries (20 foreign countries were represented) revealed that Sweden may be the only country that has formally incorporated POEs into their housing program. A description of the Swedish POE process is, therefore, presented here.

In addition to Sweden, Canada was found to be ahead of the U. S. in performing POEs and the Canadian government is now negotiating to include POEs as part of the programming process in all government-supported construction.

England, Denmark and Norway have all made relatively greater use of POEs in government construction than the U. S. The Swedish example, however, is the most developed one.

SWEDISH HOUSING SYSTEM AND THE POE PROCESS

INTRODUCTION

In Sweden the post occupancy evaluations of residential environments are part of building research programs. The scope of building research in Sweden is very extensive. It covers the entire range beginning with social and behavioral theory to the technical aspects of building. In the United States, in contrast, building research appears to refer to the research in the structural, engineering, and similar technical aspects of housing and rarely, if ever, is any consideration given to the human factors. In Sweden, the research progression starts from the human-behavioral perspective moving on to the technical aspects which is unique and has as its goal better environments for human needs.

The entire building effort in Sweden is based on the premise that the built environment should meet not only the technical and economic requirements but also socio-cultural ones. This is accomplished by a housing policy which is deeply rooted in the social and behavioral needs of the users of the residential environment. In order to do justice to this emphasis, efforts have been made, in recent years, to invite the tenant organizations to participate in the planning of their residential environments and in influencing the design of their dwellings. The tenant input forms an important part of building research which becomes the basis for building regulations, guidelines, and recommendations.

ADMINISTRATIVE STRUCTURE

The building research effort and post occupancy evaluation of residential environments in Sweden appears to be a part of housing and physical planning. In order to understand the POE process, therefore, it is important first to examine the structure of the housing and physical planning.

All matters pertaining to housing and physical planning in the country are within the jurisdiction of the Ministry of Housing and Physical Planning. This ministry conducts its affairs through 5 different boards, councils, and institutes all of which cooperate with each other although their functions are distinctly different. Figure II-1 depicts their administrative structure.

The primary functions of each of these five units of the Ministry of Housing and Physical Planning is described below.

National Housing Board (NHB). It is primarily responsible for the construction of housing, provision of housing loans, and administration of low income housing programs such as housing allowances. It is in the construction aspect where POE information is utilized. The National Housing Board Communicates with the county and the municipal housing boards which are responsible for the implementation of housing decisions and guidelines at the local level.

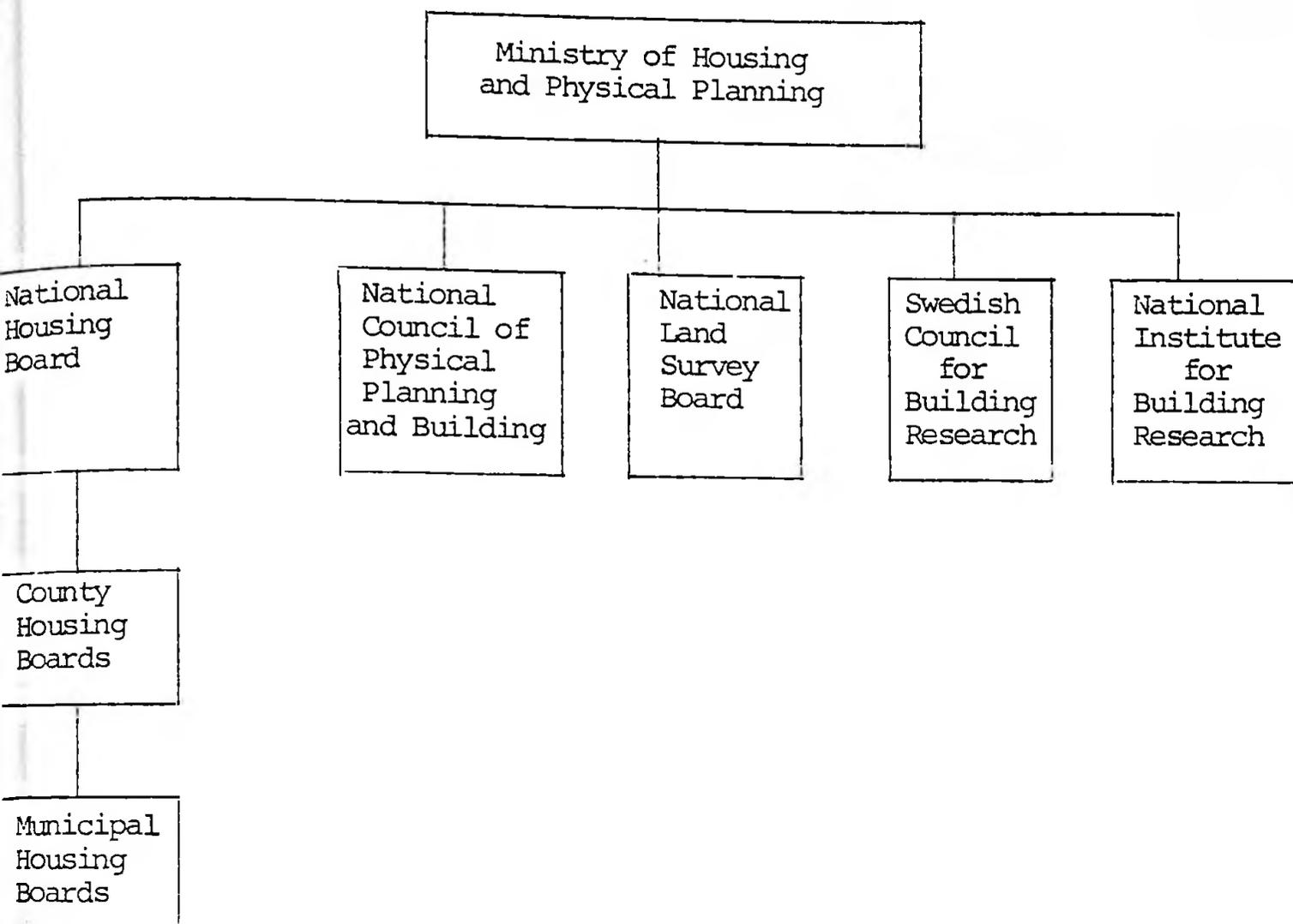


Figure II-1

Administrative Structure of Housing and Physical Planning in Sweden

National Council of Physical Planning and Building (NCPBB). The primary duty of this council is the compilation of Swedish Building Regulations. Such regulations and guidelines are developed through POEs under the control and direction of the agencies to be described later. The first set of building regulations and guidelines were implemented in 1967 which have been superseded by the new set of regulations and guidelines developed in 1975 and implemented in 1976. This indicates that the building regulations and guidelines are periodically revised. Since they are based on POE information, it follows that POEs are continuously conducted and results transferred to the Council of Physical Planning and Building. Once compiled, these regulations and guidelines are given to the housing board which has responsibility for their implementation through its local housing boards.

National Land Survey Board (NLSB). This board surveys the land available for housing and makes decisions regarding the location of different kinds of

housing for different kinds of people. Research information gained from POEs is used for such decisions. The land survey results are then communicated to the National Housing Board for use in site selection and construction.

Swedish Council for Building Research (SCBR). Founded in 1960, this Council is directly involved in POEs and focuses upon research, development, and rationalization. It provides financial support for such studies. Because of its central role in POEs it will be discussed in more detail later.

National Institute for Building Research (NIBR). This institute is responsible for conducting all sorts of building related research studies including POEs. It is financed 100% by the Swedish Council for Building Research and claims 30% of its entire research budget. The rest of the research budget of the Swedish Council for Building Research is used in funding other research and POE projects by other individuals, research organizations, and universities, and other research related activities. It is, therefore, important to note that the government machinery itself has created a mechanism in the form of the National Institute for Building Research through which it itself conducts POEs and building research.

THE SWEDISH COUNCIL FOR BUILDING RESEARCH

Organization. The SCBR operates by means of the following organizational make-up (Figure II-2).

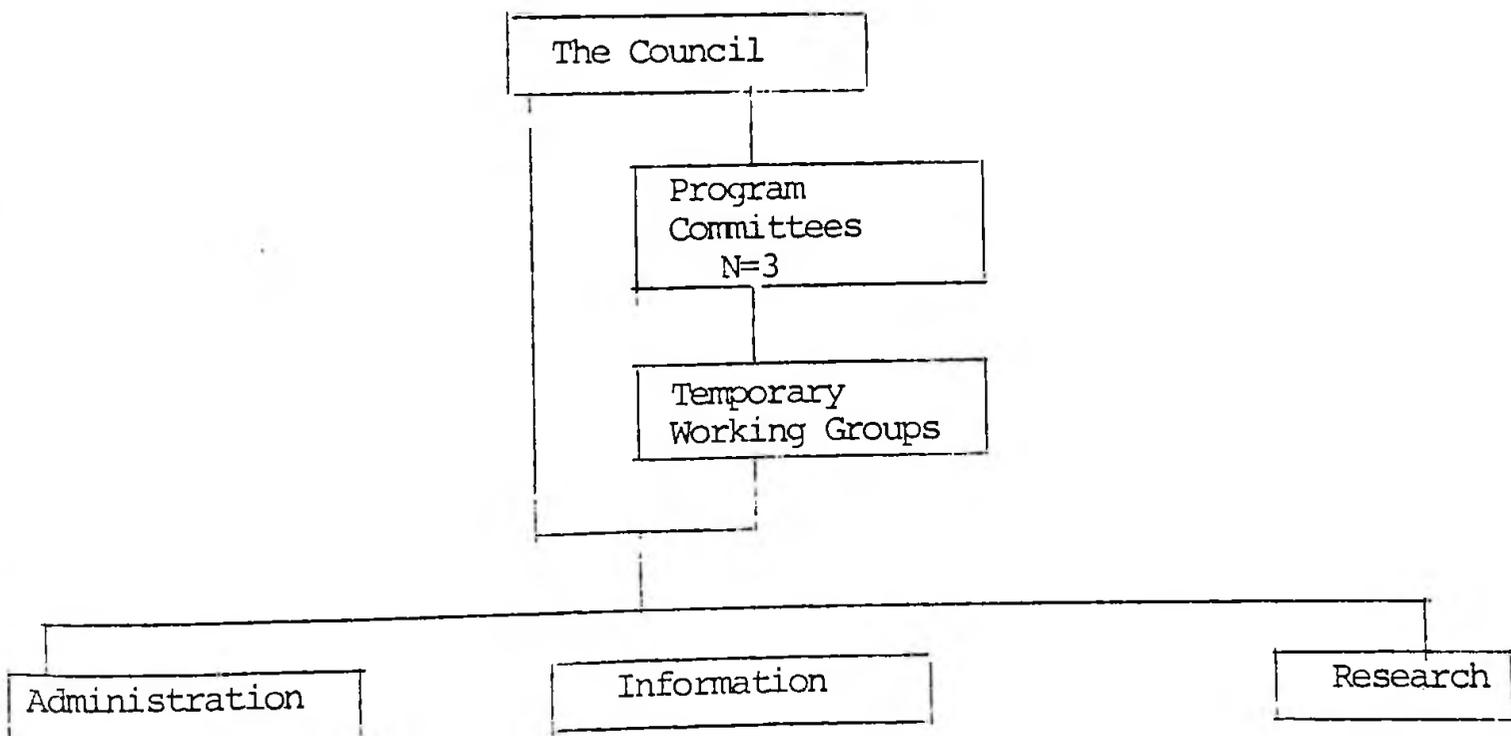


Figure II-2
Organization of SCBR

The Council is composed of 11 members appointed by the government. Each of the members represents a particular aspect of the building sector ensuring balanced input. The 3 planning committees working directly under the supervision of the council devote their energies to planning, consideration of future needs, and evaluation of attained research results. The temporary working groups are organized from time to time as needed which study intensively the research needs, initiate, coordinate, and direct project-blocks with specific goals.

A project-block is a group of research studies combined together based on similarity of problem orientation. Thus, the projects in a block would have common objectives although they would belong to different subject areas and scientific disciplines.

Finance. The SCBR is financed by three sources.

1. Levy on building industry wages which is .7% of wages, and constitutes 82% of all SCBR funds.
2. State contribution in proportion to its share of building activity at present amounts to 14% of SCBR's total funds.
3. Interests and sale of building research publications which account for the remaining 4% of SCBR funds.

It is important to note that the funding for SCBR, an organization directly responsible for building research and POEs are primarily and largely financed by building industry wages. In other words, the building industry supports the building research activity and apparently profits by it through use of research information in building construction.

Goals. The overall goals of the Swedish Council for Building Research (SCBR) are:

1. Programming. "To be well informed on research and development needs and within the framework established by national policy, to draw up and review short-term, operational plans answering to definite needs as well as to draft long-term programme studies." *
2. Information. "To ensure that new research results are speedily put to use and that existing information remains available and easily accessible." *
3. Research and Development. "To provide research and development that furthers
 - a built environment possessing qualities corresponding to social goals and consumer demands and which promotes greater social equality.
 - user participation

*Source, "Swedish Council for Building Research," Stockholm, 1976.

- low total costs with greatest possible economy of natural resources
- a building sector which functions in harmony with the national economy and labor market and which provides good working conditions for its employees
- a basis for formulating new goals for society." *

These goals clearly underline the research basis for housing policy in Sweden. The research is conducted in existing housing, the results of which are used in new housing which in turn is researched to provide data for future housing.

Allocation of Resources by goals: The following table shows how the SCBR funds are spent with respect to its goals.

TABLE II-1
SCBR Funds Allocated to Goals

Goals	1974 - 1975 %	Projected 1980 - 1981 %
1. Programming	5	4
2. Information	13	15
3. Promotion of R & D	82	81
TOTALS	100	100

Clearly most of the money goes for the conduct of research. Of the remaining, most is spent on information dissemination. The proportion of projected expenses by goals in future years is essentially the same as it is now. Since promotion of research and development and information dissemination are obviously the most important activity for SCBR, they need to be examined in a little bit more detail.

Research and Development: Areas of Activity. Three specific R & D areas may be identified.

1. Planning and use of built environment.
2. Design and operation of technological systems.
3. Building administration, construction, and maintenance.

* Source, "Swedish Council for Building Research," Stockholm, 1976.

Of these the first area is primarily relevant for POE operations since it directly focuses on people and their use of their housing. There are two aspects to it.

A. Research for Planning and Design

It determines "how the built environment is used and appreciated and how it could be designed to satisfy the requirements and wishes of different types of users/consumers."

Research covers such factors as indoor-outdoor climatological conditions, acoustics, the perception and experience of the environment, the effect of environment on life styles, the utilities, the transportation, the economic aspects of building, operational costs, cost-benefit ratios, use of open spaces, vegetation, and retention of environmental qualities.

B. Research on Planning and Design

It is concerned with "the ways and methods of physical planning and design." The planning process is examined and "efforts are made to develop and improve planning and design methods for the built environment."

Allocation of Research and Development Funds by Areas of Activity. The table below shows the funding for different areas of Research and Development Activity for the year 1976-1977.

While research in all the three areas provides information that is useful for future building design, construction, operation, and maintenance, the first area is the only one that focuses on people, their behavior and how they are related to housing design, quality, and overall residential environment.

TABLE II-2
Allocation of SCBR Research Funds by Areas of Activity

Areas of Activity	SW Kr	Equivalent U. S. \$	%
1. Planning and Use Built Environment	22,400,000	4,592,000	34
2. Design and Opera- tion of Techno- logical Systems	26,300,000	5,391,500	39
3. Building Adminis- tration, Construc- tion, Maintenance	18,200,000	3,731,000	27

Looking at the breakdown of allocation of resources, it is clear that the importance of this area of research has been adequately realized on which over 4 and 1/2 million dollars are spent in a year. In contrast, no such activity exists at the government level in the United States.

Information. It is recognized that the research results cannot be utilized unless properly communicated to those who would use them. Information dissemination, thus, becomes an activity of major importance for SCBR. But, communication of information is not enough. It should be in a form that is understandable and usable by the practitioners in the building industry. Recognizing the needs the SCBR does two things:

- A. It adapts the research information in such a way that it is quickly and efficiently disseminated and made available to all those who may be interested in them either for educational purposes or for conversion of research findings into practical applications or both.
- B. It takes the research reports documenting the researcher's work and transfers the results in the form of norms, regulations, and recommendations, thereby changing research results into applicable information. Through proper channels it is then provided to the building practitioners. This is a very difficult and technically sophisticated task. For this reason, people specially qualified in style and communication skills are employed.

Efforts at Cooperation: The effectiveness of the work of SCBR depends in part upon its cooperation with a variety of organizations, both in the area of the conduct of research and dissemination of research information. The SCBR, therefore, cooperates with 1) other agencies that grant funds for building research or research that may have relevance for the building industry, 2) building industry itself, 3) universities, and a variety of research institutions and research organizations, 4) community representatives 5) national administrative bodies, 6) all Nordic countries, and 7) many international research, housing, and building organizations.

Its cooperation with the building industry and community representatives is especially significant and noteworthy. It is the building industry through which research information can be implemented and it is through community organizations that it can be learned as to which kind of research information is needed and what appropriate research inputs are. In the U. S. no such cooperation is possible since there is no organization at the federal government level that is equivalent to SCBR. Furthermore, cooperation across governmental levels in the U. S. is virtually unheard of in the scale already practiced in Sweden. It would be naive to assume that merely establishing an equivalent of the SCBR in the U. S. would automatically bring about the same effect as in Sweden. In fact, a major effort at cooperation among the government and private agencies would be necessary.

The Conduct of Research. As indicated earlier SCBR itself does not conduct research. It provides funding and support for it together with planning, administration, publication, information dissemination, etc. The government

branch that does research is the National Institute for Building Research. Apart from it, over 3/4 of all building research including POEs is conducted by the academic institutions, universities, research institutes, and institutes of technology. Some research is also conducted by private consultants, builders, and various organizations in the building sector.

It is not surprising that a majority of building research is conducted by academic and research institutions and organizations since they have the necessary expertise in conducting scientific research. The uniqueness of the Swedish system, however, (aside from its ability to obtain cooperation) is that the information is transformed into regulations, guidelines, and recommendations by SCBR and made useable in a continuous flow of research, evaluation, upgrading of standards, and constant attention to the goal of improving the quality of housing to coincide with consumer needs.

THE GUIDELINES, THEIR DEVELOPMENT AND APPLICATION

It has been pointed out earlier that the building guidelines, regulations, and recommendations are developed from the research results. They are based on well proven solutions. In other words, the research conducted in inhabited environments provides the information that leads to the development of guidelines. These are revised periodically based on new research information obtained from new residential environments. Once developed and approved they must be incorporated in the building design. Of course, the differences in local conditions are taken into account and the local housing boards are expected to use the guidelines as the starting point and modifying them or adding to them other building requirements as needed according to the dictates of the local housing environment. This means that the guidelines as standards can be modified when warranted by local conditions. Also, standards in excess of what is prescribed cannot be demanded. In no case, however, can the guidelines, standards, etc. be ignored. It is through this process of guidelines that the POE information is utilized and made part of the housing system.

THE POE PROCESS

Two things are clear from the POE Process Flow Chart on the following page:

1. The POE information is used through regulations and guidelines whose implementation by local housing boards presumably is mandatory.
2. This process is applicable in government constructed, government assisted, and government controlled housing only. While the POE information is available to anyone who wants to use it, the private developers and builders are apparently under no obligation to do so. However, when one considers that in Sweden less than 30%

housing is single family housing of which 97% is in the hands of private investors,* it is clear that the majority of Swedish housing is government controlled and therefore uses POE information.

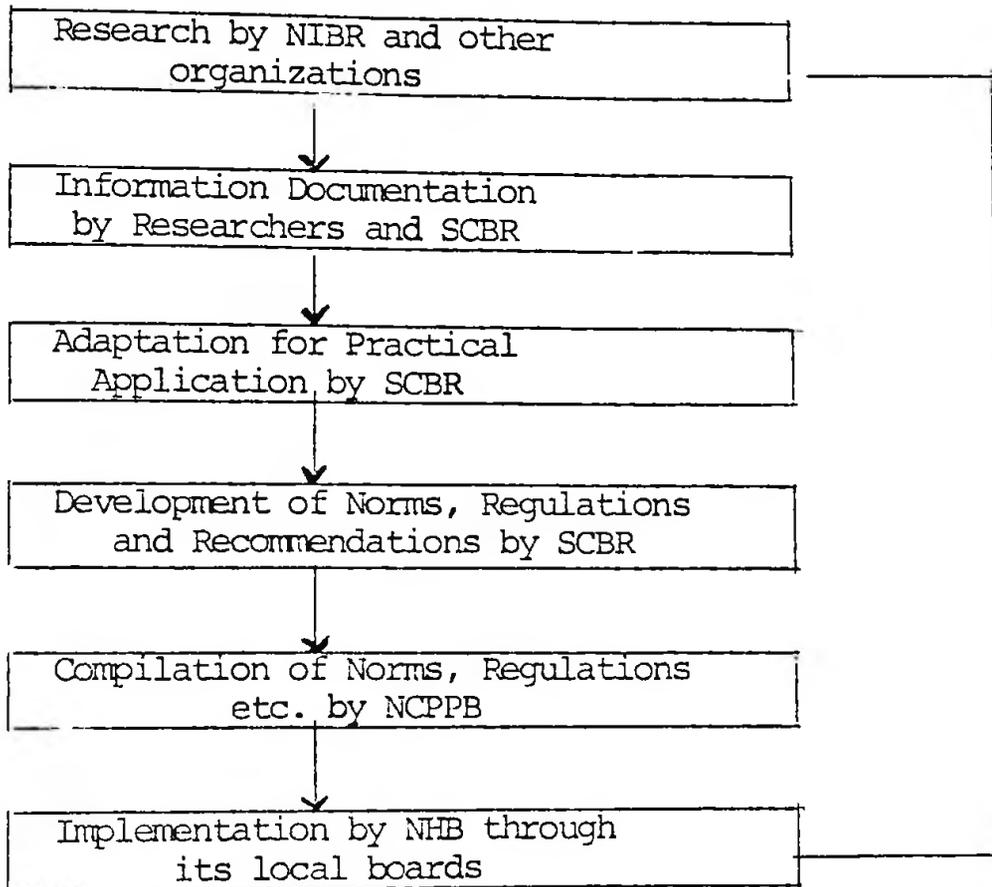


Figure II-3

POE Process Flow Chart

Part of the reason for insistence on the use of POE information is the demand by tenant's organizations to have more influence over planning of their residential environments. What they want and need is learned through POEs.

*Source, "Housing, Building and Planning in Sweden." Departmentens off Setcentral, Stockholm, 1976.

SUMMARY POINTS

1. POEs are conducted as part of an extensive building research program administered by the government.
2. POEs focus on social-behavioral aspects as well as on structural engineering and technical aspects.
3. The POE process involves the cycle of research, information documentation, adaptation of research results for application, development and collection of norms, regulations and standards, implementation, and research.
4. The entire process is controlled and directed by the Ministry of Housing and Physical Planning through five units.
5. One of these units is the Swedish Council of Building Research which is directly responsible for planning and financing of research.
6. Another of these units is the National Institute of Building Research which conducts research. This research is conducted at government level although the majority of research is conducted in academic and research institutions.
7. The majority of funding for building research comes from a .7% levy on building industry wages.
8. The research results are implemented by means of regulations and guidelines set by the SCBR.
9. It is mandatory to implement the guidelines although adjustments according to local conditions can be made.
10. The tenants and tenant organizations are involved in all phases of building research, design, and planning.
11. Since less than 30% of all Swedish housing is single family which is primarily controlled by private investors and not required to follow government set building guidelines and regulations, the majority of Swedish housing is, therefore, covered by building research and a POE system.

The Swedish Plan would suggest that all proposed building research in HUD (whether social or technical) should require not only the distribution of the results of research to pertinent professional groups, but also should designate the particular sections in HUD which would be required to study and use the results of research in fashioning new and ever improved techniques for guidance in evaluating plans as well as improving or changing former requirements which are no longer valid.

TASK IIb

Identify other Individuals and Organizations with Post Occupancy Evaluation Expertise.

1,305 examples of POEs were collected throughout the world. Analyzing these reports, 499 persons were located with expertise in conducting POEs, and 169 organizations were discovered with ability to conduct POEs. These individuals and organizations are listed in Appendix I with a description of the methods used in finding them. The list represents an up-to-date (January, 1978) compendium of people and organizations who have done POEs throughout the world.

TASK IIc

Comparative Analysis of Efficiency and Effectiveness of the Various Techniques used in Post Occupancy Evaluations.

SUMMARY

The POEs have been conducted primarily in northeastern states and California and in projects located in urban areas and communities with a population of 100,000 or more. Projects less than 15 years old were studied and with 500 or less units. The building type most favored for study was high rise, although single family had the largest share of residential units.

The majority of POEs were conducted using subjects who were not initial occupants of the study project. The subjects were generally elderly, families with or without children, whites, blacks, and low income. In general, the sample size utilized was less than 200, and the samples drawn were statistically representative.

The POEs lasted for a year or less, and were conducted within 7 years of the occupancy of the project. The reports were prepared within 1 year of the completion of the POE. Most of the reports were prepared between 1973 and 1976 and most of them were published. The most favorite methods of publication were printing and mimeographing.

The majority of POEs were conducted by university departments followed by research organizations, were sponsored by different federal government agencies, and had the general public as their audience.

The principal investigators of most of the POEs were university professors.

The results of most of the POEs were not put to any use. Most of the POEs were considered successful by the researchers who conducted them. The behaviors and variables measured by most POEs were preferences, attitudes, perceptions/images, activities, and complaints/criticisms. The favorite topics studied were internal spatial physical functional and living environment related attributes followed by social, behavioral, service and human aspects; external spatial and functional attributes and site, locational, communal, community and neighborhood related attributes.

Most of the POEs tabulated their data without any statistical analyses.

The methods of data collection used by most POEs were the structured interview, direct observation, and questionnaires, all of which have only face validity. (Appear to be valid on the surface).

The total cost of the majority of POEs was \$5,000 or less and the total man hours used were 1,000 or less. The mean cost per sample unit was \$120.6, and the mean man hours per sample unit were 19.62. The cost per hour was \$6.24. Thus, the per unit cost rate of doing POEs was expensive not

because the reimbursement rate for the investigators was high but because researchers spent too much time conducting POEs.

The total cost of POEs increased with increase in numbers of building types studied, number of behaviors studied, number of units in the sample, and man hours spent. Man hours increased with increase in number of building types, number of behaviors, number of methods, and sample size. Cost per sample unit increased with increase in number of building types, number of behaviors, and man hours. Man hours per sample unit increased with increase in number of methods and population but decreased with increase in sample size. Cost per hours increased only with increase in number of behaviors studied.

INTRODUCTION

Post occupancy evaluations of residential environments have been loosely defined as those research studies which (a. focus on lived-in residential environments of any kind, and (b. collect data from the users-occupants concerning their reactions to their living environment. This broader definition was applied to identify published or unpublished POEs of residential environments in the United States and abroad.

The POEs thus identified were compiled to form an International Bibliography on the subject. It was intended to examine these POEs to understand their general characteristics and also gain some understanding about the cost of such studies in dollars and in man hours and how these two variables related to some other characteristics such as the POE sponsor, POE principal investigator, the population types sampled, the methods employed, the building types studied and behaviors measured. This, however, proved impossible with respect to all POEs listed in the bibliography for at least four reasons.

1. The bibliography contained 1,305 references and it was impossible to examine all of them within the time limits of the existing contract with HUD.
2. There were quite a few references from foreign countries (735) and to obtain all the needed information on them would have been extremely time consuming and expensive.
3. It was not possible to find informants for some POEs, particularly the ones which were very old or whose principal investigators were deceased or could not be located. The informant in each case was necessary because the published report did not contain all the needed information and the informant is the only source for unpublished POEs.
4. Some references led to POEs which were incomplete or did not contain adequate, appropriate, and reliable information.

It was necessary, therefore, to be selective. And so, all the foreign references, with the exception of Canada, all those which lacked informants and had incomplete, inadequate, inappropriate and/or unreliable information

were excluded from the consideration. The remaining references were subjected to closer examination which revealed that the POEs can be placed into the following four broad categories.

1. Informal. The POE is informal in cases where some one looks at a residential environment, takes photographs, maybe talks to a few residents, and then writes about it without collecting any systematic data or attempting any analyses. Many articles in architectural journals or popular magazines such as "House and Home" were of this type.
2. Non Specific. The nonspecific POEs are those which do not specify any one residential area or environment. Instead, they cover several projects throughout the city, county, state, or even the country, and sometimes include large city blocks, or even full cities and suburbs. Many POEs involving national samples and geared toward an appraisal of more general community aspects are of this type.
3. Primarily nonevaluative. Even though they have to involve some kind of evaluation to qualify as a POE some studies do not have this as their primary goal. Such studies may be comparisons, or surveys of various kinds of residential environments, or experiments investigating human responses of various kinds as a function of the residential environment. In the process, they happen to have collected data that are evaluative in nature.
4. Formal. The POEs are formal if they (a. study an identified and specified residential environment, (b. collect data after the environment has been either fully or partially occupied, (c. focus on the functional attributes of the environment and on the behaviors, attitudes, reactions, etc. of the residents, (d. employ recognized methods of data collection and analyses, and (e. present the results in the form of a scientific report, published or unpublished, rather than a journalistic article.

Of these four categories the formal POEs are the ones that provide most of the adequate and appropriate information and are more worthy of consideration. The other, more informal POEs, may provide useful information but they require a considerable amount of evaluation to determine which information is useful. Even though restrictive, this definition, therefore, has been used over the broader definition given at the beginning of this report.

The information about these formal POEs was collected by means of a questionnaire. Since it was designed to obtain factual information it was called a fact sheet. A copy of the fact sheet is attached as Appendix IV. A total of 265 fact sheets were completed.

An attempt was made to provide all the information asked for in the fact sheets about each POE. However, it has not been always possible, primarily because either some information was never gathered, hence unavailable, or the respondent was other than the person who had the information but was inaccessible due to lack of knowledge of his whereabouts, or his foreign placement at the time of the study or his being deceased. The missing information was minimal and it does not seem to have affected overall results of this inquiry.

The 265 fact sheets do not necessarily represent as many residential environments. In some cases the same environment has been evaluated by several different investigators separately, sometimes by the same investigator several times. In the latter case, only one fact sheet has been prepared on the study which appears to be the most important among all of them while in the former case each study constitutes a case of separate evaluation and separate fact sheets have been prepared on each one of them. In cases where the same investigator evaluated a number of residential environments simultaneously in one study, separate fact sheets have been prepared for each of the environments studied.

PURPOSE

The overall purpose of preparing and analyzing fact sheets on POEs of residential environments was to understand some of the general characteristics of the POEs that have been conducted which would give us some idea about their positive qualities and deficiencies. This information could be used to improve the nature and quality of future POEs.

Another specific purpose is to relate cost in dollars and in man hours to selected POE variables, especially methods. This cost analysis will help us understand if cost is a restrictive factor in conducting POEs and which variables need to be controlled to make the POEs cost effective.

The results concerning these two purposes are presented in two separate parts.

PART I
GENERAL CHARACTERISTICS

LOCATION OF POES

Geographical distribution of POEs was investigated with respect to four variables, (a. urban-rural, (b. U.S.-Canada, (c. states within U. S. and Canada and (d. the size of the community. The results are presented in Tables II-3, -4, -5, and -6.

According to the data almost all (98%) POEs were conducted in residential environments located in urban areas and only 2% in rural areas. These figures should be viewed with some caution, however. The determination of the rural-urban location was made on the basis of the name of the locality given by the respondent. In some cases this name referred to a large area such as a county or SMSA which included rural areas and it was not possible to distinguish which part of this particular area was studied, i.e., whether it was truly in a heavily populated or sparsely settled section. In these cases the location was arbitrarily counted as urban. This may have inflated the proportion of urban locations.

TABLE II-3

LOCATION OF POE
Urban vs. Rural

Type of location	N	%	Adjusted %
Urban	257	97	98
Rural	6	2	2
No Answer	2	1	-
Total	265	100	100

Most of the POEs were conducted in the United States (84%) and only (16%) in Canada. However, the population of Canada is a little less than one tenth that of the U. S. while the ratio of POEs is about one to five, indicating that it is doing POEs at a rate disproportionately higher than the U. S. This also appears to be true for Norway, Sweden, and Denmark. Compared to these countries then, the U. S., despite its large number of POEs, is mounting a disproportionately lower effort.

TABLE II-4
 LOCATION OF POEs
 U.S. or Canada

Country	N	%	Adjusted %
U.S.	219	82	84
Canada	42	16	16
No Response	4	2	-
Total	265	100	100

When location of POEs in various states is examined a clear pattern emerges. Of all the states in the U. S. 21 (42%) had no POEs. Among the rest the POEs appear to be concentrated in New York (16%) and California (16%) two major states on two coasts. These two states are followed by Pennsylvania (8%), Massachusetts (7%), New Jersey (6%), and Ohio (5%). Other states individually have a share of no more than (4%), and as low as .5% of POEs. On the whole, it appears that the northeastern states have a very large proportion of POEs. With the exception of California and Ohio all other states with a comparatively large proportion of POEs are the four northeastern states and they together take a share of 37% of all POEs in the United States. This may be due to the concentration of academic institutions and the heavy population which provides more projects to evaluate.

Of the studies done in Canada more seem to be concentrated in Manitoba (36%), followed by Ontario (17%), Quebec (19%), British Columbia (14%), Alberta (12%), and Nova Scotia (2%) (see Table II-5 on following page).

The POEs have been conducted, in general, in large communities with a mean population of 749,189 based on 1970 census data. The frequency distribution presented in Table II-6 (on page 33) shows that of the POEs whose community populations are available a majority (63%) were conducted in communities with a population of over 100,000.

POE AREA OR PROJECT CHARACTERISTICS

1. Age of the Project. The data reported in Table II-7 (see page 34) indicates that the average age of the project studied is 15 years with a range of 2 to 80 years. According to Figure II-4 (see page 35) most of the projects studied are recently completed; i.e. 74% were completed from 1961 to 1975 a period of 15 years. This indicates two things. (a. The

TABLE II-5

State and Provincial Location of POEs

States	N	%	States or Provinces	N	%
U.S.					
Alabama	3	1.4	New York	36	16
Alaska	0	0	North Carolina	2	.9
Arizona	8	4	North Dakota	0	0
Arkansas	0	0	Ohio	11	5
California	35	16	Oklahoma	1	.5
Colorado	0	0	Oregon	5	2
Connecticut	3	1.4	Pennsylvania	18	8
Delaware	0	0	Puerto Rico	6	3
District of Columbia	3	1.4	Rhode Island	1	.5
Florida	4	2	South Carolina	1	.5
Georgia	7	3.2	South Dakota	0	0
Hawaii	1	.5	Tennessee	7	3.2
Idaho	0	0	Texas	5	2
Illinois	9	4	Utah	0	0
Indiana	1	.5	Vermont	0	0
Iowa	0	0	Virginia	2	.9
Kansas	1	.5	Washington	5	2
Kentucky	5	2	West Virginia	0	0
Louisiana	0	0	Wisconsin	0	0
Maine	0	0	Wyoming	0	0
Maryland	4	2			
Massachusetts	15	7	TOTAL	219	99.8
Michigan	2	.9			
Minnesota	3	1.4	CANADA *		
Mississippi	0	0	Alberta	5	12
Missouri	2	.9	British Columbia	6	14
Montana	0	0	Manitoba	15	36
Nebraska	0	0	Nova Scotia	1	2
Nevada	0	0	Ontario	7	17
New Hampshire	0	0	Quebec	8	19
New Jersey	13	6			
New Mexico	0	0	TOTAL	42	100

*Only those states or provinces have been listed which have some POEs.

investigators are interested in conducting POEs in recently completed residential environments and (b. that POE activity has increased in recent years.

TABLE II-6

LOCATION OF POE BY SIZE OF COMMUNITY

Community Size	N	%	Adjusted	
			N	%
5,000 and under	16	6	16	7
5,001 - 50,000	46	17	46	20
50,001 - 100,000	24	9	24	10
100,001 - 250,000	27	10	27	12
250,001 - 500,000	30	11	30	13
500,00 -1,000,000	57	22	57	24
Over 1 Million	34	13	34	14
Size Unknown	7	3	-	-
No Response	24	9	-	-
TOTAL	265	100	234	100

Mean Size of Community 749,189

Range 50 - 7,605,000

2. Size of the Project. The mean size of the project in terms of the number of housing units is 841 with a range of 9 to 30,878 according to Table II-8 (see page 26). A majority (81%) of the POEs were conducted in moderate size projects of less than 500 housing units (average size, 841 units). A note should be made of the lower and upper range of project size. The lower range of 9 is derived entirely from empirical data reported. Some reporting error may be present but this is difficult to estimate. The upper range of 30,878 is very large indicating that some of the residential environments studied were not individual projects but entire communities. The

TABLE II-7
AGE OF PROJECTS STUDIED

Age Interval In - Years	N	%
1 - 5	28	21
6 - 10	37	28
11 - 15	31	23
16 - 20	8	6
21 - 25	9	7
26 - 30	7	5
31 - 35	2	1.5
36 - 40	1	.8
41 - 45	0	0
46 - 50	2	1.5
51 - 55	1	.8
56 - 60	0	0
61 - 65	4	3
66 - 70	1	.8
71 - 75	1	.8
76 - 80	1	.8
TOTAL	133	100
NO ANSWER	132	50

$\bar{X} = 15$

Range = 2 - 80 years

frequencies associated with these extremes are small and the overall results do not seem to be affected by them.

3. Types of Buildings. The residential buildings studied were classified according to their reported physical design. A total of 11 different types were studied: single family, duplex, row/town houses, garden apartments, low rise, high rise, mobile homes, dormitories, squatters, domes, and halfway houses. While the first eight types seem to be easily defined the last three types may need an explanation. Squatters refers to those settlements created by people who appropriated land and put up a shelter. Squatter settlements are usually single family dwellings, but these are not necessarily on easily separated lots. Domes refer to dome type experimental structures at the University of California which were built and occupied by students as apartments. Halfway houses are primarily large single family homes converted for group living by delinquents or mental patients. Table II-9

FREQUENCY OF POE

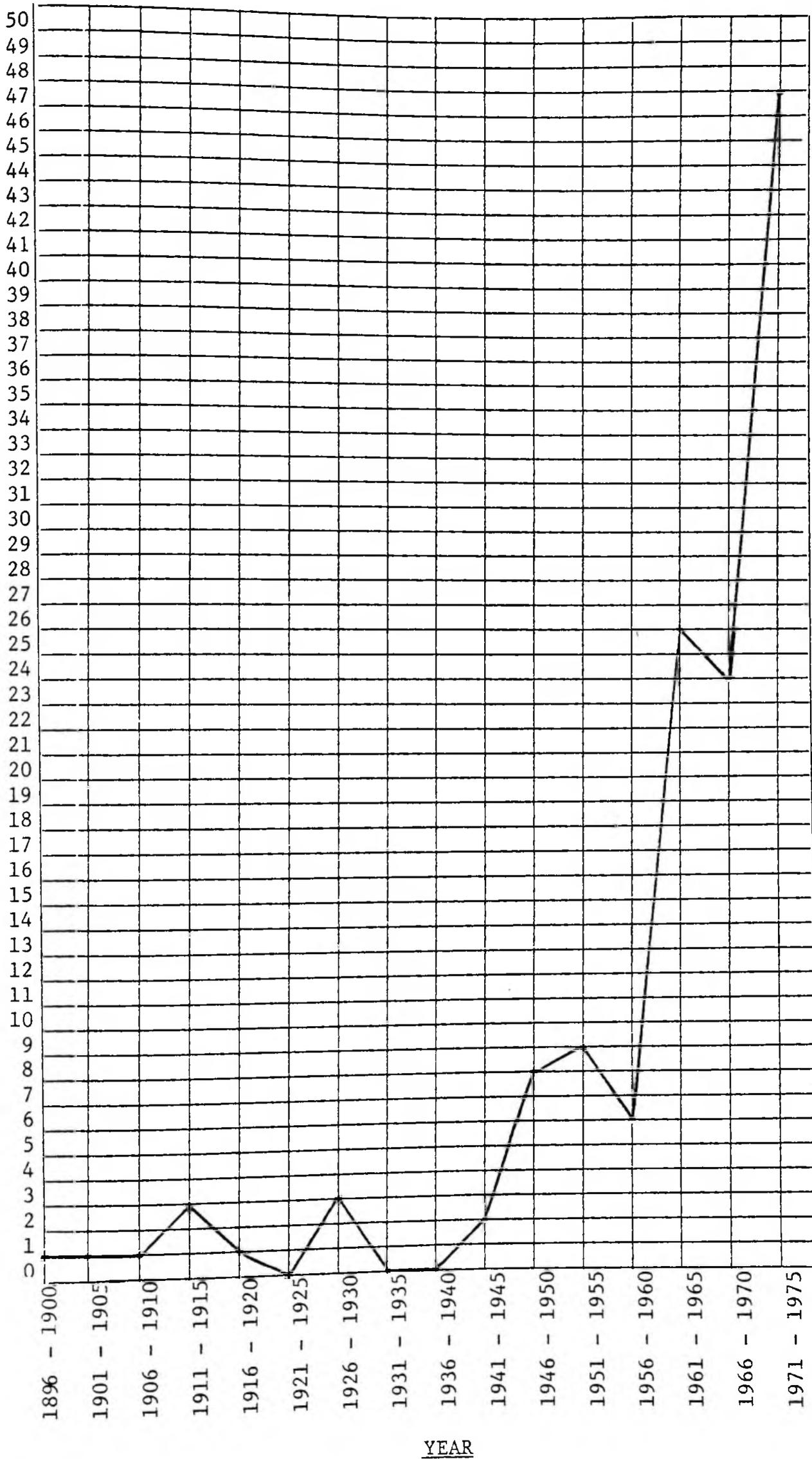


Figure II-4
Year construction completed of the Projects Studied

TABLE II-8
SIZE OF THE PROJECT

Project Size	POES			
	No. of Units	N	%	Adjusted %
100 and under	90	34	36	
101 - 500	111	42	45	
501 - 1,000	16	6	6	
1,001 - 2,000	8	3	3	
2,001 - 3,000	9	3	4	
3,001 - 4,000	1	.4	.4	
4,001 - 5,000	3	1	1	
5,001 - 6,000	2	.8	.8	
6,001 - 7,000	1	.4	.4	
7,001 - 8,000	2	.8	.8	
8,001 - 9,000	1	.4	.4	
9,001 - 10,000	2	.8	.8	
Over 10,000	2	.8	.9	
No Answer	18	7		
TOTAL	247	100.4	99.4	

$\bar{X} = 841$

Range = 9 to 30,878

(see page 37) presents the number of units within a building type studied and the proportion of owner to rental units. It is possible that some overlap may have occurred between row houses and town houses. The researchers had to operate on the word of the subjects reporting data. Therefore, row houses and town houses were combined to avoid possible overlapping.

It appears that high rise (32%) followed by low rise (23%), single family (22%), row and town houses (21%), and garden apartments (14%) are the

TABLE II-9
BUILDING TYPES STUDIED

BUILDING TYPE	POE'S		Total Units		Units with Rental Information N	Rental Units		Proportion of rental units* %
	N	%	N	%		N	%	
Single Family	59	22	76468	37	74443	1774	2	2
Duplex	17	6	2364	1	1564	939	1	60
Row/Town House	56	21	33311	16	23335	14534	15	62
Garden Apts.	37	14	31049	15	31049	31049	33	100
Low Rise	60	23	14854	7	14854	11016	12	74
High Rise	84	32	28840	14	28590	28137	30	98
Mobile Homes	6	2	1500	.7	1091	732	.8	67
Dormitories	14	5	6117	3	6117	6117	6	100
Squatters	5	2	75	.04	0	0	0	0
Domes	1	.4	14	.01	14	14	.01	100
Halfway Houses	3	1	85	.04	0	0	0	0
Unknown	9	3	13845	7	-	-	-	-
TOTAL	-	-	208522	100.8	181057	94312	99.81	52

*This ratio is based on information from only those POEs which have reported both the total numbers and the number of rentals within them.

building types favored as study sites over other types by the evaluators. This preference does not seem to be related to the number of units in a building type. Single family (37%) claims the largest share of units followed by row/town houses (16%), garden apartments (15%), high rise (14%), and low rise (7%). Thus, even though single family units constitute the largest proportion of residential units studied, they are not the most often studied. In contrast, while high rise assumed the fourth position in its share of residential units, it is the most evaluated building type.

So far as the number of rental units is concerned, garden apartments (33%) top the list followed by high rise (30%), row/town houses (15%), and low rise (12%). Other building types have an insignificant number of rental units. This is not surprising in view of the fact that garden apartments and high rise are primarily rental buildings which constitute 63% of all rental units, and other building types are primarily for sale with the possible exception of low rise.

Which building types are primarily rental can be further understood by the examination of the ratio of rental to total number of units within each building type. Garden apartments, dormitories and domes are 100% rental followed by high rise (98% rental), low rise (74% rental), mobile homes (67% rental), row/town houses (62% rental), and duplexes (60% rental). Single family has only 2% rental. Perhaps, because it is built primarily for ownership. No rental information is available for squatters, nor is any information available on halfway houses. These proportions are not surprising and seem consistent with the primary rental or sale purpose of the building.

In summary, it may be said that high rise buildings are the subject of the largest number of POEs, although single family has the largest share of residential units. With the exception of single family which has an insignificant proportion of rental units, most building types studied have a very large proportion of rental units with garden apartments, dormitories, and domes being almost completely rental.

4. Combination of Building Types. Many POEs studied a number of different building types simultaneously. A total of 39 different building combinations occurred, which are presented in Table II-10 (see Table II-10 on following page). The frequency of POEs associated with most building type combinations are very low and do not suggest preference of some combination over another. All building types were studied by some POEs alone without any combination with other building types. 79% of all POEs were of a single building type only. Table II-11 shows the largest proportion focused on high rise (26%) followed by row/town houses (15%), low rise (11%), single family (10%), and garden apartments (7%). Duplex (1%), mobile home (1%), dormitories (5%), dome (4%), and halfway houses (1%) were also studied exclusively but their proportions are very low (see Table II-11 on page 40).

In summary, it may be said that most POEs were conducted in one building type exclusively. A large variety of building type combinations were studied but no particular combinations seem to occur more frequently than others.

TABLE II-10
COMBINATION OF BUILDING TYPES STUDIED

Building Type Combinations	N	%	Adjusted %
Single Family	26	10	10
Single Family - Duplex	2	.8	.8
Single Family - Duplex - Row/Town - Garden	1	.4	.4
Single Family - Duplex - Garden	1	.4	.4
Single Family - Duplex - Garden - Mobile - Dorms	1	.4	.4
Single - Duplex - Low	2	.8	.8
Single - Duplex - Low - High	4	1.5	1.6
Single - Row/Town	1	.4	.4
Single - Row/Town - Garden	5	2	2
Single - Row/Town - Low	1	.4	.4
Single - Row/Town - Low - ?	1	.4	.4
Single - Garden	1	.4	.4
Single - Garden - Low	1	.4	.4
Single - Garden - Low - High	1	.4	.4
Single - Garden - High	1	.4	.4
Single - Garden - Mobile	1	.4	.4
Single - Low	7	3	3
Single - Low - Mobile	1	.4	.4
Single - High	1	.4	.4
Duplex	3	1	1
Duplex - Garden - Low	1	.4	.4
Duplex - Low	1	.4	.4
Duplex - Low - High	1	.4	.4
Row	39	15	15
Row - Garden	1	.4	.4
Row - Low - High - Dorms	1	.4	.4
Row - High	4	1.5	1.5
Garden	19	7	7
Garden - Low - High	1	.4	.4
Garden - High	2	.8	.8
Low Rise	30	11	12
Low - High	2	.8	.8
Low - High - ?	1	.4	.4
Low - Squatters	5	2	2
High Rise	65	24	26
Mobile Homes	3	1	1
Dormitories	12	4.5	5
Domes	1	.4	.4
Halfway Houses	3	1	1
Unknown	11	4.5	-
TOTAL	265	100.6	99.7

TABLE II-11

NO. OF BUILDING TYPES STUDIED

No. of Building Types	No.	%	Adjusted %
1	201	76	79
2	27	10.2	11
3	17	6.4	7
4	8	3	3
5	1	.4	.4
No Answer	11	4	-
TOTAL	265	100	100.4

EVALUATION SUBJECTS AND POPULATION

1. Subjects' Tenancy. It was attempted to determine if the subjects from whom POE data were collected were the initial occupants in the residential environment. If they were, it would mean that the POE was conducted soon after the residential environment was completed and the results reflect the early reactions of occupants to a new living environment whose characteristics have likely not changed over time. Data reported in Table II-12 indicated that the majority of POEs (74%) were conducted using subjects who were not the first tenants of the study environment. This suggests several things. (a. Most POEs were conducted after the living environment had been occupied for such a long time that it allowed population turnover, (b. These environments during the period of their completion and the start of POE may have undergone such changes that they may not represent the original design or occupancy intentions, and (c. The data obtained could represent those reactions of subjects which are influenced both by the original environmental qualities incorporated by the designer and the ones that were added by the previous tenants. Sometimes tenants themselves bring about changes by painting, adding closets, etc.

TABLE II-12
SUBJECTS' TENANCY

Ss Initial Occupants	N	%	Adjusted %
Yes	67	25	26
No	195	74	74
No Answer	3	1	-
TOTAL	265	100	100

2. Populations studied. Table II-13 presents the frequency of kinds of populations studied by POEs. Five specific, plus one miscellaneous, categories of populations have been considered. Since not every POE researcher indicated all the population types studied, and since it is not known how many POEs did not report which population types, the frequency and the proportions presented in Table II-13 may not be truly representative of all POEs. 18% did not specify any population category other than "residents/tenants."

The data show that 53% of the POEs studied elderly populations and 4% concentrated only on children or teenagers. Since no question about specific ages of the populations was asked, it is not known how many studies specifically concentrated in the ages above teens but non-elderly (under 65 years) population. However, it appears that this number would be large if the marital status of the population is used as a guide. It can be reasonably speculated that most married adults and families with children would fall within the above teen and below elderly population. The proportions of POEs in which these population groups were studied are 64% and 53% respectively. There are certainly overlaps since many families with children are also counted with adult married. The proportions nonetheless show that over half of all POEs concentrated on the middle-aged population group. This also indicates that a fairly large proportion of studies, over 50% of them, studied married families both with and without children. Adult singles were studied by 61% of the POEs. This population group includes elderly, most of whom are single. If the elderly are excluded, it would appear that the POEs studying only single adults is very small although it is impossible to indicate a specific proportion.

Handicapped populations were studied by 13% of POEs.

TABLE II-13
POPULATIONS STUDIED

POPULATION TYPES	N	%
1. Age		
Elderly	141	53
Children & Teenagers	11	4
2. Married Status		
Adult Married	169	64
Adult Single	162	61
Families with Children	141	53
3. Special Groups		
Handicapped	35	13
4. Color and Ethnic Origin		
Black	135	51
Caucasian	198	75
Mexican-American	22	8
Hawaiian	1	.4
American-Indian	4	1.5
Chinese-Oriental	2	.8
Jews	17	6
Puerto Rican	8	3
5. Income		
High	75	28
Middle	140	53
Low	177	67
6. Miscellaneous		
Architects	25	9
Students	15	6
Staff	31	12
Residents/Tenants	48	18
Mailmen	2	.8
Enlisted Men	2	.8
7. No Answer	3	1

Eight different ethnic groups were studied. Caucasians were studied by most POEs (75%), followed by blacks (51%), Mexican-Americans (8%), Jews (6%), Puerto-Ricans (3%), American-Indians (1.5%), Chinese-Oriental (.8%), and Hawaiian (.4%). Judged against the proportion of ethnic groups in the general population it appears that blacks are studied proportionately more than any other group. Although specific data are not available, based upon what the respondents told about the general characteristics of the environment studied, the reason for the great number of studies done on blacks may be due to the use of POE in many public housing projects which are often primarily inhabited by blacks.

When income is considered, most POEs (67%) studied low income people followed by middle income (53%), and high income (28%). In comparison to their proportion in the general population, the higher proportion of low income people may be due to the study of public housing projects which have only low income populations.

The miscellaneous category includes a variety of people on whom POE data were collected. The largest population of POEs (18%) in this category mentions only residents/tenants which reflects that this many researchers did not specify the population group and could not be placed in any other category. Among others 12% studied the building staff, 9% focused on the building architect, and 6% reported to have studied students. Mailmen and enlisted men were studied by .8% POEs which were conducted in environments inhabited by people in the armed forces and which focused on mail delivery. These professions represent special population groups.

Most POEs studied two or more kinds of populations. Only 34% of the POEs restricted themselves to only one population type. For example, most would study a combination of blacks, elderly, families, etc. rather than just blacks or just elderly. The population type spread is presented in Table II-14 on the following page.

3. Sample. The sample is a representative selection from the total number of housing units within a given residential environment. In many cases, although not always, this number was the same as the number of people from whom the data were obtained, in which case one respondent represented one residential unit studied. The data on sample sizes are given in Table II-15. The majority of POEs (84%) utilized sample sizes under 200. The mean sample size was 118.01 with a range of as low as 4 to as high as 1,000 (see Table II-15 on following page).

Most POEs (72%) attempted to draw a statistically representative sample, according to Table II-16 indicating that the results should be valid not only for the sample but also for the environment from which the sample was drawn (see Table II-16 on page 45).

TIME FACTORS IN EVALUATION

1. Evaluation Duration. Duration refers to the length of time it takes in order to finish a POE. This must be distinguished from the actual man hours put into a POE. A long duration may involve few man hours while

TABLE II-14

NUMBER OF TYPES OF POPULATIONS STUDIED

Number of Types	N	%	Adjusted %
1	34	12.8	13.0
2	4	1.5	1.5
3	22	8.3	8.4
4	27	10.2	10.3
5	22	8.3	8.4
6	33	12.5	12.6
7	28	10.6	10.7
8	30	11.3	11.5
9	23	8.7	8.8
10	35	13.2	13.4
11	4	1.5	1.5
No Answer	3	1.1	-
TOTAL	265	100.0	100.0

TABLE II-15

DISTRIBUTION OF SAMPLE SIZES

Sample Size Class Intervals	N	%	Adjusted %
1 - 50	66	25	44
51 - 100	32	12	21
101 - 200	28	11	19
201 - 300	14	5	9
301 - 400	3	1	2
401 - 500	0	0	0
501 - 600	3	1	2
601 - 700	1	.4	.7
701 - 800	2	.8	1.3
801 - 900	0	0	0
901 - 1000	1	.4	.7
No Answer	115	43	-
TOTAL	265	99.6	99.7

 $\bar{X} = 118.01$

Range 4 - 1000

NOTE: Mean based on actual scores N = 150

TABLE II-16

REPRESENTATIVENESS OF SAMPLE

Representativeness of Sample	N	%	Adjusted %
Representative	179	67	72
Non Representative	69	26	28
No Answers	17	7	-
TOTAL	265	100	100

a short duration may involve many man hours. According to the data in Table II-17 the majority of evaluations (73%) were done within a period of 1 year or less. Actually 42% of these were done in less than a year. Although the range of duration is from less than one year to 8 years with a mean of 1.7 years, the proportion of POEs lasting for two years or more is less than 8%. These data indicate that POEs in general last a year or less.

2. Duration between occupancy and assessment. Table II-18 presents the relevant data. The purpose of this analysis was to know how late after initial occupancy the POE started. Occupancy time itself can be a prolonged element. Some projects rent or sell faster than others. No precise measure was made of whether the duration began after the first unit was rented or the last. The data indicate that the range of this duration is less than 1 year to 269 years with a mean of 12 years. The mean may be inflated because of a few POEs having extremely long duration between occupancy and assessment. An examination of the adjusted proportion of POEs in Table II-18 indicates that the majority of POEs (70%) were conducted within 7 years of the initial occupancy and 29% were conducted within two years. It, therefore, appears that while a few POEs focused upon very old residential areas most of them evaluated those that were occupied seven years or fewer before the study began. Many of them were occupied only two years before. This suggests that most POEs have been conducted in recently occupied residential environments with a majority of the initial occupants present. This finding qualifies the previous report (page 41, Table II-12) that POEs were largely not conducted on initial occupants.

TABLE II-17
EVALUATION DURATION

Duration	N	%	Adjusted %
Less than 1 year	102	39	42
1 year	74	28	31
2 years	19	7	8
3 years	16	6	7
4 years	17	6	7
5 years	2	.8	.8
6 years	1	.4	.4
7 years	3	1	1
8 years	6	2	3
No Answer	25	9	-
TOTAL	265	99.2	100.2

\bar{X} = 1.7 years Range = less than 1 - 8 years

3. Duration Between Assessment and Report. An attempt was made to determine how long it took to prepare the report after the evaluation was complete. The relevant data are presented in Table II-19. Although preparation of reports took from less than one year to as long as five years, the average duration was only one year with 71% of the POEs having their reports completed in less than one year. There were 6.5% POEs without any report, of which 5% were not written because the evaluation had not been finished. Thus, almost all POEs were followed by reports which were prepared within a few months.

EVALUATION REPORT

1. Year of Report. This information tells us the years when POEs were conducted. The data are presented in Table II-20, and Figure II-5. These data indicate that the majority of POEs (64%) were conducted and their reports written within a four year duration between 1973 to 1976. Figure II-5 reveals that even though POEs had been conducted as early as 1951 their numbers remained extremely low until 1966 never exceeding 3% of the total. After this year the numbers of POEs gradually increased. 1974 is associated with the highest proportion (25%) of all POEs examined in this report. This indicates that in recent years the POE activity has increased (see Table II-20 on page 49 and Figure II-5 on page 50).

2. Publication of Report. According to data in Table II-21 of the reports that were written the majority (89%) were published (see Table II-21 on page 49).

TABLE II-18

DURATION BETWEEN OCCUPANCY AND ASSESSMENT

Duration	N	%	Adjusted %	Duration	N	%	Adjusted %
Less than 1 year	8	3	5	27 years.	1	.4	.7
1 year	22	8	14	28 years	1	.4	.7
2 years	16	6	10	38 years	1	.4	.7
3 years	14	5.3	9	41 years	1	.4	.7
4 years	10	3.8	7	44 years	1	.4	.7
5 years	9	3.4	6	53 years	1	.4	.7
6 years	23	8	15	55 years	1	.4	.7
7 years	6	2.3	4	57 years	2	.8	1
8 years	4	1.5	3	59 years	1	.4	.7
9 years	2	.8	1	65 years	1	.4	.7
10 years	2	.8	1	77 years	1	.4	.7
11 years	3	1	2	198 years	1	.4	.7
12 years	3	1	2	269 years	1	.4	.7
13 years	5	1.9	3				
15 years	1	.4	.7	Assessment Began Before Occupancy	4	1.5	-
16 years	1	.4	.7				
17 years	2	.8	1	No Answer	106	40	-
18 years	1	.4	.7				
19 years	2	.8	1				
23 years	5	1.9	3				
25 years	2	.8	1	TOTAL	265	99.4	99.5

 \bar{X} = 12 years

Range = Less than 1 - 269 years

3. Form of Publication. Nine different forms were used for publication of reports. Table II-22 shows that the most frequently used methods of publication were printed-published (26%), and mimeographed (26%), followed by journal-newspaper publication (16%), typed (15%), book or chapter publication (12%), presentation in conference (9%), theses (5%), and letter report (3%). It appears that printing or mimeographing of reports represent the standard form in which each study report is required to be presented. Very few POE reports reach professional journals or the form of book or chapters in a book. On the whole, it appears that most reports get published, and hence are theoretically not inaccessible (see Table II-22 on page 51).

ORGANIZATIONS DOING POEs

Eight different types of organizations have been identified which have conducted POEs. They and the frequency of POEs associated with them are presented in Table II-23 (see page 51). According to this table

TABLE II-19

DURATION BETWEEN ASSESSMENT AND REPORT

Time Lag	N	%	Adjusted %
Less than 1 year	164	62	71
1 year	61	23	26
2 years	3	1	1.3
3 years	2	.8	.9
4 years	0	0	0
5 years	1	.4	.4
Report Before Assessment was Complete	9	3	-
No Report	4	1.5	-
Report but no Information on Assessment Dates	9	3	-
No Report because Assessment is Continuing	12	5	-
TOTAL	265	99.7	99.6

 \bar{X} = 1. Year

Range = less than 1 - 5 years

TABLE II-20
YEAR OF REPORT

YEAR	N	%	Adjusted %
1976	24	9	10
1975	32	12	13
1974	62	23	25
1973	39	15	16
1972	9	3	3
1971	24	9	10
1970	9	3	3
1969	4	2	2
1968	2	.8	.8
1967	17	6	7
1966	2	.8	.8
1965	7	3	3
1963	4	2	2
1962	8	3	3
1959	1	.4	.4
1955	2	.8	.8
1952	2	.8	.8
1951	1	.4	.4
No Report	16	6	-
TOTAL	265	100	101

TABLE II-21
PUBLICATION OF REPORT

Published?	N	%	Adjusted %
Yes	222	84	89
No	27	10	11
No Report	16	6	-
Total	265	100	100

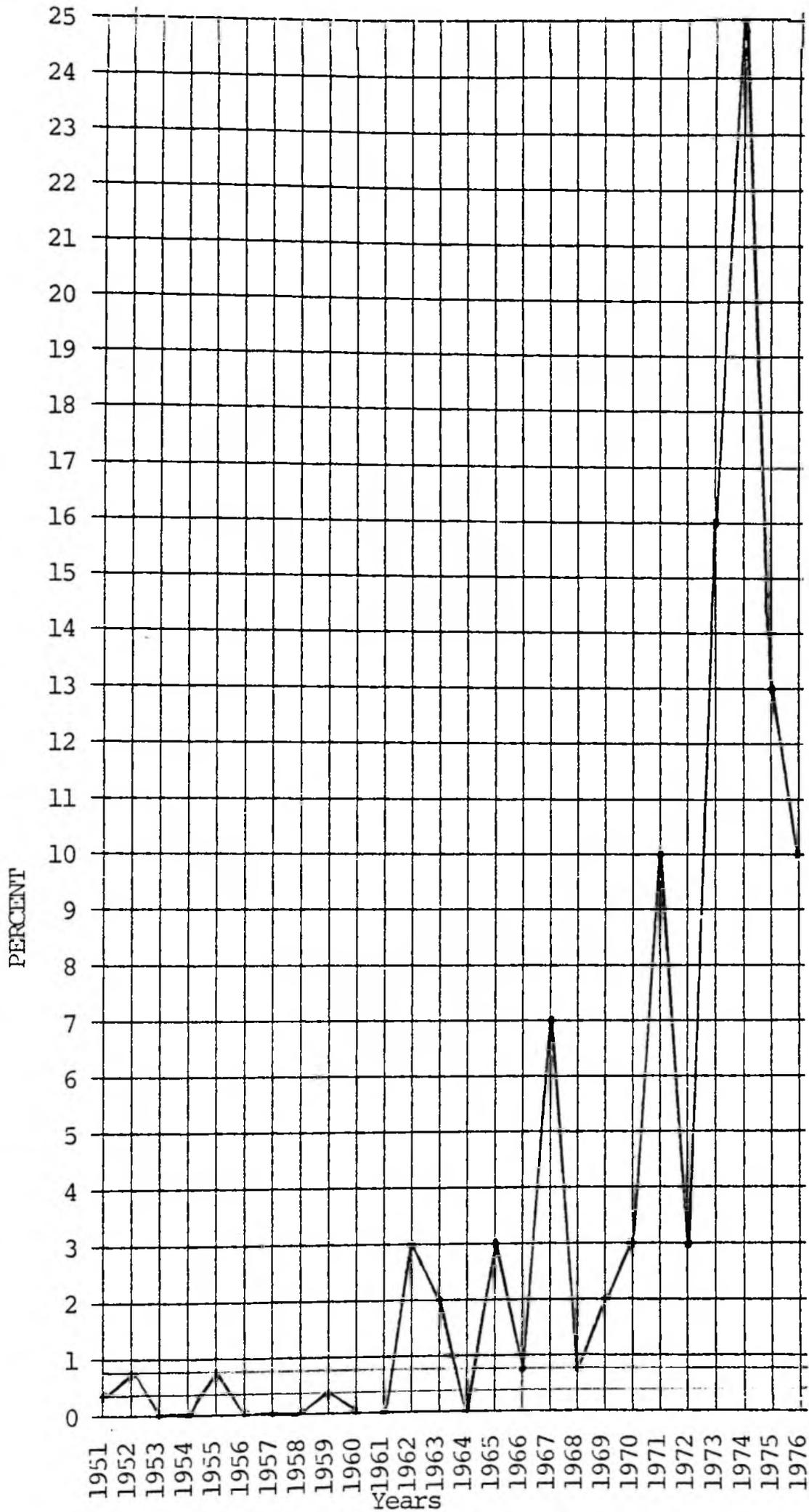


Figure II-5
Percent of Reports by Year

TABLE II-22
FORM OF PUBLICATION OF REPORTS

Form of Publicity	N	%
Printed Published Report	69	26
Mimeographed Report	70	26
Typed Report	40	15
Journal Publication, Newspaper	43	16
Book or Chapter Publication	33	12
Presented in Conferences	24	9
Thesis	13	5
Letter Report	8	3
No Answer	7	3
No Report	16	6

TABLE II-23
ORGANIZATIONS DOING POEs

Type of Organization	N	%	Adjusted %
Architect	9	3.4	4.5
City Planning	1	.4	.5
Community Organization	1	.4	.5
Federal Government Agency (NBS)	9	3.4	4.5
Hospital Research Department	1	.4	.5
Housing Organization	6	2.3	3.0
Research Organization	38	14.3	18.8
University and University Departments	137	51.7	67.9
No Answer	63	23.8	-
TOTAL	265	100.1	100.2

the majority of POEs (67.9%) were conducted by university departments, followed by research organizations (18.8%). These two together take credit for 86.7% of all POEs indicating that the contribution of other types of organizations in doing POEs is minimal.

There were 21 different university departments within which POEs were conducted. They are listed in Table II-24 according to which the largest proportion of POEs was conducted by Centers for Urban and Regional Studies (20%) followed by Institutes for Environmental Studies (16%), and Schools or Colleges of Architecture (13%), and Planning Research Centers (11%). This indicates that although a large variety of university departments are involved in doing POEs, the ones which are devoted to planning, design, environmental and urban problems are taking the lead (see Table II-24 on page 53).

ORGANIZATIONS SPONSORING POES

A total of 12 different types of organizations were identified which provided financial support for the POEs. They, together with the frequency of POEs associated with them, are listed in Table II-25. According to this table different federal government agencies (45.9%) are the major sponsor of POEs followed by the universities (18%). Other organization types have sponsored very few POEs (see Table II-25 on pages 54, 55, and 56.)

Table II-25 also lists the subtypes within each broad type of organization. The architecture category includes architects (11%), architectural firms (78%), and architectural magazines (11%) as sponsors, with architectural firms taking the lead among them. Only three different professional associations sponsored POEs which were The Agricultural Development Council (5%), The Gerontological Society (28%), The Canadian Structural Clay Association (67%) of which the last one has sponsored the most POEs. Of the two business organizations that sponsored POEs one was the International Basic Economy Corporation and the other was unnamed. Among foundations Ford (62%) sponsored the largest number of POEs, followed by Kaplan (15%), Russell (15%), and Hogg (8%). Twelve different federal government agencies had sponsored POEs of which The National Institute of Mental Health (25%) took the lead. The Central Mortgage and Housing Corporation of Canada (22.3%) followed closely. Even if this agency is excluded because it is foreign, the relative contribution of the U. S. Federal Government agencies does not change. The National Science Foundation sponsored 18% of POEs, followed by HUD with 13.4%. All others had sponsored less than 5% of the POEs. The two housing organizations that sponsored POEs were Public Housing Authorities (62%), and Model Housing Boards (38%). Five different state departments had also financed POEs of which The Departments of Community Affairs took the lead with 42% closely followed by Urban Development Corporations with 37%. Adult Parole Boards had sponsored 16% of POEs and Dormitory Authorities of the State only 5%. Two university departments, home economics (80%), and psychology (20%) were identified as sponsors of POEs. Both together sponsored only 5 (1.9%) POEs. It seems more probable that the finances were provided by the university to their departments to conduct POEs and actually all the POEs mentioned as sponsored by these two departments should be included in the category of university.

TABLE II-24
UNIVERSITY DEPARTMENTS DOING POEs

University Departments	N	%	Adjusted %
Agricultural Experiment Station	1	.7	.7
Architecture Research	4	3	3
Center for Continuing Education	2	1	1.5
Center for Planning and Development Research	1	.7	.7
Center for Urban and Regional Studies	27	20	20
College of Environmental Design	1	.7	.7
College of Home Economics	4	3	3
Department of City and Regional Planning	4	3	3
Department of Design and Environmental Analysis	8	6	6
Department of Psychology	3	2	2
Department of Sociology	5	4	4
Energy Engineering Department	2	1	1.5
Environmental Psychology Program	6	4	4
Housing Research and Development, Housing Research Center	4	3	3
Institute for Environmental Studies	21	16	16
Planning Research Center	15	11	11
Polytechnic Institute	3	2	2
School of Business Administration	1	.7	.7
School of Design - Community Development Group	1	.7	.7
School or College of Architecture	18	13	13
Youth Development Center	4	3	3
Department not Known	2	1	-
TOTAL	137	99.5	99.5

TABLE II-25

ORGANIZATIONS SPONSORING POEs

Types of Organizations	Sub Type		Major Type		
	N	%	N	%	Adjusted %
Architecture					
Architects	1	11			
Architectural Firms	7	78			
Architectural Magazine	1	11			
Total	9	100	9	3.4	3.7
Associations					
Agricultural Development Council	1	5			
Gerontological Society	6	28			
Canadian Structural Clay Association	14	67			
Total	21	100	21	8.0	8.6
Building Contractor	1	100	1	.4	.4
Business Organization					
(No name)	1	50			
International Basic Economy Corporation	1	50			
Total	2	100	.2	.8	.8
City Planning Department	4	100	4	1.5	1.5
Foundations					
Ford	8	62			
Hogg	1	8			
Kaplan	2	15			
Russell Sage	2	15			
Total	13	100	13	4.9	5.3

(Continued on next page)

TABLE II-25 (Continued)
ORGANIZATIONS SPONSORING POEs

Types of Organizations	Sub Type		Major Type		
	N	%	N	%	Adjusted %
Government Agency					
Agriculture Department	4	3.6			
Army Corps of Engineers	1	1			
CMHC Canada	25	22.3			
HEW	6	5			
NIH	1	1			
NIMH	28	25			
PHS	4	3.6			
HUD	15	13.4			
NBS	1	1			
NEA	6	5			
NSF	20	18			
Office of Education	1	1			
Total	112	99.9	112	42.3	45.9
Housing Organizations					
Public Housing Authority	8	62			
Housing Board *	5	38			
Total	13	100	13	4.9	5.3
Research Organizations	1	100	1	.4	.4
State Government Department					
Adult Parole Board	3	16			
Department of Community Affairs	8	42			
Dormitory Authority of the State	1	5			
Urban Development Corp.	7	37			
Total	19	100	19	7.2	7.8
University	44	100	44	16.6	18.0

*Canadian designation of housing authority

(Continued on next page)

TABLE II-25 (Continued)
ORGANIZATIONS SPONSORING POES

Types of Organizations	Sub Type		Major Type		
	N	%	N	%	Adjusted %
University Departments					
Home Economics	4	80			
Psychology	1	20			
Total	5	100	5	1.9	2.0
No Sponsor	-	-	21	7.9	-
Total	-	-	265	100.8	99.9

It should also be noted that 7.9% were not sponsored by anyone. These were conducted by students as part of their university degree programs.

CLIENT

Clients refers to those organizations and individuals who commissioned the POE and paid for it. Because of the financial support factor many respondents confused the sponsor with the client. The sponsor was that organization which paid for the study but did not initiate it. Many studies did not have any client. They were done by curious researchers and funded by various federal government agencies. Because of these confusions, the data concerning clients are a partial duplication of data for sponsors and not reliable. The client characteristics of POEs, therefore, are not analyzed and discussed here.

PRINCIPAL INVESTIGATOR

Six broad categories of principal investigators have been identified. Table II-26 presents the data regarding the population of POEs conducted by each category of principal investigator. According to this table most POEs were conducted by university professors (61.6%) followed by university students (17.1%). These two categories together suggest that 78.6% principal investigators are from the universities. This is not surprising in view of the fact that most POEs have been reported to have been done by the universities and university departments (see Table II-23). Researchers have conducted 15.6% POEs and architects had a share of 4.9% POEs. Planners and

psychologists had only .4% each. It appears from these data that the POEs are largely based in the universities.

TABLE II-26
PRINCIPAL INVESTIGATOR

Type	N	%	Adjusted %
Architect	13	4.9	4.9
Planner	1	.4	.4
Professor	162	61.1	61.6
Psychiatrist	1	.4	.4
Researcher	41	15.5	15.6
Student	45	17.0	17.1
No Answer	2	.8	-
Total	265	100.1	100.0

BEHAVIOR AND OTHER VARIABLES MEASURED

Table II-27 lists a total of 16 behaviors and other variables measured and the frequencies of POEs associated with them. Of these the ones measured by most POEs are preferences (86%), attitudes (80%), perceptions/images (73%), activities (60%), complaints/criticisms (54.1%), satisfaction/contentment (21%), and demographic and census data (9%). All others were measured by 4% or less POEs. Thus, although the variety of behaviors and variables measured is large only 5 of them have been focused upon by over half of the POEs (see Table II-27 on following page).

Except for a few (2.6%) all other POEs measured more than one behavior or variable. The relevant data are presented in Table II-28. It appears from this table that 3 behavior-variable combinations were the most frequently used (34.3%). The mean number of behavior-variables measured was 3.9 with a range of 1 to 7 (see Table II-28 on following page).

AUDIENCES

The POEs were conducted and reports written for a variety of audiences. A total of 24 different types have been identified which are listed in Table II-29 together with the proportion of POEs associated with them. According to this table the largest proportion of POEs (61%) are addressed to the public in general, followed by government agency (43%), paying client (23%), professional colleagues (20%), architects (15%), builders/

TABLE II-27
BEHAVIORS AND OTHER VARIABLES MEASURED

	No. of POEs	%
Preferences	229	86
Perception/Image	194	73
Activities	158	60
Attitudes	211	80
Complaints/Criticism	143	54
Archival Data	10	4
Demographic and Census Data	25	9
Feelings	3	1
Expectations	2	.8
Motivations	1	.4
Satisfaction/Contentment	55	21
Use of Home/Space	7	3
Wishes	1	.4
Needs	3	1
Social Interaction	1	.4
Family Relations	2	.8
No Answer	1	.4

TABLE II-28
NUMBER OF BEHAVIOR - VARIABLES MEASURED

No. of Combinations	N	%	Adjusted %
1	7	2.6	2.6
2	27	10.2	10.2
3	91	34.3	34.3
4	38	14.3	14.3
5	62	23.4	23.4
6	35	13.2	13.2
7	5	1.9	1.9
TOTAL	265	99.9	99.9

developers (12%), and funding agencies (9%). All other mentioned audiences had a proportion of less than 3% and probably represent special cases rather than a trend. The fact that most POEs see public-at-large as their audience seems to suggest that the people doing POEs do not consider it to be just an academic exercise and feel that the general public could also benefit from them and ought to know about them.

TABLE II-29

AUDIENCES

Audience Type	N	%
Paying Client	61	23
Public-at-Large	162	61
Government Agency	114	43
Private Agency	5	2
Thesis Committee	7	3
Own Use	3	1
Housing Authority	17	6
Building Manager	19	7
Professional Colleagues	52	20
Architects	40	15
Agency Dealing with Handicapped	1	.4
University Housing Office	2	.8
Funding Agency/University	25	9
City Planning Department	5	2
University/University Department Architecture	7	3
Builders/Developers	33	12
Dean of Students at University	8	3
University Class	1	.4
Students	2	.8
Housing Industry	2	.8
Housing Professionals	2	.8
Building Commission/Hi-Rise	2	.8
World Health Organization	1	.4
Old People/Subjects Themselves	1	.4

USE OF EVALUATION RESULTS

The effort, time, and other resources spent in doing POEs are entirely lost if the results are not going to be put to use. So it was intended to find out what, if any, use was made of POE results and the outcome was not

TABLE II-30
USE OF POE RESULTS

Type of Use	N	%
Accepted, No Action	129	49
Rejected	1	.4
Applied to New Buildings	36	14
Applied to Changing Existing Buildings	21	8
Incorporated within System	20	8
Development of Research Methods	2	.8
Nothing	18	7
Pending Decision	4	1.5
Provide Guidance to Developers	4	1.5
Keep up-to-date Guidelines	5	2
Evaluation of other Developments	7	3
Applied to Transfer and Use Test	4	1.5
Convince Future Clients	3	1
Don't Know	14	5
Dessiminated	4	1.5
Incorporated into Annual Report	3	1
Plan Relocation Activities	2	.8
Prepare Housing Assistance Plan for Community Development	1	.4
Renew New Building Proposals	4	1.5
Planning Design	1	.4
Used in Next Research	2	.8
No Answer	51	19

very encouraging. According to Table II-30 almost half (49%) POE results were accepted by persons or client without any action being taken about it, 5% did not know what happened. In only 14% cases were the results reported as applied to a new building, in 8% of the cases they were incorporated into the systems. These data indicate that in general, the POE results are not usually put to any worthwhile use (see Table II-30 on page 60).

TOPICS COVERED

A wide variety of topics were covered by POEs. These topics refer to the variables that were specifically measured and studied in order to evaluate the residential environment. Because of their large number they are presented together with the frequency of the POEs associated with them in Appendix V. All the topics covered have been divided into 12 broad categories. They, and the frequency with which they have been studied are shown in Table II-31. The most favorite topic appears to be the internal, spatial, physical, functional, and living environment related attributes of housing which have been studied by 89% of POEs. This is followed by social, behavioral, service, and human aspects (78%), external spatial and functional attributes (72%), and site, locational, communal, community, and neighborhood related attributes, (71%). The percentages with which other topics have been studied are less than 39% and some are as low as 9% and 3%. In order for POEs to be useful they need to focus upon how the residential environments function from many different perspectives. This seems to have been accomplished when we consider the topics that have claimed the largest proportion of POEs.

TABLE II-31

TOPICS COVERED

Topics Covered	N	%
Cost and Time Factors	103	39
Design and Planning Related to Need and Life Style	35	13
External Spatial and Functional Attributes	191	72
Health, Mental and Physical	9	3
Housing, Building Type	34	13
Internal, Spatial, Physical, Functional, and Living Environment Related Attributes of Housing	236	89
Maintenance	83	31
Management, Policy, and Administration Related Attributes	23	9
Safety and Security	92	35
Site, Locational, Communal, Community, and Neighborhood Related Attributes	189	71
Social, Behavioral, Service and Human Aspects	207	78
Specific Building Areas	43	16

DATA ANALYSIS

The data reported in Table II-32 indicate that eight different methods of data analyses were utilized, among which the one used by most POEs (65%) was tabulation without statistical analyses. In only 25% of the cases parametric and in 31% cases non-parametric statistics were used. In 19% of the POEs only subjective impressions were provided. This indicates that the POEs in general have not relied upon sophisticated data analysis techniques and descriptive reporting in the form of tables has usually been used.

TABLE II-32

METHODS OF DATA ANALYSES

Methods	N	%
Subjective	50	19
Statistical, Parametric	66	25
Statistical, Non-Parametric	82	31
Tabulation without Statistics	173	65
Content Analyses	2	.8
Architectural Diagnosis	1	.4
Photographic Assessment	1	.4
None	1	.4
Gutman's Multiple Scales	2	.8
No Answer	2	.8

SUCCESS OF POEs

From the viewpoint of the person giving information for the POEs who usually was the principal investigator, most of the POEs (97%) were successful. (See Table II-33) Only 2% were neutral and only 1% were reported to be unsuccessful. These data indicate what the respondent thought. It seems that different respondents interpreted this question differently. Some took success to mean the project was done on time and within budget limitations, others found it successful if it achieved the goals it set out to achieve, or were able to collect the data intended. Surely, there were other interpretations, as well. Our interest was in determining if the POE was successful in affecting the housing design quality in any way. Because of the differences in interpretation of the questions the results do not provide the information sought.

TABLE II-33

SUCCESS OF ASSESSMENT

Success Level	N	%	Adjusted %
Successful	237	89	97
Neutral	4	1.5	2
Unsuccessful	3	1	1
No Answer	21	8	-
TOTAL	265	99.5	100

PART II
METHODS AND COST ANALYSIS

METHODS ANALYSES

1. Types of Methods. A large variety of methods of data collection were used, 28 to be specific. According to Table II-34 the method used by most POEs was the structured interview (76%), followed by direct observation (55%), and questionnaire (50%). All other methods were used in less than 39%, cases. Some by only 1 (.4%) POE. It should be noted here that many respondents treated questionnaire and structured interview as the same and used this latter term to describe both methods. This may have been responsible for a larger proportion of POEs using structured interviews in comparison to those using questionnaires. Actually, the two are separate methods. A structured interview is much like a conversation where the interviewer has certain questions in mind and may or may not record the answers. A questionnaire is a sheet of paper with specific questions printed on it. These questions may be answered directly on the sheet or through the interviewer.

The data indicate that although there are a variety of methods in use the concentration seems to be on only three methods, structured interview, direct observation, and questionnaire.

2. Combination of Methods. With 28 different methods in use the possible number of combinations of methods used in POEs could be astronomical. However, only 69 combinations have been used. When we examine the data in Table II-35 it appears that the combination of methods used by most POEs was Audiovisual/Camera - Structured Interview - Maps/Site Plans - Indirect Observation - Questionnaire, (17%), followed by structured interview alone (15%), questionnaire alone (10%), structured interview - rating scales (10%), behavior/cognitive mapping - structured interview - medical examination - direct observation - rating scales - site visit - sociometric survey (9%), and audiovisual/camera - unstructured interviews - direct observations - questionnaire (8%). All other methods whether used alone or in combination with other methods were used by 4.4% and less POEs. These proportions are small because the number of various combinations used is large. When the methods combinations with large proportions are examined it appears that the methods used by most POEs (see preceding section) are the ones that are also combined by most POEs.

3. Number of Method Combinations. Different POEs used different numbers of methods. (See Table II-36). Some used only one method (19%). The proportion of POEs using 2, (16%), 3 (15%), 4 (16%), and 5 (17%) methods were smaller. Six methods were used by 8% POEs, 7 methods by 9%, and 10 and 11 methods were used by 1 POE (.4%) each. Thus, while as many as 11 methods have been used in one POE most POEs have either used only 1 method or only 2, 3, 4, and 5 method combinations.

4. Methods Validity. It was the intent of this analysis to determine whether or not the methods used were valid. Two indices were used for this purpose.

- A. Each method used was examined to determine if it was previously standardized or not. If it was, it was assumed to be valid. According to Table II-37 no POE used exclusively standardized

TABLE II-34

METHODS USED

Methods		%
Archival Records	8	3
Audiovisual/Camera	104	39
Audiovisual/Tape	11	4
Behavior/Cognitive Mapping	59	22
Checklist	1	.4
Ecological Psychology	6	2
Floor Plan Game	10	4
Interview/Structured	202	76
Interview/Unstructured	70	26
Literature Search	5	2
Maps, Site Plan, Drawing, Mapping Furniture	38	14
Medical Examination/Medical History	17	6
Observation/Direct	146	55
Observation/Participant	34	13
Physical Cues/Traces, Cataloguing	6	2
Psychological Tests/Self Anchoring Scale	15	6
Questionnaire	133	50
Rating Scales	39	15
Records, Reports, Minutes	4	1.5
Research Diaries	4	1.5
Rittel's Technique	1	.4
Role Playing	5	2
Scenario	1	.4
Site Visit	15	6
Sociometric Survey	15	6
Time Budget	7	3
Trips	1	.4
Walk Through	1	.4
No Answer	1	.4

methods. Only 12% used both standardized and non-standardized methods. A majority of POEs (88%) used only non-standardized methods. The standardized methods used were usually psychological tests designed to measure a variety of personality, intelligence or other variables. It appears that based on this index the methods used in POEs are generally not validated. However, this may not be an appropriate index. The kinds of topics covered, variables, and behaviors measured in POEs are those which cannot be subjected to measurement by presently standardized methods.

- B. Another way to determine the POE and its methods' validity was to see whether the POE itself was evaluated for the validity of its

TABLE II-35

COMBINATION OF METHODS USED

Methods Combinations	N	%
Archival Records - Audiovisual/Camera - Behavior/ Cognitive Mapping - Interview Structured - Observation Direct - Questionnaire (6)	6	2
Archival Records - Interview Structured - Questionnaire (3)	1	.4
Archival Records - Interview Unstructured - Observation Direct - Records (4)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Behavior/Cognitive Mapping - Ecological Psychology- Floor Plan Game - Interview Structured - Interview Unstructured - Maps/Furniture Mapping - Observation Direct - Physical Cues/Traces (10)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Behavior/ Cognitive Mapping - Ecological Psychology - Interview Structured - Interview Unstructured - Literature Search - Observation Direct - Observation Participant - Questionnaire - Time Budget (11)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Behavior/ Cognitive Mapping - Interview Structured - Interview Unstructured - Observation Direct - Questionnaire (7)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Behavior/ Cognitive Mapping - Interview Structured - Observation Direct - Observation Participant - Scenario (7)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Behavior/ Cognitive Mapping - Interview Structured - Observation Direct - Psychological Tests - Questionnaire (7)	6	2
Audiovisual/Camera - Audiovisual/Tape - Interview Structured - Interview Unstructured - Observation Direct - Physical Cues/Traces (6)	1	.4
Audiovisual/Camera - Audiovisual/Tape - Observation Direct - Observation Participant - Questionnaire - Time Budget (6)	1	.4
Audiovisual/Camera - Behavior/Cognitive Mapping - Interview Structured - Interview Unstructured - Observation Direct (5)	1	.4
Audiovisual/Camera - Behavior/Cognitive Mapping - Interview Structured - Interview Unstructured - Observation Direct - Research Diaries (6)	4	1.5
Audiovisual/Camera - Behavior/Cognitive Mapping - Interview Structured - Physical Traces (4)	1	.4

(Continued on next page)

TABLE II-35 (Continued)
COMBINATION OF METHODS USED

Methods Combinations	N	%
Audiovisual/Camera - Check List - Interview Structured - Observation Direct - Trips (5)	1	.4
Audiovisual/Camera - Interview Structured (2)	1	.4
Audiovisual/Camera - Interview Structured - Interview Unstructured - Observation Direct - Observation Participant (5)	7	3
Audiovisual/Camera - Interview Structured - Interview Unstructured - Observation Direct - Observation Participant - Questionnaire - Time Budget (7)	1	.4
Audiovisual/Camera - Interview Structured - Interview Unstructured - Questionnaire (4)	1	.4
Audiovisual/Camera - Interview Structured - Maps/Site Plans - Observation Direct (4)	6	2
Audiovisual/Camera - Interview Structural - Maps/Site Plans - Observation Direct - Questionnaire (5)	30	11.3
Audiovisual/Camera - Interview Structured - Medical History - Observation Direct - Questionnaire (5)	2	.8
Audiovisual/Camera - Interview Structured - Observation Direct - Observation Participant - Questionnaire - Records (6)	1	.4
Audiovisual/Camera - Interview Structured - Questionnaire (3)	8	3
Audiovisual/Camera - Interview Structured - Walk Through (3)	1	.4
Audiovisual/Camera - Interview Unstructured - Literature Search (3)	1	.4
Audiovisual/Camera - Interview Unstructured - Observation Direct (3)	2	.8
Audiovisual/Camera - Interview Unstructured - Observation Direct - Physical Traces (4)	1	.4
Audiovisual/Camera - Interview Unstructured - Observation Direct - Questionnaire (4)	14	5
Audiovisual/Camera - Observation Direct - Observation Participant (3)	1	.4
Audiovisual/Camera - Observation Direct - Questionnaire (3)	2	.8
Audiovisual/Camera - Observation Direct - Questionnaire - Rating Scale (4)	3	1
Behavior/Cognitive Mapping - Ecological Psychology - Interview Structured - Psychological Tests - Time Budget (5)	1	.4
Behavior/Cognitive Mapping - Floor Plan Game - Interview Structured - Interview Unstructured - Observation Direct - Observation Participant (6)	5	2

(Continued on next page)

TABLE II-35 (Continued)
COMBINATION OF METHODS USED

Methods Combinations	N	%
Behavior/Cognitive Mapping - Interview Structured (2)	2	.8
Behavior/Cognitive Mapping - Interview Structured - Interview Unstructured - Observation Direct - Time Budget (5)	1	.4
Behavior/Cognitive Mapping - Interview Structured - Interview Unstructured - Observation Participant - Psychological Tests - Questionnaire (6)	1	.4
Behavior/Cognitive Mapping - Interview Structured - Literature Search - Questionnaire (4)	1	.4
Behavior/Cognitive Mapping - Interview Structured - Medical Examination - Observation Direct - Rating Scales - Site Visit - Sociometric Survey (7)	15	6
Behavior/Cognitive Mapping - Interview Structured - Observation Direct (3)	2	.8
Behavior/Cognitive Mapping - Interview Structured - Observation Direct - Questionnaire (4)	1	.4
Behavior/Cognitive Mapping - Interview Unstructured - Observation Direct - Questionnaire (4)	4	1.5
Ecological Psychology - Interview Structured - Interview Unstructured - Observation Direct - Observation Participant - Questionnaire (6)	1	.4
Ecological Psychology - Interview Structured - Maps (3)	1	.4
Ecological Psychology - Interview Structured - Observation Direct - Questionnaire (4)	1	.4
Floor Plan Game - Interview Structured (2)	1	.4
Floor Plan Game - Interview Structured - Interview Unstructured - Observation Direct - Records (5)	1	.4
Floor Plan Game - Interview Structured - Observation Direct (3)	1	.4
Interview Structured (1)	26	10
Interview Structured - Interview Unstructured (2)	3	1
Interview Structured - Interview Unstructured - Observation Direct - Observation Participant (4)	1	.4
Interview Structured - Interview Unstructured - Questionnaire (3)	8	3
Interview Structured - Observation Direct (2)	4	1.5
Interview Structured - Observation Direct - Observation Participant (3)	4	1.5
Floor Plan Game - Interview Structured - Observation Direct - Physical Cues (4)	1	.4
Interview Structured - Observation Direct Questionnaire (3)	1	.4

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TABLE II-35 (Continued)
COMBINATION OF METHODS USED

Methods Combinations	N	T
Interview Structured - Observation Direct - Questionnaire - Rittel's Technique (4)	1	.4
Interview Structured - Observation Direct - Records(3)	1	.4
Interview Structured - Observation Participant - Psychological Tests - Role Playing (4)	5	2
Interview Structured - Observation Participant - Questionnaire (3)	1	.4
Interview Structured - Psychological Tests - Questionnaire - Rating Scales (4)	1	.4
Interview Structured - Questionnaire (2)	7	3
Interview Structured - Questionnaire - Rating Scales (3)	1	.4
Interview Structured - Rating Scales (2)	19	7.2
Interview Unstructured (1)	4	1.5
Interview Unstructured - Literature Search - Observation Direct (3)	2	.8
Interview Unstructured - Questionnaire (2)	2	.8
Observation Direct - Questionnaire (2)	4	1.5
Observation Participant (1)	1	.4
Observation Participant - Questionnaire - Time Budget (3)	2	.4
Questionnaire (1)	18	7
TOTAL	265	100.0

results. If it was, then it was possible to find out whether or not the POE was found to be valid. It turned out, according to Table II-38 that 71% of the POEs were not followed up by any kind of evaluation. The remaining were evaluated by eight different methods. Except for a separate validation study, claimed by only 3% POEs, all others do not mention the validity question.

Based upon these data it would appear that validity determination by most POEs has not been made.

In conclusion, it may be said that it is not clear if many of the methods used in POEs have been independently tested for validity. More than likely the researchers have assumed validity without further testing in their use of POE methods. Some more appropriate index as a measure of validity may need to be utilized.

TABLE II-36
NUMBER OF METHODS COMBINATIONS

Number of Methods Used	N	%
1	51	19
2	43	16
3	40	15
4	41	16
5	44	17
6	20	8
7	24	9
10	1	.4
11	1	.4
TOTAL	265	100.8

TABLE II-37
METHODS STANDARDIZED

Standardized or Non-Standardized	N	%
Standardized only	0	0
Non-Standardized Only	233	88
Standardized and Non-Standardized	32	12
TOTAL	265	100

TABLE II-38

EVALUATION OF POE

Type of Evaluation	N	%
None	190	72
Review by Outside Consultant	12	5
Review by Committee	27	10
Comparison with Past Research	9	3
Separate Validation Study	7	3
Internal Validation	12	5
By Teacher	1	.4
Book Review	4	1.5
By Sponsor	1	.4
No Answer	15	6

COST FACTORS

1. Monetary Cost of POEs. One objection against doing POEs is that they are too expensive, and if this high cost of doing POEs is added to the cost of the building the total price will be unacceptable. We intended to find out just how expensive the POEs are. The data are provided in Table II-39.

According to this table the costs in dollars ranged from \$0 to \$750,000 per POE, with a mean of \$25,035.74. These figures are interesting in the sense that POEs can be conducted for no cost done mostly by students for their class theses, on the one hand and for very high cost on the other. The mean cost itself would be considered higher than most building designers, builders, and others could comfortably absorb. When we examine the cost class intervals a new fact emerges. As many as 60.6% POEs were conducted at a cost of \$5,000 or less and 45% POEs were done at a cost of only \$2,000 or less indicating that the majority of POEs have been done for only an amount which would be considered reasonable. The high mean cost obviously is due to a very high maximum range.

2. Man Hours Spent in POE. The cost of conducting POEs can also be looked at from the view point of man hours. According to the data presented in Table II-40 the range of man hours was from 5 to 240,000 with a mean of

TABLE II-39
 FREQUENCY DISTRIBUTION OF POEs by Cost

Cost Class Intervals	N	%	Adjusted %
0	18	6.8	7.8
1 - 100	12	4.5	5.2
101 - 500	51	19.2	22.1
501 - 1,000	10	3.8	4.3
1,000 - 2,000	13	4.9	5.6
2,001 - 3,000	10	3.8	4.3
3,001 - 4,000	11	4.2	4.8
4,001 - 5,000	15	5.7	6.5
5,001 - 10,000	13	4.9	5.6
10,001 - 15,000	10	3.8	4.3
15,001 - 20,000	12	4.5	5.2
20,001 - 30,000	23	8.7	10.0
30,001 - 40,000	2	.8	.9
40,001 - 50,000	5	1.9	2.2
50,001 - 100,000	17	6.4	7.4
100,001 - 200,000	2	.8	.9
200,001 - 300,000	4	1.5	1.7
Over - 300,000	3	1.1	1.3
No Answer	34	12.8	-
TOTAL	265	100.1	100.1

$\bar{X} = 25,035.74$

Range = 0 - 750,000

TABLE II-40
 FREQUENCY DISTRIBUTION OF POEs BY MAN HOURS

Man Hours Class Intervals	N	%	Adjusted %
1 - 50	25	9	14.0
51 - 100	14	5	7.9
101 - 200	23	9	12.9
201 - 300	18	7	10.1
301 - 400	27	10	15.2
401 - 500	3	1	1.7
501 - 1,000	21	8	11.8
1,001 - 2,000	17	6	9.6
2,001 - 3,000	8	3	4.5
3,001 - 4,000	3	1	1.7
4,001 - 5,000	2	.8	1.1
5,001 - 10,000	7	3	3.9
10,001 - 15,000	4	1.5	2.2
15,001 - 20,000	2	.8	1.1
20,001 - 30,000	2	.8	1.1
Over - 30,000	2	.8	1.1
No Answer	87	33	-
TOTAL	265	99.7	99.9

$X = 3391.8$

Range = 5 to 240,000

3,391.8. The very large range indicates that POEs could vary from very small in scope requiring very few man hours to very large and complicated. The mean seems quite large although it may not be quite representative because of its being influenced by a very high maximum range. An examination of data in Table II-40 indicates that 73.6% POEs needed 1,000 or less man hours, which suggests that most POEs do not require large man hours, and therefore, should not be considered very expensive in terms of this variable. A word of caution is needed here. The reported man hours may not be reliable. Most informants had to guess man hours because they had not kept any record. Also, the man hours for which the investigators were paid was often not the same as actual number of hours spent. In many cases, the actual hours far exceeded the hours recorded. It is, therefore, possible that the man hours per POE may be much higher than what the data suggest.

3. Cost per Sample Unit. Since the size of a POE depends upon the number of housing units investigated, the total cost may not be a valid measure of the true cost of POEs. Therefore, cost of POEs was also determined as a ratio of total cost to total number of residential units in the study sample. The results are reported in Table II-41. According to these results the cost per unit ranged from \$0 to \$1,035.0 with a mean of \$120.6.

4. Man Hours per Sample Unit. Since total number of man hours also depends upon the total number of units in a sample, a valid measure in this case is a ratio of man hours to number of units rather than average number of man hours per POE. The results are reported in Table II-42. Accordingly, the minimum number of man hours per sample unit was 0.2 and maximum was 131.1 with a mean of 19.62. To the builders and designers these figures may represent too high a cost of doing POEs.

5. Cost per Man Hour. The cost of doing POEs could depend upon the cost per hour of the people doing it. The data are presented in Table II-43. According to this table some investigators worked for nothing. These were students doing POEs as part of their course requirements. These cases, however, do not represent the true cost to the investigators. Among the ones who were paid for their efforts, the range was from less than a dollar to \$32.2 per man hour. This large range indicates that a variety of investigators from very inexpensive to expensive are involved in POEs. However, the average is only \$6.24 per man hour, which, in the context of of current labor rates would be considered moderate. It may, therefore, be said that while there are extremes on both sides of the scale of rate of payment, the average cost is very reasonable.

6. Concluding Remarks on Cost Factor. When these cost factors are considered together several points become apparent. The evaluation cost of \$120.6 per unit in the sample is quite high at least from the perspective of the builders and architects. This high cost may be due to the rate of payment for the investigators, for the amount of time spent in studying the units in a sample or both. Surely, other cost factors are also involved, but the personnel time and their salaries account for the largest proportion of any research budget and they can be used as a fair index of cost. The data suggest that the remuneration rate of \$6.24 per man hour is conservative in

TABLE II-41
 FREQUENCY DISTRIBUTION OF POEs BY COST PER UNIT

Class Interval	N	%	Adjusted %
0	18	6.8	11.5
1 - 10	42	15.9	26.8
11 - 25	4	1.5	2.5
26 - 50	7	2.6	4.5
51 - 100	25	9.4	15.9
101 - 150	18	6.8	11.5
151 - 200	5	1.9	3.1
201 - 300	17	6.4	10.8
301 - 400	17	6.4	10.8
Over 400	4	1.6	2.5
No Answer	108	40.8	-
TOTAL	265	100.1	99.9

Range = \$0 - 1035.0

Mean = 120.6

TABLE II-41
 FREQUENCY DISTRIBUTION OF POEs BY COST PER UNIT

Class Interval	N	%	Adjusted %
0	18	6.8	11.5
1 - 10	42	15.9	26.8
11 - 25	4	1.5	2.5
26 - 50	7	2.6	4.5
51 - 100	25	9.4	15.9
101 - 150	18	6.8	11.5
151 - 200	5	1.9	3.1
201 - 300	17	6.4	10.8
301 - 400	17	6.4	10.8
Over 400	4	1.6	2.5
No Answer	108	40.8	-
TOTAL	265	100.1	99.9

Range = \$0 - 1035.0

Mean = 120.6

TABLE II-41
 FREQUENCY DISTRIBUTION OF POEs BY COST PER UNIT

Class Interval	N	%	Adjusted %
0	18	6.8	11.5
1 - 10	42	15.9	26.8
11 - 25	4	1.5	2.5
26 - 50	7	2.6	4.5
51 - 100	25	9.4	15.9
101 - 150	18	6.8	11.5
151 - 200	5	1.9	3.1
201 - 300	17	6.4	10.8
301 - 400	17	6.4	10.8
Over 400	4	1.6	2.5
No Answer	108	40.8	-
TOTAL	265	100.1	99.9

Range = \$0 - 1035.0

Mean = 120.6

TABLE II-42

FREQUENCY DISTRIBUTION OF POEs BY MAN-HOURS PER UNIT

Man-Hours Per Unit Class Intervals	N	%	Adjusted %
0.2 - 0.9	18	7	16
1.0 - 5.9	32	12	28
6.0 - 10.9	21	8	19
11.0 - 20.9	13	5	12
21.0 - 30.9	9	3	8
31.0 - 40.9	2	.8	2
41.0 - 50.9	2	.8	2
51.0 -100.9	15	6	13
101.0 -150.9	1	.4	.8
No Answer	152	57	-
TOTAL	265	100.0	100.8

$\bar{X} = 19.62$

Range = 0.2 - 131.1

TABLE II- 43

FREQUENCY DISTRIBUTION OF POEs BY COST PER MAN-HOUR

Cost Per Man-Hour Class Intervals	N	%	Adjusted %
0	18	7	10
.1 - .9	19	7	11
1 - 5.9	73	28	41
6 -10.9	24	9	14
11 -15.9	26	10	15
16 -20.9	13	5	7
21 -25.9	3	1	2
26 -and over	1	.4	.6
No Answer	88	33	--
Total	265	100.4	100.6

$\bar{X} = 6.24$

Range = 0.0 to 32.2

comparison to current reimbursement rates, so this cannot be a prime factor in making the POE cost rate expensive. The other factor is the amount of time spent in doing POEs which, at a rate of 19.6 hours per unit is quite excessive. Thus, the inescapable conclusion is that the per unit cost rate of doing POEs is expensive, not because the reimbursement rate for the investigators is high, but because the researchers spend too much time in doing POEs. This leads to a recommendation that if POEs are to be accepted and used as part of residential building design systems, they should be so designed that they do not take too much time to execute. Since many POEs have been done within the time constraints of builders and architects, there is ample evidence that POEs can meet these time limitations. A month is not an unreasonable time to set as a flexible standard.

COST MEASURES AND SELECTED CRITICAL VARIABLES

1. Introduction. Five different cost measures have been considered. They are
 - A. Total cost in dollars (cost)
 - B. Total man hours (hours)
 - C. Cost in dollars per sample unit, (cost/units)
 - D. Man hours per sample unit, (hours/units)
 - E. Cost in dollars per man hour, (cost/hours)

The interest was in determining if these cost factors were related to certain critical variables. The following seven critical variables were selected.

- A. Number of Building Types studied (Bldg)
- B. Number of Behaviors or Variables Measured (Beh.)
- C. Number of Methods Utilized (Meth.)
- D. Number of Types of Population (Pop.)
- E. Sample Size (Samp.)
- F. Man Hours (Hours)

The relationship between different cost measures and the critical variables was determined by Pearson r .

The interest was also in determining if various cost measures were affected by the different treatments of the following selected critical variables:

- A. Organization Doing POE
- B. Organization Sponsoring POE
- C. Number of Behaviors and other Variables Measured
- D. Number of Building Types Studied
- E. Number of Methods Utilized
- F. Principal Investigator
- G. Number of Types of Population

For this purpose analysis of variance was used. It should be noted here that for analysis of variance only those treatment groups within a

variable (factor) have been utilized which have sufficiently large N to make analysis meaningful.

2. Correlation Between the Cost Measures and the Selected Variables. The results of the correlational analyses (Pearson r) are summarized in Table II-44. The cost is found significantly and positively related to the number of building types studied, number of behaviors studied, number of units studied and man hours spent, indicating that the total cost increases with an increase in these four variables. All r values are significant below the .001 level. The correlation between cost and number of methods utilized and the size of population in the units is very low and not significant at the .05 level. This suggests that an increase or decrease in the number of methods of data collection does not correspondingly increase or decrease the cost. Lack of correlation between cost and population size is not surprising because cost depends upon the sample size and not on the overall population size from which the sample is drawn.

Man hours is significantly and positively related to four remaining variables. The only variable not correlated is population size. This is not surprising because the amount of time spent depends upon the number of subjects and size of samples, not population size. Of the five significant correlations, those between hours and number of methods and hours and number of behaviors are significant at the .02 and .03 levels respectively while the other two are significant below the .001 level. These correlations indicate that man hours spent increases as the number of building types, number of behaviors, number of methods, and sample size increase.

Cost per unit in the sample is found significantly related with number of building types (below .001 level) number of behaviors (at .01 level) and man hours (below .05 level), and all these correlations are positive indicating that cost per unit increases with increase in these three variables. Cost per unit is not significantly correlated with number of methods, size of population or sample size.

When man hours per unit is examined it is found significantly related with number of methods being used (.03 level) size of population (at .05 level) and size of sample (below .01 level) of which the last correlation is negative. This suggests that man hours per unit increases with increase in number of methods and population but decreases with increase in sample size.

Cost per man hours is a measure of payment rate for the researchers and it is significantly and positively correlated at the .05 level only with number of behaviors studied. This could mean that only the more expensive researchers study larger numbers of variables.

When all the correlations are looked at together the following conclusions emerge.

- A. The rate of payment for researchers on the whole is independent of all variables except number of behaviors studied.

TABLE II-44

SUMMARY OF CORRELATIONS BETWEEN COST MEASURES AND SELECTED VARIABLES

Cost Measures		Selected Variables					
		Bldg	Beh.	Meth.	Pop.	Samp.	Housing
Cost	r	.225	.176	.034	.059	.503	.981
	N	223	231	231	229	147	173
	P	.001	.004	.301	.186	.001	.001
	Sig. .05	S	S	NS	NS	S	S
Hours	r	.310	.145	.137	.024	.668	1.000
	N	171	178	178	176	113	178
	P	.001	.026	.034	.376	.001	.001
	Sig. .05	S	S	S	NS	S	S
Cost/Units	r	.309	.169	.098	.082	-.008	.157
	N	150	157	157	155	147	118
	P	.001	.017	.109	.152	.459	.044
	Sig. .05	S	S	NS	NS	NS	S
Hours/Units	r	-.118	-.017	.177	.154	-.222	.140
	N	107	113	113	111	113	113
	P	.111	.429	.030	.053	.009	.069
	Sig. .05	NS	NS	S	S	S	NS
Cost/Hours	r	-.040	.125	.019	.012	.021	-.076
	N	170	177	177	175	112	173
	P	.300	.048	.398	.434	.411	.159
	Sig. .05	NS	S	NS	NS	NS	NS

- B. Increases in the number of behaviors studied are accompanied by increases in all cost measures except hours per sample unit.
 - C. Increase in number of methods employed is accompanied by increase in total man hours and man hours per sample unit only. It is not related to any monetary cost measure (in dollars).
 - D. On the whole population size is not related with any cost measure.
 - E. Sample size increase is accompanied by increase in total cost, and total man hours, and is accompanied by decrease in man hours per sample unit. Thus, while total man hours increase, the average man hours decrease with increase in sample size.
 - F. Increase in man hours is accompanied by increase in total cost and average cost per unit.
3. Effect of Selected Variables on Various Cost Measures : Analyses of Variance Results. In this section each of the selected variable will be treated separately and its effect on each of the five cost measures will be analyzed.

A. Organizations doing POE

The results of the effect of different organizations doing POE on the five cost measures are summarized in Table II-45.

Four types of organizations doing POEs had frequencies large enough to be considered for analysis. They were architectural organizations which included individual architects, housing organizations such as Housing Authorities, research organizations, and universities including university departments. These organizations did not have significant differential effect at .05 level on four of the five cost measures. The cost measure significantly affected was man hours per unit. Newman-Keuls test yielded results which revealed that a significant difference at the .05 level existed between research organizations, and university, and university departments, the former having spent on an average significantly more man hours per unit (30.88) than the later (6.49), (Table II-46). The other two organizations did not differ significantly with any other organization.

B. Organizations sponsoring POE

The POE sponsoring organizations which have been compared on the five cost factors are: 1.) architectural organizations including architects, 2.) professional associations, 3.) foundations, primarily charitable, 4.) various federal government agencies, 5.) housing organizations, 6.) state government agencies, and 7.) university and university departments.

The results of the analyses of variance are summarized in Table II-47. According to this table the sponsoring organizations differ

TABLE II-45

TYPE OF ORGANIZATIONS DOING POE AND COST

Cost Measure	Groups	\bar{X}	N	F	P	Sig. .05
Cost	Architectural Organizations	2,555.44	9	.592	.621	NS
	Housing Organizations	4,000.00	5			
	Research Organizations	25,514.08	35			
	Universities and University Departments	34,773.35	123			
	Total	30,308.80	172			
Hours	Architectural Organizations	491.11	9	.165	.920	NS
	Housing Organizations	640.00	5			
	Research Organizations	1,725.85	14			
	Universities and University Departments	4,381.45	96			
	Total	3,648.40	124			
Cost/Unit	Architectural Organizations	85.89	7	2.12	.102	NS
	Housing Organizations	88.89	5			
	Research Organizations	230.86	26			
	Universities and University Departments	137.61	73			
	Total	154.00	111			
Hours/Unit	Architectural Organizations	9.94	7	4.65	.005	S
	Housing Organizations	14.20	5			
	Research Organizations	30.88	8			
	Universities and University Departments	6.49	55			
	Total	9.93	75			
Cost/Hours	Architectural Organizations	8.38	9	1.20	.313	NS
	Housing Organizations	6.25	5			
	Research Organizations	10.87	14			
	Universities and University Departments	7.75	95			
	Total	8.09	123			

TABLE II-46

TYPE OF ORGANIZATION DOING POE AND MAN HOURS PER UNIT

Newman-Keuls Test Sig. at .05 Level

Subset 1			
Group	Universities and University Dept.	Architectural Organizations	Housing Organizations
Mean	6.49	9.94	14.20
Subset 2			
Group	Architectural Organizations	Housing Organizations	Research Organizations
Mean	9.94	14.20	30.88

significantly on four out of the five cost measures. The only measure on which no significant difference was found was man hours. The significant difference between total cost and cost on the other three measures (cost per unit, hours per unit, cost per hours) was below the .003 level.

Newman-Keuls test was applied to test differences between specific groups. The results are shown in Table II-48. So far as total cost in dollars is concerned, even though the over all F value (Table II-47) of 3.435 was found significant below the .003 level, no significant difference between means are noted, all of them forming one homogenous subset. Based on the size of means in Table II-47 and Table II-48 it may be said that the average cost of POEs sponsored by foundations was highest (\$76,333.33) and of those sponsored by professional associations was lowest (\$263.30) which may have been responsible for the overall significant F ratio.

When cost per unit is considered, the significant differences exist between university and federal government agencies and professional associations and federal government agencies, suggesting that federal government agencies sponsored the most expensive studies (\$277.50 per unit), followed by professional associations (\$49.33 per unit), and universities which had the least expensive studies (\$17.46 per unit).

TABLE II-47

POE SPONSORING ORGANIZATIONS AND COST

Cost Measure	Groups	X	N	F	P	Sig. 05
Cost	Architectural Organizations	1,566.55	9	3.435	.003	S
	Associations	263.30	20			
	Foundations	76,333.33	12			
	Federal Gov't Agencies	48,790.79	92			
	Public Housing Organizations	4,841.41	12			
	State Gov't Agencies	6,960.52	19			
	Univ. & Univ. Depts	1,901.52	42			
	Total	27,642.38	206			
Hours	Architectural Organizations	448.88	9	1.22	.29	N
	Associations	257.40	20			
	Foundations	3,806.66	6			
	Federal Gov't Agencies	10,108.97	49			
	Housing Organizations	453.00	10			
	State Gov't. Agencies	815.10	19			
	Univ. & Univ. Depts.	675.68	44			
	Total	3,675.89	157			
Cost/Unit	Architectural Organizations	78.81	7	16.39	.00	S
	Associations	49.33	20			
	Foundations	53.26	2			
	Federal Gov't Agencies	277.50	49			
	Housing Organization	105.77	9			
	State Gov't, Agencies	117.83	12			
	Univ. & Univ. Depts	17.46	40			
	Total	131.70	139			
Hours/Unit	Architectural Organizations	11.16	6	17.83	.00	S
	Associations	60.39	20			
	Foundations	9.30	2			
	Federal Gov't Agencies	17.10	15			
	Housing Organizations	11.55	8			
	State Gov't Agencies	11.88	12			
	Univ. & Univ. Depts	3.98	39			
	Total	19.02	102			
Cost/Hours	Architectural Organizations	5.18	9	6.156	.000	S
	Associations	1.80	20			
	Foundations	6.24	6			
	Federal Gov't Agencies	6.77	49			
	Housing Organizations	10.57	10			
	State Govt. Agencies	11.83	19			
	Univ. & Univ. Depts	6.65	40			
	Total	6.85	153			

POE SPONSORING ORGANIZATIONS AND COST MEASURES

Newman-Keuls Test

Sig. at .05 Level

Cost		Subsets									
Cost	Subset 1	Assoc.	Arch.	Univ.	Hous.	State Govt.	Govt.	Found.			
	Group Mean	263.30	1566.55	1901.57	4841.41	6960.52	48790.79	76333.33			
	Subset 1	Univ.	Assoc.	Found.	Arch.	Hous.	State Govt.				
Cost/Unit	Group Mean	17.46	49.33	53.26	78.81	105.77	117.83				
	Subset 2	Found.	Arch.	Hous.	State Govt.	Govt. Federal					
	Group Mean	53.26	78.81	105.77	117.83	277.50					
Hours/Unit	Subset 1	Univ.	Found.	Arch.	Hous.	State Govt.	Govt. Federal				
	Group Mean	3.98	9.30	11.16	11.55	11.88	17.10				
	Subset 2	Assoc.									
Cost/Hours	Group Mean	60.39									
	Subset 1	Assoc.	Arch.	Found.							
	Group Mean	1.80	5.18	6.24							
Cost/Hours	Subset 2	Arch.	Found.	Univ.	Govt. Federal	Housing					
	Group Mean	5.18	6.24	6.65	6.77	10.57					
	Subset 3	Found.	Univ.	Govt. Fed	Housing	State Govt.					
Group Mean	6.24	6.65	6.77	10.57	11.83						

With respect to average hours per unit the professional associations differed from all other groups. The POEs sponsored by professional associations were the largest in time spent with an average of 60.39 man hours per unit.

In terms of cost per hours, significant differences exist between architectural organizations (\$5.18) and state governments (\$11.83) between professional associations (\$1.80) and federal government agencies (\$6.77), housing organizations (\$10.57) and state governments, (\$11.83) and universities (\$6.65). Thus, hourly cost was lowest for professional associations, and highest for state governments followed by housing organizations, federal government, and universities.

It is interesting, therefore, to note that while the professional associations spent a lot of time doing studies, their per hour cost was the lowest.

C. Number of Behaviors and Variables Measured

Do the cost measures vary with the number of behaviors or other variables measured in POEs? The answer may be gleaned from Table II-49. It should be noted that the number of behaviors and other variables associated with a very small number of POEs have not been considered for analyses of variances.

The number of behaviors and variables measured had no influence on the total number of man hours spent and on cost in dollars per man hours, the differences between groups measuring as few as only one and as many as seven behavior and variables being not significant.

The differences between groups were highly significant with respect to total cost (.006 level) and cost per unit (.01) but only at .05 level with regard to man hours per unit. Newman-Keuls method was applied to identify the specific groups between which significant differences existed with regard to these three cost measures. The results are summarized in Table II-50 (see Table 50 on page 88).

There are no significant differences between the groups measuring one to six behaviors whose total costs vary from \$45.25 to \$34,963.23 on behaviors and other variables. However, total cost is significantly higher (\$160,200.) for POEs measuring 7 behaviors and other variables than for POEs measuring less than 7 behaviors and other variables. Why the total cost jumps from \$134,063.23 to \$160,200 as soon as the number of behavior and other variables increases from 6 to 7 is not clear, but it could be due to different methods used.

With respect to cost in dollars per unit the groups measuring 2 variables (\$13.20) are significantly different from the groups measuring 5 (\$149.08) and 4 (\$197.36) variables. No other groups differ significantly from each other. It may be argued that the more the number of variables measured the more the effort which increases

TABLE II-49
NUMBER OF BEHAVIORS AND VARIABLES MEASURED AND COST

Cost Measure	Group	\bar{X}	N	F	P	Sig. 05
Cost	1	14,550.00	5	3.14	.006	S
	2	4,525.86	23			
	3	19,528.89	82			
	4	15,344.82	29			
	5	29,628.15	53			
	6	34,963.23	34			
	7	160,200.00	5			
	Total	25,035.74	231			
Hours	1	2,912.00	5	.977	.442	NS
	2	609.52	17			
	3	536.33	60			
	4	1,872.00	10			
	5	3,802.74	51			
	6	10,216.90	32			
	7	2,346.66	3			
	Total	3,391.81	178			
Cost/Unit	1	51.08	3	3.15	.01	S
	2	13.29	22			
	3	120.60	59			
	4	197.36	24			
	5	149.08	28			
	6	116.96	21			
	Total	120.56	157			
Hours/Unit	1	8.20	3	2.26	.05	S
	2	4.67	17			
	3	29.38	43			
	4	25.57	9			
	5	15.61	25			
	6	14.31	16			
	Total	19.62	113			
Cost/Hours	1	7.77	5	1.14	.34	NS
	2	5.06	21			
	3	5.37	59			
	4	3.64	10			
	5	7.57	47			
	6	7.12	32			
	7	7.09	3			
	Total	6.23	177			

TABLE II-50

NUMBER OF BEHAVIORS AND VARIABLES MEASURED AND COST MEASURES

Newman-Keuls Test
Sig. at .05 Level

Cost Measure	Subsets						
Cost	Subset 1						
	Group 2	1	4	3	5	6	
	Mean	4,525.86	14,550.00	15,344.82	19,528.89	29,628.15	34,963.23
	Subset 2						
Cost/Unit	Group 7						
	Mean	160,200.00					
Cost/Unit	Subset 1						
	Group 2	1	6	3			
	Mean	13.29	51.08	116.96	120.60		
	Subset 2						
Hours/Unit	Group 1	6	3	5	4		
	Mean	51.08	116.96	120.60	149.08	197.36	
Hours/Unit	Subset 1						
	Group 2	1	6	5	4		
	Mean	4.67	8.20	14.31	15.61	25.57	
	Subset 2						
Hours/Unit	Group 1	6	5	4	3		
	Mean	8.20	14.31	15.61	29.38	29.38	

the cost per unit. While this explains why measurement of five and four variables is significantly more expensive than the measurement of only two variables, it still does not explain why there are no significant differences between POEs measuring one, three, and six variables, where the variation in the number of variables measured is the longest. Therefore, another factor such as method, seems a far more likely explanation. Number of variables does not seem to be, of itself, a proven factor for increasing cost. When man hours spent per unit are considered, significant differences exist between POEs measuring two variables (4.67) and three variables (29.38) only. One would speculate that the increase in number of variables to be measured would add to the time needed to collect the data and so the relationship should be linear, but that does not seem to be the case.

D. Number of Building Types Studied.

The data concerning relationships between the number of building types (high rise, low rise, single family, etc.) studied and the cost measures are presented in Table II-51 on the following page.

While the number of different building types studied varied from one to five only three groups of POE studying 1, 2 or 3 building types have been considered for analyses because the frequencies associated with 4 and 5 building types studied are very low.

According to the results in Table II-51, irrespective of the number of building types studied, the groups do not differ significantly with respect to man hours per unit and cost in dollars per man hour. However, highly significant differences (.001) have been noted between the three groups with respect to the other three cost measures (total cost, total man hours, and cost per unit). An attempt was made, therefore, through Newman-Keuls procedure to identify the specific groups between which the differences existed. The results are reported in Table II-52 on page 91.

There are no significant differences between groups studying 1 or 2 different building types but groups studying 3 building types differ from the other two groups on all three cost measures. Group 3 costs significantly more in terms of total cost, (\$86,597.05), total man hours (\$61,760.00) and cost in dollars per unit (\$295.20) than the other two groups.

Since the study of more than 1 building type does not necessarily increase the amount of work needed to do a POE, the increased cost when 3 building types are studied is hard to explain.

E. Number of Methods Utilized.

It is conceivable that the cost would increase with the increase in the number of methods used to collect the data. The results reported in Table II-53 (see page 92) show that all F ratios are significant below .01 and 4 are significant below the .001 level. This means

TABLE II-51

Number of Building Types Studied and Cost

Cost Measures	Groups	\bar{X}	N	F	P	Sig. .05
Cost	1	17,573.97	180	7.028	.001	S
	2	37,694.75	24			
	3	86,597.05	19			
	Total	25,620.33	223			
Hours	1	2,007.61	150	23.00	.000	S
	2	3,051.88	17			
	3	61,760.00	4			
	Total	3,509.14	171			
Cost/Unit	1	102.49	121	8.60	.000	S
	2	126.83	15			
	3	295.20	14			
	Total	122.91	150			
Hours/Unit	1	21.73	96	.747	.476	NS
	2	10.97	10			
	3	2.60	1			
	Total	20.54	107			
Cost/Hours	1	6.11	149	.147	.864	NS
	2	5.25	17			
	3	5.81	4			
	Total	6.01	170			

TABLE II-52

Number of Building Types Studied and Cost Measures

Newman-Keuls Test
Sig. at .05 Level

Cost Measures	Subsets		
Cost	Subset 1		
	Group	1	2
	Mean	17,573.97	37,694.75
	Subset 2		
	Group	3	
	Mean	86,597.05	
Hours	Subset 1		
	Group	1	2
	Mean	2,007.61	3,051.88
	Subset 2		
	Group	3	
	Mean	61,760.00	
Cost/Unit	Subset 1		
	Group	1	2
	Mean	102.49	126.83
	Subset 2		
	Group	3	
	Mean	295.20	

TABLE II-53

Number of Methods Used and Cost

Cost Measures	Groups	\bar{X}	N	F	P	Sig. .05
Cost	1	6,151.88	43	2.856	.011	S
	2	32,059.97	40			
	3	57,329.96	30			
	4	18,773.80	36			
	5	2,645.50	40			
	6	69,515.62	16			
	7	23,942.30	26			
	Total	25,035.74	231			
Hours	1	1,421.48	35	3.06	.007	S
	2	639.00	20			
	3	1,260.52	19			
	4	2,564.02	38			
	5	459.82	40			
	6	21,972.18	16			
	7	4,988.00	10			
	Total	3,391.81	178			
Cost/Unit	1	17.63	34	12.42	.000	S
	2	206.64	37			
	3	282.45	15			
	4	45.70	29			
	5	15.17	17			
	6	189.35	2			
	7	194.98	23			
	Total	120.56	157			
Hours/Unit	1	6.04	28	7.543	.000	S
	2	15.97	18			
	3	17.07	14			
	4	46.85	27			
	5	4.23	16			
	6	8.85	2			
	7	21.33	8			
	Total	19.62	113			
Cost/Hours	1	4.65	38	12.034	.000	S
	2	4.98	20			
	3	14.88	19			
	4	2.91	34			
	5	7.53	40			
	6	6.31	16			
	7	4.26	10			
	Total	6.23	177			

that groups using different numbers of methods differ from each other but it does not mean that the higher costs are necessarily related to the larger number of methods used. The Newman-Keuls Test pinpoints the groups between which significant differences exist and the results are summarized in Table II-54 (see page 94). The number of groups in this table indicates the number of methods used.

Even though the F ratio for total is significant no means of groups have been found between which the difference is significant. The means, however, suggest that the largest difference exists between group 5 ($\bar{X}=2,645.50$) and group 6 ($\bar{X}=69,515.62$) indicating that both the lowest and the highest total cost are associated with large number of methods (5 and 6) employed. This suggests that the relationship between total cost and number of methods used is not linear.

When cost per unit is considered groups 5, 1, and 4 have significantly lower means than groups 7, 2, and 3. Again, cost per unit is not necessarily related to number of methods used.

The only significant difference found with respect to man hours per unit is between groups 5 and 4 and between groups 1 and 4.

On cost in dollars per hour the significant differences exist between groups 4 and 5 and between group 3 and all the other 6 groups. Group 4 has the lowest cost per hour rate (\$2.91), and group 3 has the highest (\$14.88). The rate for group 5 (\$7.53) is not significantly different from that of groups 7, 1, 2, and 6.

Considering all the above mentioned significant differences it may be noted that although certain groups differ from certain other groups the reason for this is not clear. Certainly, the increase in cost on any cost measure is not related with increase in the number of methods used and the relationship is not linear.

F. Principal Investigator

Many different types of principal investigators have been identified and depending upon their outlook toward research it is possible that the cost of their POEs may differ. For example, an architect researcher may be inclined to spend less on POEs than a university professor researcher. The analyses of cost measures in respect to types of investigator is presented in Table II-55

For purposes of these analyses 4 types of principal investigators have been considered because they are associated with frequencies sufficiently large to be meaningful. They are 1) university professors, 2) architects and planners, 3) researchers, and 4) students.

Different types of principal investigators did not differ significantly from each other on total cost and total man hours spent. They were, however, significantly different on all other measures,

Number of Methods Utilized and Cost Measures
Newman-Keuls Test
Sig. at .05 Level

Cost Measures	Subsets							
Cost	Sub Group Mean	5 2,645.50	1 6,151.88	4 18,773.80	7 23,942.30	2 32,059.97	3 57,329.96	6 69,515.62
Hours	Sub Group Mean	5 459.82	2 639.00	3 1,260.52	1 1,421.48	4 2,564.02	7 4,988.00	
	Sub Group Mean	6 21,972.18						
Cost/Unit	Sub Group Mean	5 15.17	1 17.63	4 45.70	6 189.35			
	Sub Group Mean	6 189.35	7 194.98	2 206.64	3 282.45			
Hours/Unit	Sub Group Mean	5 4.23	1 6.04	6 8.85	2 15.97	3 17.07	7 21.33	
	Sub Group Mean	6 8.85	2 15.97	3 17.07	7 21.33	4 46.85		
Cost/Hours	Sub Group Mean	4 2.91	7 4.26	1 4.65	2 4.98	6 6.31		
	Sub Group Mean	7 4.26	1 4.65	2 4.98	6 6.31	5 7.53		
	Sub Group Mean	3 14.88						

TABLE II-55
PRINCIPAL INVESTIGATOR AND COST

Cost Measures	Groups	\bar{X}	N	F	P	Sig. .05
Cost	Professors	32,932.65	148	2.22	.08	NS
	Architects	2,829.08	12			
	Researchers	29,735.62	29			
	Students	193.68	41			
	Total	25,122.85	230			
Hours	Professors	4,584.50	118	.507	.67	NS
	Architects	932.30	13			
	Researchers	3,460.00	9			
	Students	513.44	38			
	Total	3,391.81	178			
Cost/Unit	Professors	140.49	88	6.87	.000	S
	Architects	75.16	8			
	Researchers	206.61	24			
	Students	26.92	36			
	Total	121.11	156			
Hours/Unit	Professors	9.15	66	12.42	.000	S
	Architects	10.51	8			
	Researchers	24.06	8			
	Students	43.11	31			
	Total	19.62	113			
Cost/Hours	Professors	7.78	118	17.68	.000	S
	Architects	6.99	12			
	Researchers	8.95	9			
	Students	0.52	38			
	Total	6.23	177			

cost per unit, hours per unit, and cost per hour. Identification of specific groups between which these differences existed was done by Newman-Keuls test and the results are presented in Table II-56.

An examination of this table reveals that the students spent significantly less money per unit (\$26.92) than professors (\$140.49) and researchers (\$206.61) but spent significantly more man hours per unit (43.11) than professors (9.15) and architects (10.51). When cost in dollars per hour is considered the students rate is lowest (\$0.52) and significantly lower than that of architects (\$6.99), professors (\$7.78) and researchers (\$8.95). It suggests, therefore, that the students spend less money and more time at a very low rate of compensation. Actually, these results are due to the fact that most students are doing these studies for their course work and are not getting paid for them and in most cases no monetary values are involved. If students as a group are excluded, no significant differences between principal investigators on any of the cost factors would be found.

G. Number of Types of Populations

The data were collected from different types of subjects living in the residential environments evaluated. Since the variety of population groups in a study increases the researchers work load during sampling and data processing, it is expected that the larger the number of different types of populations studied, the more the cost. Whether or not this expectation is justified can be determined by the data reported in Tables II-57 and II-58 (see Table II-57 on pages 98 and 99, and Table II-58 on page 100).

Table II-57 shows all F ratios to be significant indicating that types of population have significantly different costs, on all cost measures. Newman-Keuls test was applied then to determine differences between specific types of groups. The results are reported in Table II-58.

When total cost in dollars is considered it seems that groups with 6 and 5 different population types are significantly more expensive than all the other groups which do not differ significantly among themselves. However groups with 2 and 6 different population types use significantly more man hours than all the other groups which do not differ significantly among themselves.

In terms of cost per unit group 1 is the lowest \$32.09 and is significantly different from group 4, (\$384.39), group 6 (\$213.08), and group 10 (\$220.93). Group 10 has the highest cost per unit and is significantly different from group 3 (\$83.97), group 7 (\$46.99), group 8 (\$40.46), and group 9 (\$88.13). Significant differences also exist between group 6 (\$213.08), and group 7 (\$46.99), and group 8 (\$40.46); between group 7 (\$46.99), and group 10 (\$220.93); and group 8 (\$40.46), and group 10 (\$220.93). There is no systematic pattern among these differences, and the reason for these differences is not clear.

TABLE II-56

Principal Investigator and Cost Measures

Newman-Keuls Test

Sig. at .05 Level

Cost Measures	Subsets			
Cost/Unit	Subset 1 Group Mean	Students 26.92	Architects 75.16	
	Subset 2 Group Mean	Architects 75.16	Professors 140.49	Researchers 206.61
Hours/Unit	Subset 1 Group Mean	Professors 9.15	Architects 10.51	Researchers 24.06
	Subset 2 Group Mean	Researchers 24.06	Students 43.11	
Cost/Hours	Subset 1 Group Mean	Students 0.52		
	Subset 2 Group Mean	Architects 6.99	Professors 7.78	Researchers 8.95

TABLE II-57

Number of Types of Population and Cost

Cost Measures	Groups	\bar{x}	N	F	P	Sig. .05
Cost	1	1,081.53	32	2.189	.024	S
	2	45,000.00	4			
	3	17,874.65	20			
	4	8,040.00	15			
	5	67,687.50	20			
	6	56,252.56	32			
	7	8,416.37	24			
	8	2,343.70	30			
	9	27,817.13	23			
	10	35,157.37	29			
	Total	25,232.29	229			
Hours	1	279.23	26	2.01	.041	S
	2	7,839.00	4			
	3	467.78	19			
	4	3,142.05	17			
	5	1,094.42	14			
	6	22,460.66	15			
	7	2,611.85	20			
	8	450.64	28			
	9	3,867.83	18			
	10	1,031.40	15			
	Total	3,426.69	176			
Cost/Unit	1	32.09	16	6.103	.000	S
	2	134.10	2			
	3	83.97	18			
	4	384.39	6			
	5	138.66	12			
	6	213.08	25			
	7	46.99	18			
	8	40.46	25			
	9	88.13	14			
	10	220.93	19			
	Total	121.80	155			

(Continued on next page)

TABLE II-57
(Continued)

Cost Measures	Groups	X	N	F	P	Sig. .05
Hours/Unit	1	5.67	12	5.748	.000	S
	2	19.25	2			
	3	13.62	14			
	4	30.61	6			
	5	12.07	11			
	6	23.97	9			
	7	3.61	15			
	8	49.06	25			
	9	8.85	10			
	10	1.72	7			
	Total	19.91	111			
Cost/Hours	1	3.18	30	2.818	.004	S
	2	11.04	4			
	3	9.49	19			
	4	5.48	12			
	5	8.27	14			
	6	7.68	15			
	7	8.17	20			
	8	3.90	28			
	9	5.78	18			
	10	5.96	15			
	Total	6.19	175			

Examination of data on man hours per unit reveals that groups 4 (\$30.16) and 8 (\$49.06) which do not differ significantly with each other do differ significantly with groups 1 (\$5.67), 3 (\$13.62), 5 (\$12.07), 7 (\$3.61), 9 (\$8.85), and 10 (\$1.72), with respect to cost in dollars per hour. No groups differ significantly with each other even though an overall significant F ratio has been obtained.

These data demonstrate that there are significant differences between some groups on certain cost factors but the reason for these differences is not clear. The data clearly indicate that there is not a linear relationship positive or negative between cost factors and number of population types studied. Thus, the cost neither decreases nor increases with increase in the number of populations studied. Ultimately, then, the cost of a POE can be determined by the planning of the researcher and not necessarily limited to being increased

Number of Types of Population and Cost Measures
Newman-Keuls Test
Sig. at .05 Level

Cost Measures	Subsets									
	1	2	3	4	5	6	7	8	9	10
Cost	Subset 1									
	Group Mean	1081.53	2343.70	8040.00	8416.37	17874.65	27817.13	35157.37	45000.00	
Hours	Subset 2									
	Group Mean	56252.56	67687.50							
Hours	Subset 1									
	Group Mean	279.23	450.64	467.78	1031.40	1094.42	2611.85	3142.05	3867.83	7839.00
Hours	Subset 2									
	Group Mean	7839.00	22460.66							
Cost/Unit	Subset 1									
	Group Mean	32.09	40.46	46.99	83.97	88.13	134.10	138.66	220.93	
Cost/Unit	Subset 2									
	Group Mean	83.97	88.13	134.10	138.66	213.08	220.93	384.39	7.68	
Cost/Unit	Subset 3									
	Group Mean	134.10	138.66	213.08	220.93	384.39	7.68			
Hours/Unit	Subset 1									
	Group Mean	10	1.72	3.61	5.67	8.85	12.07	13.62	19.25	23.97
Hours/Unit	Subset 2									
	Group Mean	19.25	23.97	30.61	49.06					
Cost/Hours	Subset 1									
	Group Mean	3.18	3.90	5.48	5.78	5.96	7.68	8.17	8.27	11.04

uncontrollably by factors like kinds and number of people studied
or number of variables. If the average POE can be done for
\$5,000, then, many POEs can be done for less.

POEs Conducted by Housing Professionals
and Academicians : A Comparison

The people conducting POEs can be placed into two broad categories, (a. Housing professionals defined as those who are directly involved in the development, production, and management of housing, and (b. Academicians defined as those who have only scientific, academic, and research interest in housing. A small group of academicians, not represented in the group studied, have an interest in applied studies.

A comparison of the general characteristics of the POEs conducted by these two groups of people revealed some important differences. They are summarized in Table II-59 on the following page.

Differences in POEs Conducted by Housing
Professionals and Academicians

Variables	Housing Professionals	Academicians
1. No. of POEs	31	265
2. \bar{X} Age of Project Site	6.5 years	15 years
3. \bar{x} Population of residents	294	841
4. \bar{X} Sample Size	49	118
5. % Reports published	0	89
6. % POEs New Buildings Whose Results Used Existing Buildings	71 77.4	0 * 0 *
7. Organizations doing POEs	Housing Authorities	Universities, Research organizations
8. Sponsoring organizations	Housing Authorities	Federal Government Agencies
9. Principal Investigator	Market Analyst, Housing Management, Architect	Professors, Students Researchers
10. Audience	Housing Auth. Staff	Public in general
11. Behaviors and Variables Measured	Demographics, use of Space, Community factor, Activities, Construction Quality, Cost	Preferences, Attitudes, Perception/Image, Activities Complaints/criticisms
12. Cost Per POE \$	3,728	25,035
13. Man-Hours Per POE	93.7	339.8
14. Cost per Sample Unit	274.85	120.60
15. Man-Hours Per Sample Unit	6.45	19.62
16. Cost per Man-Hour \$	28.70	6.24

*For the 265 Fact Sheets used, there were no academic POEs being used for buildings but several not included are being used at present.

According to the comparison data the housing professionals as against academicians had conducted very few POEs (31 vs 265), evaluated more recently built housing projects (\bar{X} 6.5 yrs vs 15 yrs old) with smaller mean population (294 vs 841), employed a smaller study sample (49 vs 118), did not publish their evaluation results (0 vs 89) but, generally, used the results of their evaluations both in new construction (71% vs 0%) and in existing building (77.4% vs 0%). This indicates that while housing professionals may not be very much inclined toward doing POEs, when they do conduct them it is in recently built projects and apparently for the purpose of using the results both in new construction and in existing buildings. The academicians, in contrast seem to be doing a lot of POEs but more for the sake of knowledge than for application of results for better building designs and construction. Among housing professionals the POEs were primarily conducted and sponsored by housing authorities who themselves were also the audience while among academicians the POEs were conducted by universities and research organizations but sponsored by federal government agencies with public in general as audience. Again the practical use orientation of the housing professionals is obvious. They conduct and financially support the POEs, and then use the results themselves. The academicians in contrast, use federal government funds to conduct POEs, and publish results to reach public in general, and do not concern themselves with the use of POE results. The type of principal investigator among housing professionals is typically a market analyst, a housing manager or an architect who would be expected to be a practical use oriented person in contrast to a professor, a student or a researcher among academicians, who would be expected to be interested mainly in academic information. The differences in the behaviors and variables measured by the housing professional and academicians also show the practical use orientation of the former. The housing professionals concentrate on the use of space, community factors, demographic features of the population, the activities, construction quality, and cost, all of which have direct bearing on actual design, construction, and management of housing. The academicians in contrast focus upon preferences, attitudes, perceptions, activities, and complaints, which although useful is making design decisions and in influencing housing management, however, have little or no relevance for much practical matters as construction quality and cost.

An examination of the cost data reveals that the POEs conducted by housing professionals are less expensive than those conducted by academicians in terms of cost per POE (\$3,738 vs \$25,035), man hours per POE (93.7 hours vs 339.8 hours), and man hours per sample unit (6.45 hours vs 19.62 hours). Although POEs conducted by housing professionals in comparison to academicians are more expensive in terms of cost per sample unit (\$274.85 vs \$120.60), and cost per man hours (\$28.70 vs \$6.24), the overall cost of doing POEs has been kept low by housing professionals apparently by having a smaller sample size and spending fewer man hours in conducting POEs.

If POEs are to serve their purpose of providing information that could be used for better environmental design of residential facilities, they need to be made part of the building process and need be conducted by the people who are directly involved in the development, production, and management of housing. This means that more POEs need to be conducted by housing professionals. It is conceivable to secure a cooperative effort between

housing professionals who bring with them the practical use orientation, and the academicians who provide sophisticated research strategies. Such a cooperative effort would ensure scientifically valid research on the one hand and its application in building design and management on the other. The financial support from various federal government agencies that at present seem to be going to the academicians could be channeled into the above mentioned cooperative efforts reducing the cost burden of doing POEs on housing professionals.

TASK IId

Collect and Develop a Bibliography

Searching 91 journals, and periodicals, and numerous books, a total of 1,305 examples of Post Occupancy Evaluations was uncovered. Appendix II is a complete list of the references to these studies. Some were a single POE of a single location, others are large projects covering several cities, and thousands of units. Some have not been translated into English.

Appendix II details the criteria used in deciding whether a study should be included in the bibliography. This list could have been larger if impressionistic studies that did not collect data were included.

According to contract specifications, the researchers contacted the HUD library twice in order to determine what systems of cross-classification would be needed in order to fit the bibliography into HUD's library system. Both times the researchers were informed that the bibliography was satisfactory as it stands.

The main conclusion to be drawn from this unexpectedly large bibliography is that the POE has emerged as a discipline in its own right and that the literature needs to be translated and summarized in a form useful to housing professionals. This bibliography will only be truly useful when it is categorized by housing type, design variables, POE topics, and other indices and housed in an available central location. Such a summary and translation was beyond the scope of the present contract.

TASK IIIa

Develop a Model of the Housing Delivery System

A. INTRODUCTION

In order to understand the context within which post occupancy evaluation in Federal housing programs can operate, the processes involved in the development of projects within these programs must be known. Initially, all of the HUD programs were compiled and studied.

It was decided finally to choose and model the processes of a few diverse programs which are representative of the approximately 80* which are now or were in existence in the past. In deciding which programs to model, consideration was given to the present and the likely future production impact of the programs. An effort was made to include programs which are diverse in participants, program recipient group, and the nature of HUD's involvement.

TABLE III-1
Programs Chosen for Modeling

PROGRAM	NEW ⁽⁴⁾ UNITS	% TOTAL ⁽⁶⁾
Multifamily Mortgage Insurance ⁽¹⁾	116,600	26
Section 8, New Construction ⁽²⁾	170,000	37
Public Housing ⁽³⁾	56,000	12

Single Family Mortgage Insurance ⁽⁵⁾	110,000	25
	452,600	100

(1) Mostly 221 (d) (3) and (4)

(2) Includes 25,500 units 202 (15% total Section 8 units)

(3) Almost entirely Turnkey, but includes 6,000 Indian housing units

(4) Existing units are not included

(5) Single Family not modeled

(6) Of the 4 programs listed

*Source: Programs of the Department of Housing and Urban Development, March, 1977.

Table III-1 lists the three programs which were chosen for modeling and the number of new units proposed in the FY 78 Housing Budget Request.

SECTION 8 PROGRAM

In the Section 8 New Housing Program (a modification of the old Section 23 of the U. S. Housing Act of 1937), HUD is actively and directly involved with developers who are responsible for the construction of a project. The developer, with profit or non-profit motives, may stay with a project as the owner/manager during the occupancy stage, or he may act on behalf of a private sponsor who owns and manages a project. Occupants are from lower income groups. HUD's Budget Request for Fiscal Year 1978 includes 170,000 newly constructed Section 8 units. This represents about 37% of HUD's total requests for new units. Included in this figure are 25,500 units of Section 202, Direct Loan Program for Housing for the Elderly or Handicapped. The processing requirements for Section 202 will be considered the same as those for Section 8 for the purpose of this study. (See Exhibit 1, page 110, Section 8 Program in fold-out). A note needs to be made that some researchers have found the design criteria themselves in section 202 for elderly can be modified in the design phases at the time of preliminary review. This is because the original design criteria are very general and the modifications take the form of sharpening specifics. The question is raised - if this can be done for elderly, why not for other groups?

MULTIFAMILY MORTGAGE INSURANCE PROGRAM

While the mortgagees play the important role of actually submitting the applications for commitments and sponsors'/architects' exhibits to HUD, the major interaction in the Multifamily Mortgage Insurance (MFMI) development process is between the Sponsor/Mortgagor with his architect, and HUD (at the Field Office level). The MFMI model was based on Section 207, Rental Housing. Although no future activity in 207 is expected, other MFMI programs have similar processes. Most anticipated activity in the future is in 221 (d) (3) and 221 (d) (4) for new housing and 223 (f) for refinancing existing housing. Generally, the process is the same for these programs although some requirements may differ among programs. The mortgagor, who may be a private developer, may stay with the project during the occupancy stage, or sell to a non-profit organization, depending on the program. Housing built under MFMI is generally rented by families in the moderate to upper income brackets. HUD's 1978 budget request includes 116,600 new units utilizing a processing flow similar to the one modelled. This represents approximately 26% of HUD's requested new units (See Exhibit 1 - Multifamily Mortgage Insurance Program in fold-out).

PUBLIC HOUSING PROGRAM

In Turnkey Public Housing, HUD determines through HAPs what housing it will assist in a given year and notifies the Public Housing Authorities of assistance for which they may apply. HUD also acts as overall reviewer of proposed projects, giving primary responsibility for execution and ownership of projects to the Public Housing Authorities. The developer/builder steps out of the process shortly after the project is constructed. The housing is intended for very low and moderate income groups. HUD's Public

Housing Budget Request for 1978 is for 56,000 new dwelling units, about 12% of the total new units which have been requested for that fiscal year. Almost all of these Public Housing Units will be built utilizing the Turnkey method (see Exhibit 1 - Public Housing Program in fold-out).

Following for each of the three programs modelled, is a brief statement on the program, its background and a detailed processing flow diagram, Exhibit 2 a through c.

The level of detail chosen for the three processes modelled allows for easy visual comprehension of the major activities and stages in each process. Several of the activities in each of the models could have been further subdivided yielding more detail. For example, a "review" activity in the HUD responsibility track may cover a sequential set of activities by different HUD personnel reviewing a particular document. Similarly, a developer's "submittal" activity may represent activities by his architects, accountants and lawyers.

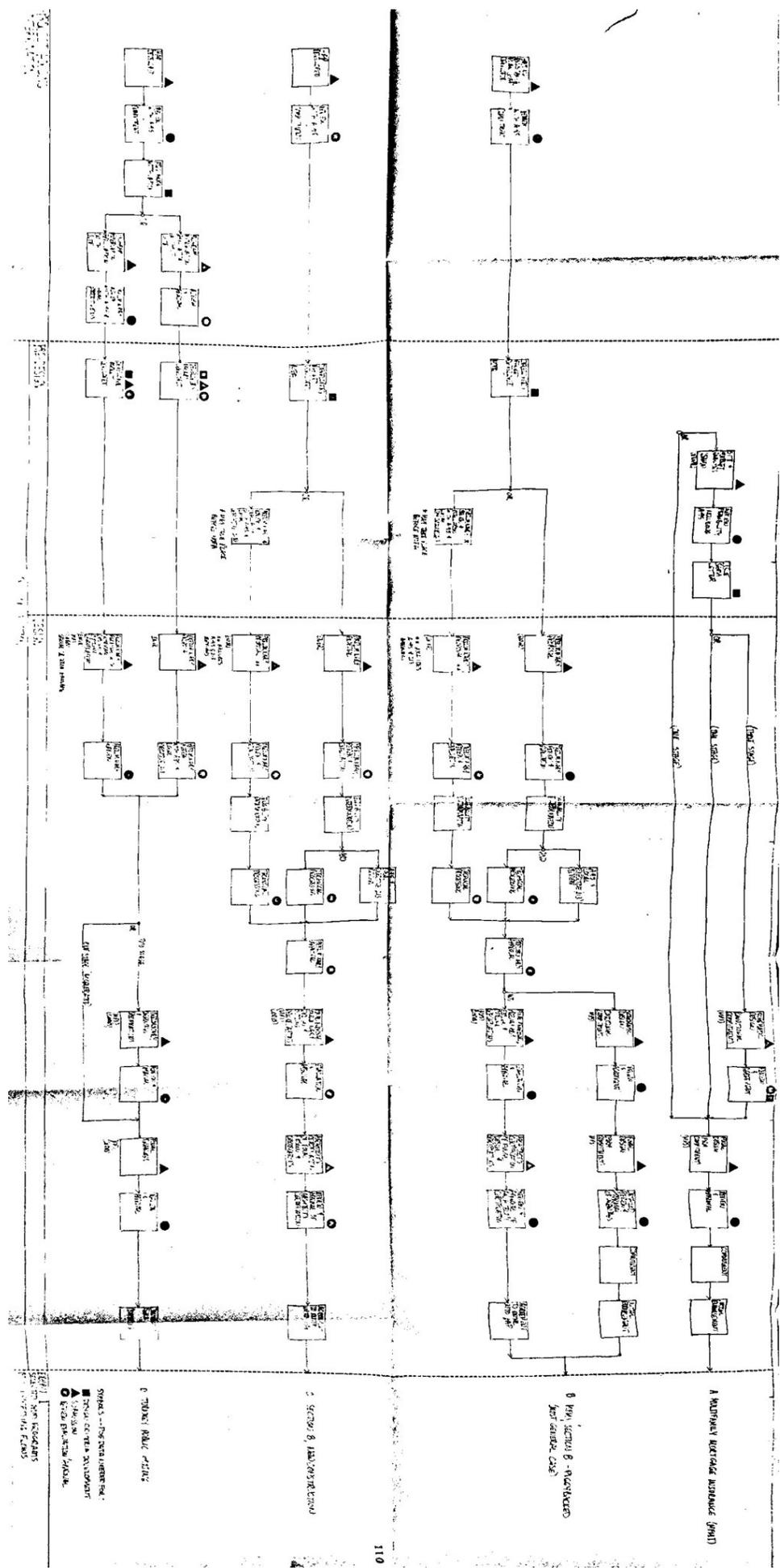
The primary purpose of the models in Exhibit 1 is to illustrate where post occupancy evaluation (POE) principles and lessons can be applied and where POE information can be inserted into the process. More detailed models (Exhibits 2 a, b, c) are necessary to convey these ideas in greater depth. Yet, Exhibit 2 is itself a simplification of the actual processes, and the basis for the further simplification of Exhibit 1.

COMBINED PROGRAMS

Often, more than one HUD housing program is used in combination with another. It is common with the Section 8 Housing Assistance Programs where Mortgage Insurance and Federal Loan Programs are often used in conjunction with Section 8 Programs. This is especially true for Section 202 housing. Exhibit 1 also illustrates this typical combination of Section 8 and MFMI programs.

In the Section 8 New Construction Processing Flow Diagram immediately following the developer's submission of the preliminary proposal, the "Mortgage Guarantee Review" by HUD, and the "Mortgage Insurance Submissions" by the developer occur. At this point, a process nearly identical to that indicated in the Multifamily Mortgage Insurance Processing Flow Diagram may begin and run concurrently with the Section 8 processing. Technically, these two sets of activities are independent. However, since the processing is frequently done by the same personnel, in practice the tendency is to combine the processing activities.

In cases where two or more HUD programs are likely to be used in combination, or "piggy-backed", consideration must be given to the occurrence of redundant requirements for POE information. Exhibit 3, The Basic POE Process, which illustrates the possible entry points for POE information in the programs modelled, also illustrates where such possible redundancies can occur due to the combined use of the two HUD programs.



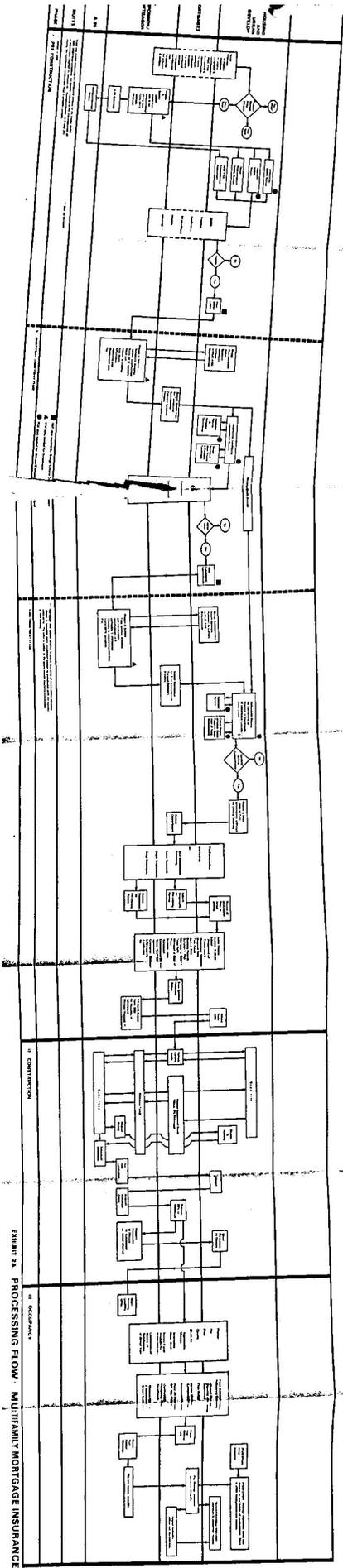
1 MAIN SERVICE (SCHOOL)

2 THE NEW LORRY P.D.

3 TRUCK CO. TEL. A. AND C. AND D.

4 THINKY BALKS ATLINE

5 THE NEW LORRY P.D.
 6 TRUCK CO. TEL. A. AND C. AND D.
 7 ELECTRIC BULB SYMBOL



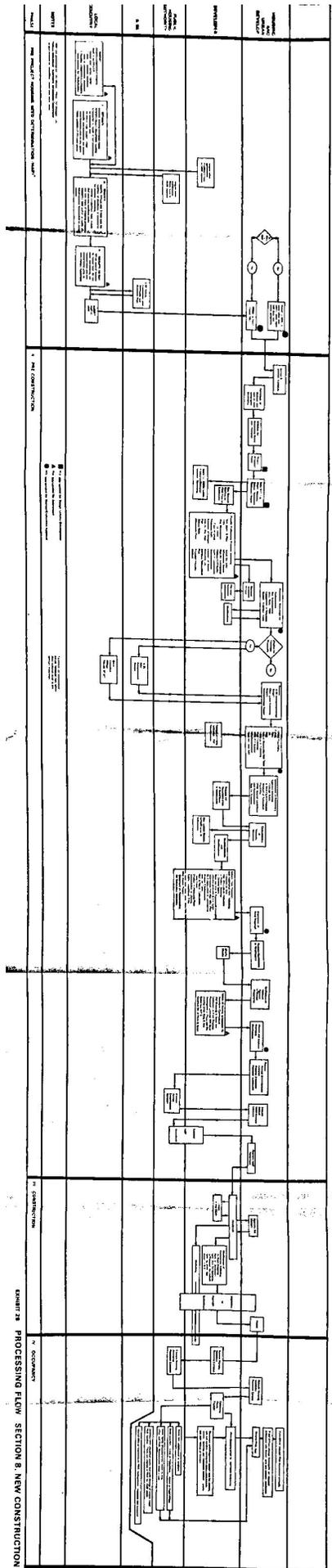
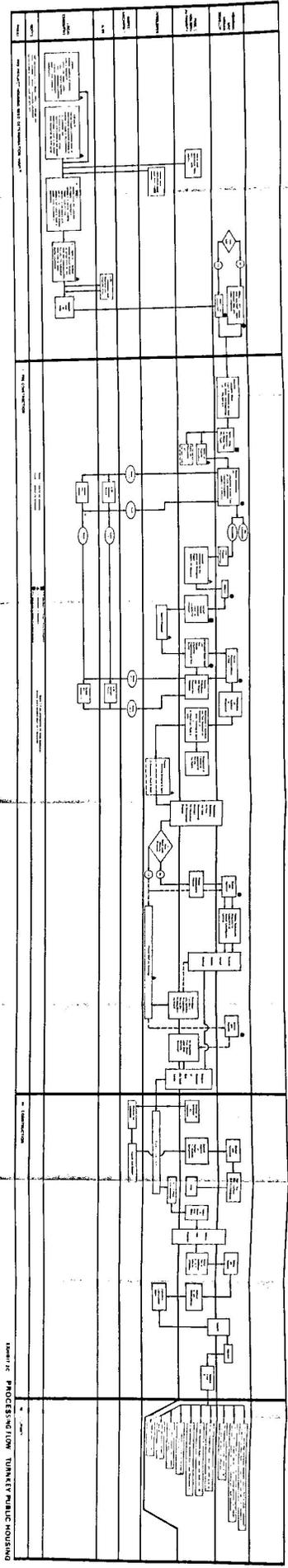
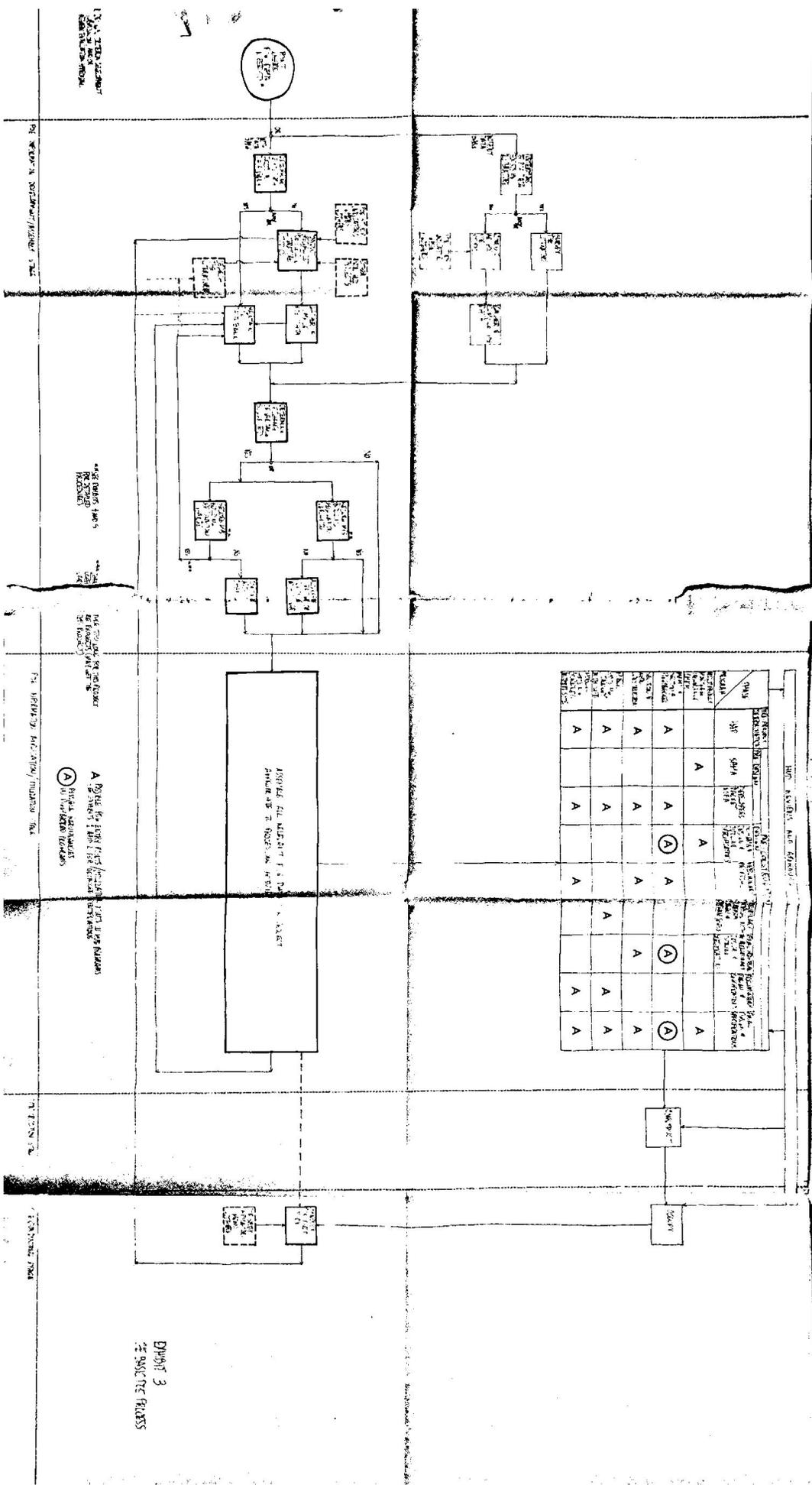


EXHIBIT 28 PROCESSING FLOW SECTION 8, NEW CONSTRUCTION



Resim 12: TÜRKİYE PÜBLİK KONUTLARI İŞ AKIŞI



NO.	DESCRIPTION	QTY	UNIT	REMARKS
1	STOP RELAY	1	PC	
2	START RELAY	1	PC	
3	STOP BUTTON	1	PC	
4	START BUTTON	1	PC	
5	STOP LAMP	1	PC	
6	START LAMP	1	PC	
7	STOP WIRE	1	PC	
8	START WIRE	1	PC	
9	STOP CONTACT	1	PC	
10	START CONTACT	1	PC	
11	STOP COIL	1	PC	
12	START COIL	1	PC	
13	STOP TERMINAL	1	PC	
14	START TERMINAL	1	PC	
15	STOP WIRE	1	PC	
16	START WIRE	1	PC	
17	STOP CONTACT	1	PC	
18	START CONTACT	1	PC	
19	STOP COIL	1	PC	
20	START COIL	1	PC	
21	STOP TERMINAL	1	PC	
22	START TERMINAL	1	PC	
23	STOP WIRE	1	PC	
24	START WIRE	1	PC	
25	STOP CONTACT	1	PC	
26	START CONTACT	1	PC	
27	STOP COIL	1	PC	
28	START COIL	1	PC	
29	STOP TERMINAL	1	PC	
30	START TERMINAL	1	PC	
31	STOP WIRE	1	PC	
32	START WIRE	1	PC	
33	STOP CONTACT	1	PC	
34	START CONTACT	1	PC	
35	STOP COIL	1	PC	
36	START COIL	1	PC	
37	STOP TERMINAL	1	PC	
38	START TERMINAL	1	PC	
39	STOP WIRE	1	PC	
40	START WIRE	1	PC	
41	STOP CONTACT	1	PC	
42	START CONTACT	1	PC	
43	STOP COIL	1	PC	
44	START COIL	1	PC	
45	STOP TERMINAL	1	PC	
46	START TERMINAL	1	PC	
47	STOP WIRE	1	PC	
48	START WIRE	1	PC	
49	STOP CONTACT	1	PC	
50	START CONTACT	1	PC	
51	STOP COIL	1	PC	
52	START COIL	1	PC	
53	STOP TERMINAL	1	PC	
54	START TERMINAL	1	PC	
55	STOP WIRE	1	PC	
56	START WIRE	1	PC	
57	STOP CONTACT	1	PC	
58	START CONTACT	1	PC	
59	STOP COIL	1	PC	
60	START COIL	1	PC	
61	STOP TERMINAL	1	PC	
62	START TERMINAL	1	PC	
63	STOP WIRE	1	PC	
64	START WIRE	1	PC	
65	STOP CONTACT	1	PC	
66	START CONTACT	1	PC	
67	STOP COIL	1	PC	
68	START COIL	1	PC	
69	STOP TERMINAL	1	PC	
70	START TERMINAL	1	PC	
71	STOP WIRE	1	PC	
72	START WIRE	1	PC	
73	STOP CONTACT	1	PC	
74	START CONTACT	1	PC	
75	STOP COIL	1	PC	
76	START COIL	1	PC	
77	STOP TERMINAL	1	PC	
78	START TERMINAL	1	PC	
79	STOP WIRE	1	PC	
80	START WIRE	1	PC	
81	STOP CONTACT	1	PC	
82	START CONTACT	1	PC	
83	STOP COIL	1	PC	
84	START COIL	1	PC	
85	STOP TERMINAL	1	PC	
86	START TERMINAL	1	PC	
87	STOP WIRE	1	PC	
88	START WIRE	1	PC	
89	STOP CONTACT	1	PC	
90	START CONTACT	1	PC	
91	STOP COIL	1	PC	
92	START COIL	1	PC	
93	STOP TERMINAL	1	PC	
94	START TERMINAL	1	PC	
95	STOP WIRE	1	PC	
96	START WIRE	1	PC	
97	STOP CONTACT	1	PC	
98	START CONTACT	1	PC	
99	STOP COIL	1	PC	
100	START COIL	1	PC	
101	STOP TERMINAL	1	PC	
102	START TERMINAL	1	PC	
103	STOP WIRE	1	PC	
104	START WIRE	1	PC	
105	STOP CONTACT	1	PC	
106	START CONTACT	1	PC	
107	STOP COIL	1	PC	
108	START COIL	1	PC	
109	STOP TERMINAL	1	PC	
110	START TERMINAL	1	PC	
111	STOP WIRE	1	PC	
112	START WIRE	1	PC	
113	STOP CONTACT	1	PC	
114	START CONTACT	1	PC	
115	STOP COIL	1	PC	
116	START COIL	1	PC	
117	STOP TERMINAL	1	PC	
118	START TERMINAL	1	PC	
119	STOP WIRE	1	PC	
120	START WIRE	1	PC	
121	STOP CONTACT	1	PC	
122	START CONTACT	1	PC	
123	STOP COIL	1	PC	
124	START COIL	1	PC	
125	STOP TERMINAL	1	PC	
126	START TERMINAL	1	PC	
127	STOP WIRE	1	PC	
128	START WIRE	1	PC	
129	STOP CONTACT	1	PC	
130	START CONTACT	1	PC	
131	STOP COIL	1	PC	
132	START COIL	1	PC	
133	STOP TERMINAL	1	PC	
134	START TERMINAL	1	PC	
135	STOP WIRE	1	PC	
136	START WIRE	1	PC	
137	STOP CONTACT	1	PC	
138	START CONTACT	1	PC	
139	STOP COIL	1	PC	
140	START COIL	1	PC	
141	STOP TERMINAL	1	PC	
142	START TERMINAL	1	PC	
143	STOP WIRE	1	PC	
144	START WIRE	1	PC	
145	STOP CONTACT	1	PC	
146	START CONTACT	1	PC	
147	STOP COIL	1	PC	
148	START COIL	1	PC	
149	STOP TERMINAL	1	PC	
150	START TERMINAL	1	PC	

Diagram 3
Control Circuit

State agencies may play an important role in the Section 8 program although this depends on the statutory authority of the state agency and the policy decisions at the state level.

B. MULTIFAMILY MORTGAGE INSURANCE PROGRAM (MFMI) (BASED ON 207)

Section 207 was the HUD-FHA basic Multifamily Rental Housing Mortgage Insurance Program. It was designed to aid the development of rental housing for moderate and middle income families. Over the years, 300,000 housing units have been insured under Section 207. The Section 207 Program is no longer active except for those projects which remain to be completed.

The 207 Program has been the foundation for several other HUD programs. These include the Section 213 Multifamily Cooperative Housing Program, the Section 220 Mortgage Insurance Program for Projects in Urban Renewal Areas, the Section 221 (d) (3), and (4) Multifamily Insurance Programs for Low and Moderate Income Families, the Section 231 Multifamily Insurance Program for the Elderly, and the Section 236 Insurance Program of Housing for Lower Income Families. Section 221 (d) (3), and (4) Programs are the most active programs at this time. The Section 236 Program is being phased out. The processing flow for these programs is similar to the 207 Program. However, certain submission requirements, recipients' eligibility requirements, and the limitations on costs, number of rooms, room sizes, and neighborhoods may vary. These latter variations which limit the physical aspects of designs are due to explicit provisions in the Minimum Property Standards (e.g., provisions for the elderly, and handicapped), to the tests of marketability applied by HUD, or to both.

Projects intended primarily for residential use in conformance with HUD-FHA standards and containing more than eight units are eligible for MFMI insurance. These projects may contain single family detached housing, semi-detached housing, attached housing (row housing), and include walk-up or elevator type buildings. While most tenants are families from the moderate and upper income brackets, no income requirements are placed on tenants occupying the housing. Mortgagors, however, must agree not to discriminate against families with children.

Although MFMI Program regulations theoretically allow for the approval of projects developed by any type of mortgagor, HUD, through its administrative function, limits eligibility to profit motivated individuals, partnerships, corporations, and trusts.

HUD accepts applications for mortgage insurance only from approved mortgagees. Builders or developers may not apply directly to HUD. The mortgagee reviews endorsements from HUD on behalf of the eligible mortgagor. The mortgagees and their agents are then responsible for dealing with the mortgagor. The mortgagor has the most contacts with HUD.

The majority of application and processing contacts, as well as the responsibilities regarding the evaluation and review of proposals for MFMI Programs, are delegated to HUD Field Offices.

The physical aspects of designs are governed by the Minimum Property Standards (MPS), just as in HUD's assisted housing programs.

The flow chart, Exhibit 2a, indicates the activities of the participants in the process (HUD, mortgagee, sponsor/mortgagor, and A-95 Committee) from the initial interview through occupancy (see Exhibit 2a fold-out, page 111)

C. SECTION 8 HOUSING ASSISTANCE: NEW CONSTRUCTION

Although the U. S. Government has financed housing assistance programs for leased dwellings since 1965, leasing became the primary vehicle for Federal assistance for housing low income Americans in 1974. The Housing and Community Development Act of 1974 altered national housing policy by radically reducing the traditional public housing programs, and curtailing the subsidized Mortgage Insurance Programs. In their place, Congress substituted subsidized public housing in privately owned leased dwellings.

As originally conceived, leased housing would encourage the use of the existing housing stock to shelter eligible families by allowing Public Housing Authorities (PHAs) to lease dwelling units from the private market for the purpose of subleasing them to assisted tenants. Later the program was broadened. Since the 1974 Act, the focus of the Program has shifted heavily toward the leasing of newly constructed housing.

While all types of units and building types, including mobile homes, are eligible for assistance under this legislation, HUD regulations favor projects designed to accommodate a substantial number of large families.

Under Section 8 for new or rehabilitated units which are complete and ready for occupancy, HUD contracts directly either with a private owner acting on his own or a PHA operating on its own. In some cases HUD may contract with a PHA which will hire a private owner. HUD pays the difference between a contract rent (not exceeding the fair market rent for the dwelling) and 15% to 25% of the assisted family's income. Thus, low rent is available in Section 8 projects.

Under the Program, a Housing Assistance Payments Contract runs for 5 years and is renewable three more times at the owner's option. Thus, a contract total of 20 years is possible. HUD guarantees to pay 80% of the contract rent for vacant units both during the rent up period and for 60 days between rentals. HUD also pays all of the debt service attributable to the vacant units thereafter. Private mortgages for Section 8 projects are relatively easy to obtain.

Section 8 rent assistance authority lies with HUD field offices. Information is made available to the public. Developers submit, in stages, proposals for buildings which comply with HUD requirements, including MPS which govern the physical aspects of designs. If the proposed project is selected, the developer, and HUD (and sometimes the local PHA) sign an agreement to enter into a Housing Assistance Payments Contract. Financing may be provided by HUD or by private sources. In the latter case, financing may be FHA insured, privately insured, or uninsured.

After the project is constructed the Housing Assistance Payments Contract is signed. The developer is then responsible for renting and managing the project just as in standard rental housing. He is assured, however, that rents will be very low for tenants eligible for the Section 8 Program.

Section 202 dwelling units which represent 15% of the 1978 budget request for Section 8, New Construction dwelling units, has been reactivated by the Housing and Community Development Act of 1974. It had been phased out by the 1968 Housing Act in favor of the 236 Program, which itself has now been phased out, except for those projects which remain to be completed.

The processing flow chart, Exhibit 2b, indicates the activities of the participants in the process (HUD, the Developer, the PHA, the A-95 Committee, and the Local Executive) in Section 8 projects. One model in Exhibit 1 also illustrates the processing flow when Section 8 projects are "piggy-backed" with other HUD mortgage guarantee programs (see Exhibit 2b, fold-out, page 112).

D. THE TURNKEY PUBLIC HOUSING PROGRAM

The Public Housing Program has been the predominant form of Federal housing assistance for low income families since it was first established by the United States Housing Act of 1937. By the end of 1971 there were about one million public housing units occupied by more than three million persons.* As of June 30, 1977 there were 1,169,915 units.

Although public housing originally was perceived to serve, in part, the "working poor", it increasingly has become the housing of last resort for America's poorest citizens.

The 1937 Act and subsequent additions authorize Federal aid for low income housing managed by local housing authorities (LHAs) which are now generally called Public Housing Authorities (PHAs). The housing units could be provided through new construction, by acquisition of existing housing or by leasing new or existing housing. In 1966, HUD developed and implemented the Turnkey Program on an experimental basis. In the Housing and Community Development Act of 1974, major re-emphasis was placed on this Program. New Public Housing Regulations which are effective in February 1977 require the use of the turnkey process unless the conventional method, inclusive of administrative costs, can be proven to be less expensive. A new handbook for this process was released in later March 1977.

The newest Turnkey Public Housing Regulations call for the PHA to enter into an agreement to purchase housing projects, all inclusive, from a private developer. This agreement is made prior to construction and is based upon plans proposed by the developer to meet the conditions, including the cost limits, set by the PHA. The MPS which governs the design has regulations encouraging the inclusion of special design attributes.

*Source: Housing in the 70's, National Housing Policy Review Report, page 123.

Upon completion, the developer turns the keys to the project over to the Agency. Prior to the construction, HUD signs an Annual Contributions Contract with the PHA. This guarantees HUD's yearly contribution toward the bonds which finance the project.

The flow chart, Exhibit 2c, indicates the activities of the participants in the process (HUD, the PHA, the Developer, the inspection architect, the A-95 Committee and the Local Executive) in Turnkey Public Housing projects (see Exhibit 2c fold-out, page 113).

E. DISCUSSION ON THE EXHIBITS

Exhibit 1 - Basic Processing Flow Models for Selected Existing HUD Programs, Showing Entry Points for POE

The Multifamily Mortgage Insurance (MFMI), Section 8 New Construction, Turnkey Public Housing programs, and Section 8 piggy-backed with MFMI are modeled in very basic form. The purpose is to show where HUD needs and issuances are developed, reviewed, and approved, where proposals and designs are submitted, reviewed and approved; and where environment assessments, standards, and regulations need to be considered and dealt with. It is at the design criteria development ■, submission ▲, and review/evaluation approval ● points where POE data are needed.

Exhibits 2a, b, c - Processing Flow Models, Three HUD Programs

These are the more detailed (yet in themselves simplified) processing flow models for the three representative existing HUD programs. They are described more fully in the report. Symbols (■ ▲ ●) indicate where POE information is needed.

Exhibit 3 - The Basic POE Process

For a project, once an entry point for POE is established (see Exhibits 1 and 2), the POE process begins. Four stages are POE information development and/or assembly; POE information application/utilization; construction; and POE of occupied buildings(s).

In stage 1, if a data bank (which could be a clearinghouse) exists, steps 1.1 through 1.4 are taken. If no data bank exists, the ad hoc steps 2.1 - 2.4 are taken. In either case it may be necessary to conduct POE (s) on existing, similar buildings. Figure IV 3 models the process for conducting a POE, taken from the Handbook prepared by ERDF.

If POE data suggest a code or MPS variance or change, additional steps may be taken. Such procedures are detailed in Exhibits 4 and 5.

Finally, all relevant POE data for a project are assembled, appropriate to the processing activity and HUD program (step 3). This chart is derived from Exhibits 1 and 2. During this second stage, HUD reviews and approves as necessary.

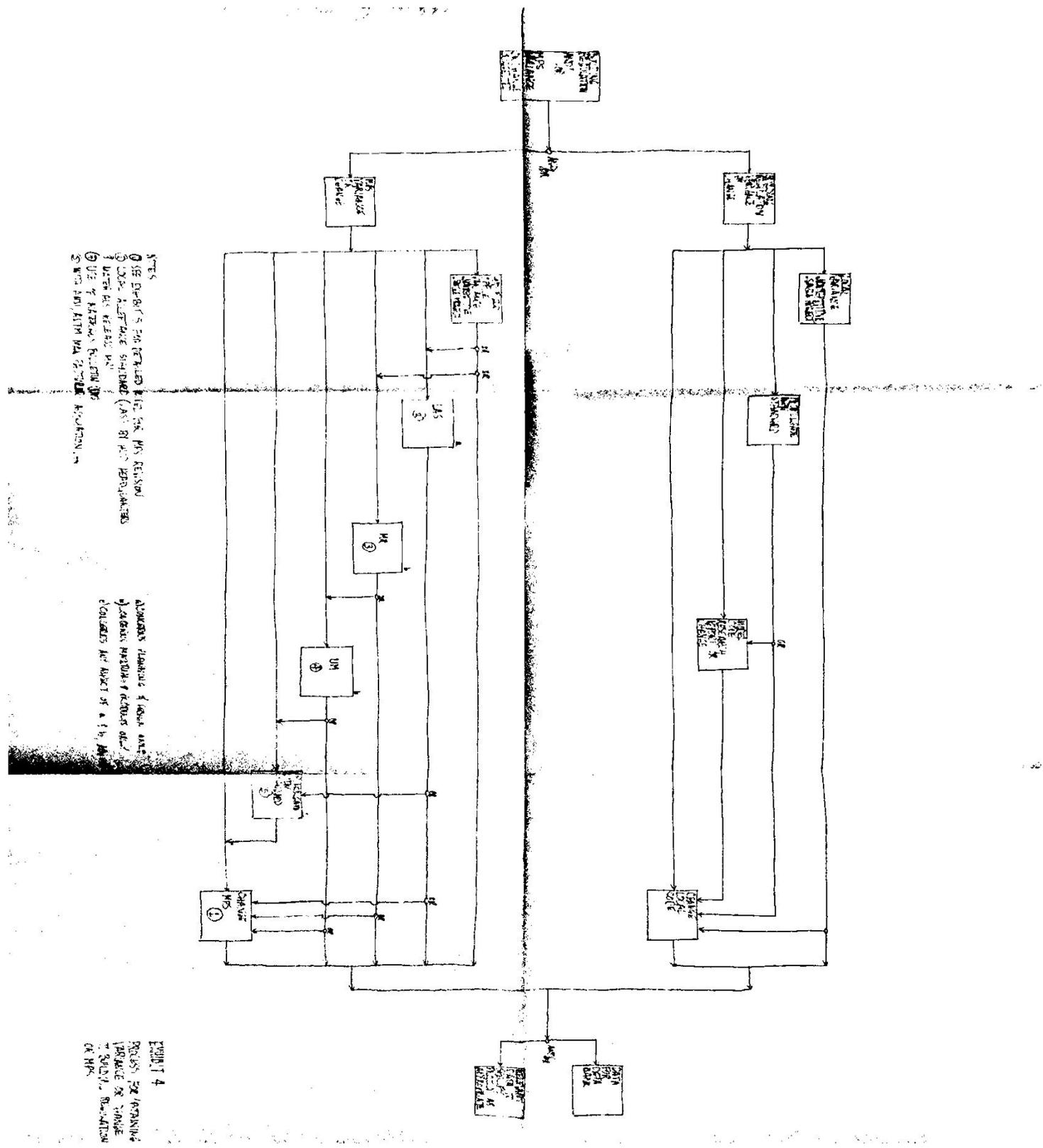
After the project is constructed and occupied for a period of time (one to two years) a POE is conducted on the project. These data feed back to the data bank for future reference.

Exhibit 4 - Process for Obtaining Variance or Change to Building Regulation or MPS.

If a variance to design criteria or materials selection criteria is suggested by POE or other source, this process is followed. A variance may be local, non-repetitive and for a single project. Or it may lead to a request to revise an MPS or code.

Exhibit 5 - MPS Revision Processing Flow

An MPS revision can be requested from any one of seventeen sources. If the proposed revision is restrictive and the substance is major, a lengthy process may be initiated. It is published at least twice in the Federal Register (FR). If an Environmental Impact Statement (EIS) is required, additional steps are necessary with two publishings in the FR. The EIS process is illustrated in Exhibit 6 (see pages 122, 123, and 124).



NOTES
 1. SEE DRAWING FOR DETAILS OF THE MOTOR RELAY
 2. LOCAL ALTERNATE STARTING (LAST OF TWO REVERSING)
 3. USE OF REVERSING RELAY FOR
 4. MOTOR AND ALTERNATE REVERSING

ADDITIONAL DETAILS & CONNECTIONS
 1. LOCAL REVERSING RELAY (SEE DRAWING)
 2. CONTACTS AND POINTS OF A 1/2 IN.

FIGURE 4
 SCHEMATIC OF A MOTOR
 CONTROL SYSTEM
 WITH REVERSING
 AND STOP

INITIAL DETERMINATION OF REQUIRED ENVIRONMENTAL CLEARANCE FOR PROJECT ACTIONS

Answer each question and follow the appropriate arrow:

Is it immediately evident that the proposed project has an unavoidable and unacceptable environmental impact? Yes → Reject

Is it immediately evident that the proposed project has a significant environmental impact? Yes →

Is the proposed project in an unacceptable noise zone (Circular 1390.2*)? Yes →

Is the proposed project a New Community or a Title X Mortgage Insurance for Land-Development project? Yes →

Does the proposed project involve new construction or substantial rehabilitation in a discretionary (normally unacceptable) noise zone (Circular 1390.2*) which is:

(1) new development in a largely undeveloped area? Yes →

(2) infill in existing development? Yes →

Is the proposed project above threshold (see Appendix-A-1) Yes →

"Circular 1390.2 applies to construction and substantial rehabilitation of residential and other noise-sensitive uses such as nursing homes, hospitals, and group practice facilities.

NORMAL ENVIRONMENTAL CLEARANCE SPECIAL ENVIRONMENTAL CLEARANCE ENVIRONMENTAL IMPACT STATEMENT

INITIAL DETERMINATION OF REQUIRED ENVIRONMENTAL CLEARANCE FOR PROJECT ACTIONS (continued)

Does the proposed project have an effect on a property listed on, or nominated to the National Register of Historic Places? Yes →

Does the proposed project have an adverse effect on a property listed on, or nominated to the National Register of Historic Places? Yes →

NORMAL ENVIRONMENTAL CLEARANCE SPECIAL ENVIRONMENTAL CLEARANCE ENVIRONMENTAL IMPACT STATEMENT

FLOWCHART OF ENVIRONMENTAL CLEARANCE PROCEDURES

NORMAL ENVIRONMENTAL CLEARANCE

Consistency check with HUD environmental policies and standards and brief evaluation of environmental impact (HUD Forms ECO-1 and ECO-2)

If there exist environmental impacts which are unavoidable and unacceptable, the proposal is rejected.

If there is no significant environmental impact clearance is complete; processing of the proposal may proceed.

If there is significant or potentially significant environmental impact, proceed to Special Clearance or Environmental Impact Statement, as appropriate.

SPECIAL ENVIRONMENTAL CLEARANCE

Preliminary version of section 102(2)(C) analysis (HUD Forms ECO-1 and ECO-3)

If there exist environmental impacts which are unavoidable and unacceptable, the proposal is rejected.

If there is no significant environmental impact, a Finding of Inapplicability is made; processing may proceed.

If there is significant or potentially significant environmental impact, proceed to Environmental Impact Statement Clearance.

FLOWCHART OF ENVIRONMENTAL CLEARANCE PROCEDURES
(cont'd)

ENVIRONMENTAL IMPACT STATEMENT

Draft EIS prepared by Hud field staff under supervision of AO/IO Environmental Clearance Officer, approved by RO-ECO.

Draft EIS distributed to CO-ECO, CEQ, other Federal agencies, A-95 agencies, and appropriate local agencies and other interested parties, and made available to the public.

Comments received and evaluated.

If evaluation reveals unavoidable and unacceptable environmental impacts, proposal is rejected.

If substantive comments are received, response is determined, project modified as appropriate, or reasons developed for not modifying; proceed to Final EIS.

If no substantive comments are received, proceed to Final EIS.

Final EIS prepared by field, including comments received and HUD response, and approved by RO-ECO.

Final EIS distributed to CO-ECO, CEQ, A-95 agencies, Federal agencies which had substantive comments on the Draft, and appropriate local agencies and other interested parties, and made available to the public.

If no substantive comments are received, processing may proceed.

If substantive comments are received, they should be taken into consideration prior to final action.

HUD action may be taken no sooner than 90 days after Draft and 30 days after Final EIS are released.

TASK IIIb

Identify and Discuss Constraints in the Building Process to the Use of Post Occupancy Evaluation

A. Introduction

In order to determine which constraints to the use of POEs were most salient, a list of constraints was derived from a consensus of consultants, advisors, and the subcontractor. This list recognized four kinds of constraints.

1. Economic Constraints

- a. The added cost of the POE.
- b. Working out a method of professional compensation.
- c. Current ceilings on partial and total costs.

2. Time Constraints

- a. Adding time to the development.
- b. Increasing design time.
- c. Time required between occupancy and evaluation.

3. Bureaucratic Constraints

- a. Compartmentalization within HUD and other agencies which resist linking development and standards with management.
- b. Absence of and resistance to mechanisms for feedback.
- c. General resistance to change in all agencies but especially at adding a new step in the housing process.
- d. Difficulty in modifying current forms and procedures.
- e. Reliance on MPS as the determiner of quality.
- f. Fragmentation of participants at federal, regional, and local levels.
- g. Rigidity of interpretation on how funding instruments can be used.
- h. Reliance on an outmoded view of marketability to determine consumer desires.
- i. A lack of knowledge among decision makers of what knowledge is needed at review levels in the field.
- j. Lack of knowledge about POEs in general.
- k. Disbelief in the usefulness of research.

4. Political Constraints

- a. Resistance to the use of POEs because of its potential embarrassment to present methods.
- b. Each level of government preferring its own method of operation.
- c. Resistance to any kind of federal intervention at the local or state levels.

- d. Inconsistencies across local government.
- e. POE not having a political value as yet.

These constraints were added to the original list from the HUD RFP and pretested on a number of housing officials, architects, builders, and planners. A final list of 23 items was realized and incorporated into the questionnaire in wording that more precisely defined the type of constraint. Respondents were asked to check the list of constraints that were most relevant to them and then were asked to rate these in terms of how easy they would be to change on a five point scale 1= very easy, 5= very hard.

B. Data on Constraints Found to be Most Relevant

Table III-2 shows the constraint marked most relevant for a majority of bankers, builders, landscape architects, planners, and interior designers was the lack of involvement with a building after it was built. Federal employees felt the most relevant constraint was the lack of a legal mandate to do POEs. Architects felt the most relevant constraint was that current financing would not permit the kind of changes POEs would show were needed. Housing officials felt current fee structures would not permit paying for POEs (see Table III-2 on following page).

Second most frequent choices show an array of financial constraints. Bankers, landscape architects, and interior designers chose next most frequently the inability to change fee structures to pay for POEs. Builders and housing officials chose the rising cost of housing and federal employees and architects chose current financing constraints. The total picture is one chiefly of a lack of involvement after housing is built with financial constraints a second most frequently chosen constraint. Any strategy that attempts to implement POEs must direct itself toward changing this lack of involvement.

C. Data on Ease of Changing Constraints

Although technically speaking Table III-3 shows the constraints actually rated easiest to change, the instructions resulted in a greatly reduced number of respondents rating many of these particular constraints. The respondents were asked to designate constraints they thought were relevant and then to rate them for ease of change. Some of the constraints in Table III-3 were not chosen as relevant by very many respondents and some of the means represent as few as four. A more meaningful rating would be to take the top three constraints chosen by each group and compare the ratings of ease of change on each of these (see Table III-3 on following page).

Averaging the means of all those groups who chose a particular constraint weights the numbers in each group equally.

Of the seven constraints listed most frequently as relevant, a lack of published standards shows the lowest average mean (3.0). However, only two groups chose this constraint most frequently as opposed to five groups that chose lack of involvement after built. The mean for lack of involvement

TABLE III-2
Most Relevant Constraints Chosen by Professionals

Group:	Bankers		Federal Employees		Builders		Landscape Architects		Architects		Planners		Interior Designers		Housing Officials	
	Involvement after built		Lack of legal mandate		Involvement after built		Involvement after built		Current financing changes		Involvement after built		Involvement after built		Involvement after built	
Chosen most often	63.6		46.8		77.4		69.4		69.4		65.1		61.5		66	
Chosen next most	Inability to change fee structure		Inability of current financing		Rising cost of housing		Fee structures		Current financing pay for POE		Lack of legal mandate		Fee Structures		Rising cost of housing	
Percent	63.6		40.6		64.5		52.8		65.3		62.7		61.5		65.4	

TABLE III-3
Constraints to the Use of POEs that Are Easiest to Change

Group:	Bankers		Federal Employees		Builders		Landscape Architects		Architects		Planners		Interior Designers		Housing Officials	
	Existing way of doing business		Inability to compete using POEs		Cannot find trained personnel		Already too much information		Existing way of doing business		Lack of common language		Cannot find POE techniques		Lack of involvement after built	
Easiest to change constraint	2.5		2.0		2.2		2.7		1.4		2.0		2.0		2.7	
Mean Rating	2.5		2.0		2.2		2.7		1.4		2.0		2.0		2.7	

was 3.07, scarcely different from the lack of published standard rating. Therefore, it would be safe to say that of the seven most frequently chosen constraints, lack of involvement after built was rated easiest to change.

By reversing the direction of the data, the rising cost of housing is seen to be the most difficult of the seven constraints to change with a mean of 4.25. Financing the changes that POEs would show needed was next most difficult to change and is rated 3.85.

D. Discriminant Function Analysis of Constraints

The discriminant function analysis tests which item in question thirteen discriminates among the various groups of professionals. Another way to look at this is it shows which item they disagree on most significantly. Further, the discriminant function analysis tests which of all the different variables the professional groups disagree on most.

The analysis was very clear: of all 23 constraints listed in question thirteen, only two significantly discriminated among the groups, items one and two. Item two (lack of involvement after building) accounts for 8.9%. The Chi square for item two is 100.52 (df=18) and P .001 for item one the Chi square is 9.80 (df=8) but the P is .279.

Essentially, this means that item two is the only variable in the constraints on which respondents disagreed to a point of statistical significance. Yet, even this difference is not large, for when the attempt is made to classify groups by their answers to items one and two (i.e. making these discriminant functions) only seventeen percent of the respondents can be classified correctly.

This analysis of constraints agrees fairly well with later analyses which show that the professional groups as a whole do not differ significantly across most variables.

E. Discussion of Research Findings

Since the constraint, "Your organization's lack of involvement with housing after it has been built," was selected by the greatest number of housing professionals and also rated the easiest to change, of the most relevant constraints, this finding must become the central focus of any recommendation dealing with constraints. When one asks what this particular constraint means, it becomes clear it is a generalized term dealing with many kinds of constraints. For bankers becoming involved with the building after construction would be different from what this involvement would mean for architects and builders. First, it would be necessary to develop some focus for concern over what happens to a building after construction. As the system now exists, there are not only no rewards for post construction concerns, but there seem to be indirect rewards for a lack of concern. More specifically, the less permanent a building, the greater the likelihood that all professions can profit. The sooner there is a need for a new building, the sooner are all the professional services required again, the sooner a new

Ratings of Ease of Change of the Three Most Relevant Constraints

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Architects	Planners	Interior Designers	Housing Officials
Constraint chosen most frequently	Involvement after built	Lack of legal mandate	Involvement after built	Involvement after built	Financing to pay for changes	Involvement after built	Involvement after built	Inability to change fee
Rating of ease of change	3.25	2.9	2.8	2.9	3.8	3.5	2.9	3.7
Constraint chosen with next lower frequency	Inability to charge fee	Inability to finance POE	Rising cost of housing	Inability to change fee	Inability to finance POE	Lack of legal mandate	Inability to change fee	Rising cost of housing
Rating of ease of change	3.9	3.4	4.3	3.5	3.4	3.3	3.7	4.2
Constraint chosen with third highest frequency	Lack of legal mandate	Lack of standards	Lack of common language	Design changes	Inability to change fee	Lack of standards	Inability to finance POE	Inability to finance changes
Rating of ease of change	3.6	3.0	2.6	3.1	3.3	3.0	3.2	3.9

building needs to be designed, financed, and built. In short, there is an indirect investment in turnover. Furthermore, there is a lack of accountability to the residents of a structure which encourages an indifferent posture on the part of the housing production and management professionals. Making a house more satisfactory, more durable and more versatile is going counter to producing income for the professions. By no means does this mean to imply that the building professions are engaged in an effort to deliberately downgrade housing in order to make a living. These forces are better characterized as an attempt to get in and get out as quickly as possible because profits depend on short construction time and quick occupancy.

In order for the professions to become involved in a building after it is built, there must be some financial incentive. How could such financial incentives be developed?

Some incentives are naturally evolving as the economy makes it more difficult to continue building new housing. Retrofitting and renovation then become more attractive than new construction and a movement toward preservation of existing housing stock has begun. Therefore an interest in preserving housing as long as possible is already established as being more economical than turnover.

A second possibility exists in the developer-manager firm. Some developers manage the housing they build, hence have a long term interest in the housing after it is built. Two firms illustrate how involvement in the building after construction is enough to establish a firm interest in post occupancy evaluation. A developer in New Hampshire hired an environmental sociologist on the assumption that they could become more competitive with the knowledge from post occupancy evaluations. While at first they did not succeed, by 1976 they were winning four out of five competitions entered. They continued to use POEs because they would enable continuously better designs.

One Developer of Boston had never heard of POEs until the ERDF sub-contractor contacted him but he immediately saw the importance of providing such information. His experience with current building regulations was one of frustration because he felt the entire system was developed to stop with construction, leaving many problems for management that were difficult to handle.

Although these two examples do not necessarily generalize to all developer-management firms, they do illustrate how involvement after construction does provide an interest in POEs and POE information.

But the above illustrations of how professionals can become involved in buildings beyond the construction point are just that -- illustrations. There is little chance that many developers will be encouraged to attempt the management role and the new emphasis on rehabilitation will not essentially change the way of doing business in the housing system. More significant methods of financial incentives and penalties must be built into the system that apply to the present way of doing business. These strategies will be discussed in Tasks IVa and IVf.

TASK IIIc

Document Current Attitudes Toward POEs

A. Attitudes Toward the Use of POEs in Private Housing

1. Topics which POEs should cover

Question 3. Which topics would you like to see post occupancy assessments cover in order for them to be most useful to you? You may answer in either the public or private sector or both. Please rank each topic you think relevant in order of its importance to you.

Question 3 asked respondents to rank what topics POEs should cover in order for them to be most useful to the respondent. Fourteen topics were listed as derived from the pretesting. Respondents were asked to rank these in order of importance. Scores were recorded by counting the number of respondents who ranked an item first or second.

Ranking for this question (see Table III-5) show a dichotomy among the professions. Bankers, federal employees, planners, and housing officials rank health and safety factors first, while architects, landscape architects, and interior designers rank the suitability of the design to occupants first. Only the builders stand outside this dichotomy. They rank what features sell better (as first or second) highest. Initially, there might be (at least) two explanations for this dichotomy. The bankers, federal employees, planners, and housing officials may be considered to be more familiar with health and safety regulations since these are more part of their everyday experience than architects, landscape architects, and interior designers. Hence, they would be more likely to see these as the prime consideration for POEs.

Another explanation might be that architects, landscape architects, and interior designers are more aware of POEs and that most POEs go beyond health and safety measures to assess the suitability of design for occupants. It is also possible that both factors are operating in these results.

Adding across all professions, 80 or 20% of all respondents ranked suitability to occupants as the most important topic for POEs to cover. Housing officials tended not to answer for the private housing sector, however. Their percentages of responses are much lower than in the public sector.

Looking at the topics ranked next most frequently as most important, the dichotomy is no longer evident. Bankers and housing officials rank maintenance and custodial costs as next most important, architects and landscape architects rank the evaluation of original design intentions, planners rank locational aspects, federal employees rank operating costs, builders rank whether the design and amenity features suit occupants, and interior designers rank environmental esthetics (see Table III-6).

If one were to recommend the primary topics for POEs, health and safety factors would have to be included as well as suitability to

TABLE III-5

Topics Ranked Most Frequently First or Second to be Included in POEs for Private Sector Housing

Group :	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Topics ranked highest	Health/Safety	Health/Safety	What features sell better	Whether features suit occupants	Health/Safety	Whether features suit occupants	Whether features suit occupants	Health/Safety
Percent ranking first or second	40.9	21.2	29	41.7	34.9	46.9	52	9.2

TABLE III-6

Topics Ranked Next Most Frequently to be Included in POEs for Private Sector Housing

Group :	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Topics ranked next more frequently	Maintenance & operating costs	Operating costs	Whether features suit occupants	Original design	Location	Original Design	Environmental Esthetics	Maintenance
Percent	36.4 (each)	18.2	19.3	30.6	30.2	34.7	40	7.4

occupants which is generally not the case in most POEs done today. Health and safety factors are generally ignored (see Task IIC, Topics included in POEs).

2. Primary Objectives of POEs.

Question 4a. In your view, what should be the primary objectives of post occupancy assessments? You may answer in either the private or public sector, or both. Please rank each objective in its order of importance.

Respondents were asked to rank 11 objectives for POEs to accomplish as derived from pretested choices. The response among the eight professional groups was unanimous that POEs should have as their primary objective making changes in future housing to better suit residents (no table). As a total across all professions, 119, or 29.7% ranked this objective in first or second place.

The objectives ranked next most frequently were investment for bankers, quality of housing for planners, architects, and housing officials, original design evaluation for landscape architects and federal employees, housing market for builders and improving the general level of knowledge and housing markets for interior designers (see Table III-7).

3. Who Should Pay for POEs?

Question 9. Who should pay for post occupancy assessments in both private and public sectors? Please rank in order of most preferred for each sector.

Respondents were asked to rank who should pay for POEs among a list of 15 parties derived from pretesting. Six of the eight professional groups feel that the developer should pay for POEs in the private housing sector. Bankers feel the consumer and builder should pay and the builders feel HUD should pay. The unanimous second choice for all professional groups was HUD (no tables).

4. Who Should Perform the POEs?

Question 10. What individuals would you select to actually carry out post occupancy assessments? Please rank in order of preference for both private and public sectors.

Respondents were asked to rank their preference for who should actually carry out post occupancy assessments from among a list of twenty agents determined by pretesting (question 10). Four professional groups (Federal Employees, Landscape Architects, Planners, and Interior Designers) named an interdisciplinary team as their first or second choice to carry out POEs. Bankers felt the occupant should conduct the POE, builders felt they (builders) should conduct the POEs, architects felt they (architects) should conduct the POEs and housing officials felt they

TABLE III-7

Objectives of POEs Ranked Next Most Frequently for Private Sector Housing

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Objectives ranked next most frequently	Investment	Original design evaluation	Housing market	Original design evaluation	Housing quality and housing markets	Housing quality	General knowledge	Housing quality
Percent	36.4	21.2	32.3	36.1	23.2 (each)	36.7	36	4.3

TABLE III-8

First Choice as to Who Should Conduct POEs for the Private Housing Sector

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Agents ranked most frequently	Occupant	Interdisciplinary team	Builders	Interdisciplinary team	Interdisciplinary team	Architects	Interdisciplinary team	Developer Housing Managers
Percent	31.8	39.4	25.8	36.1	51.2	48.9	36	11.1

(housing officials) should conduct the POEs. Thus, three professional groups felt they themselves should conduct the POE while four groups opted for an interdisciplinary team (see Table III-8).

As a second choice three professional groups, federal employees, landscape architects, planners chose architects as the agents who should carry out the POE. Bankers and builders chose HUD representatives as their second most frequently chosen agents. Architects and housing officials chose an interdisciplinary team and interior designers chose builders (see Table III-9). Generally, however, results show an interdisciplinary team as the proper group to conduct POEs.

5. How Should Results of POEs be made Public and Available?

Question 11. How should the results of post occupancy assessments be made public and available? Please rank by order of preference for both private and public sectors.

When respondents were asked to rank how POE results should be made public and available five professional groups (bankers, builders, planners, architects, and interior designers) chose existing trade journals most frequently from among ten alternatives developed by pre-testing. Federal employees, landscape architects, and housing officials, twenty-nine percent of all respondents (119), made existing trade journals their first or second choice (see Table III-10).

6. Methods for Promoting POEs.

Question 14. Select those methods below which you consider most effective in promoting the use of post occupancy assessments. Please rank the ones selected by order of their effectiveness for both private and public sectors of housing.

Respondents were given a choice from among eleven methods for promoting the use of POEs which were developed in pretesting. Planners, architects, and interior designers ranked increasing the housing industry's awareness of POEs as their most frequent first or second choice. Landscape architects and housing officials chose providing financial incentives as the best method for promoting use of POEs. Bankers and builders chose making POE results more accessible as the best method for promoting POEs. Federal Employees chose developing better POE methods as the best method for promoting POEs. Increasing the awareness of POEs in the housing industry was chosen by 22.6% of all respondents (see Table III-11).

7. Discriminant Function Analysis of Attitudes toward Private Housing

While the professional groups were separated to a great degree on their answers to attitudes on private housing compared to their answers on constraints, the discriminants were still only able to classify 42.6 percent of all the 401 cases. In other words, while these differences

Second Choices as to Who Should Carry Out POEs in the Private Housing Sector

Groups: Bankers Federal Employees Builders Landscape Architects Planners Architects Interior Designers Housing Officials

Agents ranked next most frequently	HUD Representative	Architects	HUD Representative	Architects	Architects	Interdisciplinary team	Builders	Interdisciplinary team	20	9.8
Percent	27.2	12.1	22.5	27.8	27.9	44.9				

TABLE III-10

Most Frequent First or Second Choice as to How POE Results Should be Made Available for Private Housing

Groups: Bankers Federal Employees Builders Landscape Architects Planners Architects Interior Designers Housing Officials

Method ranked most frequently	Existing trade journals	Clearing house	Existing trade journals	Clearing house and new publication	Existing trade journals	Existing trade journals	Existing trade journals	Existing trade journals	60	13.6
Percent	50	21.2	45.2	41.7 (each)	41.9	48.9				

are statistically significant, they do not classify more than half of the cases as belonging to identifiable groups on a basis of answers.

Six questions discriminated maximally among the professional groups. These were:

F Test*

Attitude

- | | |
|-----|--|
| 7.9 | 1. Who should carry out POEs? - Architects |
| 7.3 | 2. What topics should be included in POEs? -Health and Safety |
| 6.7 | 3. What topics should be included in POEs? -Locational aspects |
| 5.0 | 4. What topics should be included in POEs -Whether original design intentions were correct |
| 4.7 | 5. Primary objectives of POE - To improve general knowledge about the planning and design of housing |
| 5.9 | 6. What topics should be included in POEs? -Flexibility of interior spaces |

Most of the discriminant questions (4) were over what topics should be included in POEs and it will be recalled that this question divided the professions between bankers, federal employees, planners, and housing officials on the one hand and architects, landscape architects, and interior designers on the other. The latter group are the design professions and they tend to emphasize suitability of POEs to users' needs as opposed to the health and safety emphasis of the other professions. If there is any smaller grouping that would characterize these eight professional groups it would probably be the grouping into design professionals vs. others. Yet, even this dichotomy does not hold up well when considering constraints or the public housing attitudes listed.

The conclusion seems inescapable that at least by these data the professions do not fit into a clearly defined pattern in regard to POEs. Professional lines are constantly crossed when the many aspects of POEs are considered.

B. Attitudes Toward the Use of POEs in Public Housing

1. Topics which POEs should cover. (question 3)

Respondents were asked to rank fourteen topics that would be most useful to them to include in publicly assisted housing (question 3).

*All F Tests are significant below the .01 level

Since this ranking was side-by-side with the ranking for private sector housing, there might have been some influence from comparing ranks in both sectors.

Bankers, federal employees, and planners chose health and safety factors as their most frequent first and second choice to include in POEs for publicly assisted housing. Landscape architects, architects, and interior designers chose suitability to activities and life styles of occupants as their most frequent first or second choices. Housing officials chose maintenance and repair factors. Builders seemed largely divided on how to answer this question since many did not deal with public housing and felt it outside their province.

Comparing answers to this question (Table III-5) on public and private (Table III-12) sectors of housing reveals few differences. Housing officials chose health and safety factors for private housing and maintenance and repair factors for public housing. Builders wanted what sells in housing for the main topic in private housing but were uncertain what to answer for public housing.

The answers for both public and private sectors seem to be divided between the health and safety factors and the suitability to occupants view (see Table III-12 following page).

2. Primary Objectives for POEs (question 4a)

Given a choice among eleven objectives for POEs in publicly assisted housing (question 4a) federal employees, landscape architects, planners, architects, interior designers, and housing officials chose the objective that POEs be made for making changes in future housing to better suit residents. Bankers chose improving housing quality as their primary objective while builders were again too divided in their answers to be able to select one above others (see Table III-13 on page 140).

These answers are nearly the same for both public and private housing.

Objectives selected next most frequently for public housing differ widely from those second objectives ranked for private sector housing (see Tables III-6 and III-14). Bankers selected future housing next most frequently, federal employees chose existing housing and so did housing officials. Planners and interior designers chose improving general knowledge and architects chose housing quality. Builders and landscape architects were divided among three or more objectives as next most frequent choices.

3. Who Should Pay for POEs? (question 9)

When respondents were asked to choose from among 15 agents who should pay for publicly assisted POEs, the most frequent first or second choice among the eight professional groups was HUD. Among five of those groups (landscape architects, planners, architects, interior

TABLE III-11

Methods Most Effective in Promoting POEs in the Private Housing Sector

Group:	Bankers	Federal Employees	Builders	Landscap Architects	Planners	Architects	Interior Designers	Housing Officials
Method selected	Results more accessible	Develop better POE methods	Results more accessible	Provide financial incentives	Increase awareness	Increase awareness	Increase awareness	Develop financial incentives
Percent	36.4	24.2	32.3	36.1	39.5	38.8	32	17.9

TABLE III-12

Most Frequent First or Second Choice of Topic to be Included in POEs for Public Housing

Group:	Bankers	Federal Employees	Builders	Landscap Architects	Planners	Architects	Interior Designers	Housing Officials
Topic chosen most frequently	Health and safety	Health and safety	?	Suitability to occupants	Health and safety	Suitability to occupants	Suitability to occupants	Maintenance and repairs
Percent	18.2	39.4		25	32.6	46.9	44	45

TABLE III- 13

Objectives as next most frequent choices

Group: Bankers Federal Employees Builders Landscape Architects Planners Architects Interiors Designers Housing Officials

Objective chosen as 1 or 2 most frequently	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interiors Designers	Housing Officials
Better housing quality		Future housing	?	Future housing	Future housing	Future housing	Future housing	Future housing
Percent	18.2	48.5		36.1	60.5	46.9	60	54

TABLE III- 14

Most Frequent First or Second Choice of Objective for POEs in Public Housing

Group: Bankers Federal Employees Builders Landscape Architects Planners Architects Interiors Designers Housing Officials

Objective chosen as 1 or 2 most frequently	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interiors Designers	Housing Officials
Future housing		Existing housing & original design	?	?	Improve general knowledge	Housing quality	Improve general knowledge	Existing housing
Percent	13.6	36.4 (each)			25.6	11.7	28	29

designers, and housing officials) this was a majority choice. These choices contrast with the private sector choices where six of the eight groups chose the developer as the agent who should pay for POEs. The second most frequent choice, even in the private sector, was HUD, however (see Table III-15).

4. Who Should Perform POEs? (question 10)

When respondents were asked to rank who should carry out POEs from among 20 possible agents, federal employees, landscape architects, planners, and interior designers chose an interdisciplinary team. Bankers and builders chose HUD. Housing officials chose housing management while architects were divided between themselves and an inter-disciplinary team. These results are comparable to the answers for private sector housing with the differences that bankers chose occupants over HUD for private housing and builders chose themselves over HUD (see Table III-16).

5. How Should Results of POEs be made Public and Available? (question 11)

When asked how POE results should be made available bankers, federal employees, planners, architects, and interior designers chose existing trade journals as the best means. Builders chose existing publications and memos, and housing officials chose the Minimum Property Standards (MPS). These results are roughly comparable to those in private sector housing with the exception that two more groups chose the clearing house for the private sector (see Table III-17 on page 143).

6. Methods for Promoting POEs. (question 14)

When asked to rank eleven methods for promoting POEs in public housing four groups, builders, planners, architects, and housing officials chose "Increasing housing industry's awareness of the need for post occupancy assessments." Builders also selected "making results more accessible," and planners chose "providing financial incentives as ties with the "increasing awareness" ranking.

Bankers were not able to choose any one or two methods as predominant. Federal employees chose "Developing better POE methods," landscape artists chose, "Providing Financial Incentives," and interior designers chose making results more accessible (see Table III-18 on page 143).

The only way these results differ from private housing is that housing officials feel financial incentives would be better for private housing and interior designers feel increasing awareness for private housing would be a better method.

7. Discriminant Function Analysis of Attitudes Toward POEs in Public Housing.

Similar to the attitudes toward POEs in private housing, the attitudes in public housing correctly classify about 40% of the professionals (44.4%).

TABLE III-15

Most Frequent First and Second Choices of Who Should Pay for POEs in Public Housing

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Most frequent first or second choice	HUD	HUD	HUD	HUD	HUD	HUD	HUD	HUD
Percent	18.2	36.4	32.3	55.6	60.5	61.2	52	57.4

TABLE III-16

Most Frequent First and Second Choices of Who Should Conduct POEs in Public Housing

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Most frequent first or second choice	HUD	Interdisciplinary team	HUD	Interdisciplinary team	Interdisciplinary team	Architect and interdisciplinary team	Interdisciplinary team	Housing Management
Percent	22.7	57.6	22.5	36.1	46.5	46.9 (each)	48	35.3

Most Frequent First and Second Choices for Making POE Results Available in Public Housing

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Most Frequent first or second choice	Trade Journals	Trade Journals	Existing Publications	Clearing house	Trade Journals	Trade Journals	Trade Journals	MPS
Percent	27.2	30.3	25.8	36.1	41.9	44.9	44	40.7

TABLE III-18

Most Frequent First and Second Choices of Methods for Promoting POEs in Public Housing

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First or Second Choice	?	Develop better POE methods	Increase awareness and make results more accessible	Provide financial incentives	Increase awareness & provide financial incentives	Increase awareness	Make re-sults more accessible	Increase awareness
Percent		36.4	12.9 (each)	38.9	34.9 (each)	44.9	32	32

Seven responses to questions served to discriminate maximally among the groups:

F Test*

Attitude

- 5.9 1. Who should carry out POEs? - Local housing agency
- 6.6 2. What topics should be included in POEs? - Health and safety
- 4.0 3. Who should pay for POEs? - Architect
- 4.5 4. Primary objectives of POEs? - Better housing quality
- 4.6 5. Primary objectives of POEs? - Preventive maintenance
- 4.7 6. Who should carry out POEs? - Housing management
- 4.3 7. Who should carry out POEs? - Interdisciplinary team

The attitudes that discriminate on POEs in public housing are different from those that discriminated in private housing even though attitudes in both those areas do not differ themselves very greatly. Who should carry out POEs, and primary objectives of POEs account for a majority (5) of the discriminating questions as opposed to topics to be included in POEs which were a majority of the discriminant questions in private housing.

Once again, the finding is that the professional groups do not differ very markedly in their attitudes towards POEs.

C. What Specific Items Should be Included in POEs. (Housing in General)

1. Site, Location, and Community Related Aspects

When respondents were asked to rank four site characteristics which needed to be included in POEs (question 5a), there was unanimous agreement on two of these items, availability and accessibility of site amenities and services and general community and neighborhood design. Bankers, landscape architects and planners felt general community and neighborhood design to be most important while the remaining five professional groups chose the more functional availability of services. Clearly both aspects should be included according to these data (see Table III-19).

2. Functional and Space Related Attributes of Housing

When respondents were asked to rank seven functional and space-related aspects of housing, there was remarkable unanimity in choosing interior layout/floor plan as the most important aspect to be included in the POE. Room sizes was clearly the second choice with only landscape architects differing by their choice of access to the exterior as a second choice (see Table III-20).

*All F Tests are significant at the .01 level.

TABLE III-19
Site and Community Related Items that Need to be Included in POEs

Groups:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	General community and nghbd design	Availability of services	Availability of services	General community and nghbd design	General community and nghbd design	Availability of services	Availability of services	Availability of services
Percent	77.2	66.7	64.5	80.5	72	75.5	76	76
Second rank	Availability of services	General community and nghbd design	General community and nghbd design	Availability of services	Availability of services	General community and nghbd design	General community and nghbd design	General community and nghbd design
Percent	63.6	63.6	54.8	61.1	65.1	73.5	60	62.3

TABLE III-20

Functional and Space Related Attributes of Housing that Need to be Included in POEs

Groups:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Interior layout	Interior layout	Interior layout	Interior layout	Interior layout	Interior layout	Interior layout	Interior layout
Percent	81.8	78.8	67.7	75	81.4	93.9	96	65.4
Second rank	Room sizes	Room sizes	Room sizes	Room sizes	Room sizes	Room sizes	Room sizes	Room sizes
Percent	68.2	57.6	61.3	50	58.1	53	80	52

3. Safety and Health Aspects of the POE.

When asked to rank five safety and health aspects of POEs, respondents were close to unanimity in choosing fire prevention as the most important aspect to be included in POEs with lock and security systems as next in importance. Only builders placed lock and security systems above fire prevention (see Table III-21)

4. Living-Environment Related Attributes of Housing to be Included in POEs.

The professionals are split between acoustic and visual privacy and appearance/image as the main living/environment related attributes to be included in the POE. A slim majority of the total responses (51.1%) prefer the acoustical and visual privacy (see Table III-22).

5. Cost/Time Related Attributes of Housing

Housing officials feel maintenance and custodial attributes are most important of the cost/time related attributes of housing to be included in POEs, and landscape architects feel the cost to modify the dwelling is most important. All other professional groups feel the electrical-mechanical operating costs are the most important cost/time related attributes to be included in POEs (see Table III-23 on page 148).

6. Construction Elements

Federal employees, builders, landscape architects, and interior designers feel site work is the most important construction element to be included in POEs. However, contrasted to other choices (e.g. cost/time related attributes above), opinions here are more divided and only landscape architects and interior designers show a majority in the choices. Bankers made a first choice of carpentry, planners and housing officials chose plumbing and architects chose moisture protection. Site work was chosen by an overall percentage of 35.7 (see Table III-24 on page 148).

D. More General Attitudes Toward POEs.

1. Does Use of POEs Provide a Competitive Edge?

Responses to question 6a on the questionnaire were scored 1 for definitely an advantage, 2 for somewhat of an advantage, 3 for no advantage, 4 for some disadvantage, and 5 for a handicap. No respondent felt it would be a handicap and the array of means in Table III-25 (see page 149) indicates that the average responses were between 1 and 2, definitely to an advantage.

2. Type of Firm that Would Benefit Most from Use of POEs.

All professional groups except interior designers feel that designers will benefit most from the use of POEs. Second choice was divided between builders and owner-operators. These results indicate that although professional groups feel the primary benefit of POEs

TABLE III-21

Safety and Health Aspects to be Included in POEs

Group :	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Fire Prevention	Fire Prevention	Locks	Fire Prevention	Fire Prevention	Fire Prevention	Fire Prevention	Fire Prevention
Percent	86.4	69.7	54.8	72.2	76.7	83.7	84	72.8
Second rank	Locks	Locks	Fire Prevention	Locks	Locks	Locks	Locks	Locks
Percent	54.5	69.7	45.2	69.4	62.8	49	76	67.3

TABLE III-22

Living-Environment Related Attributes to be Included in POEs

Group :	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Appearance/Image	Acoustic & visual privacy	Appearance/Image	Appearance/Image	Acoustic & visual privacy	Appearance/Image	Acoustic & visual privacy	Acoustic & visual privacy
Percent	50	63.6	38.7	63.4	58.1	65.3	52	53
Second rank	Acoustic & visual privacy	Natural & artificial lighting	Acoustic & visual privacy	Personalize	Appearance/Image	Acoustic & visual privacy	Ability to personalize	Noise
Percent	45.5	45.5	35.5	33.3	39.5	57.1	48	36.4

TABLE III-23

Cost/Time Related Attributes of Housing to be Included in POEs

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Design	Housing Officials
First rank	Elec. MECH.	Elec. Mech.	Elec. Mech.	Cost to modify	Elec. Mech.	Elec. Mech.	Elec. Mech.	Maintenance Custodial
Percent	72.7	66.7	70.9	55.5	62.4	83.7	60	69
Second rank	Repair	Main. Custod.	Main. Custod.	Elec. Mech.	Main. Custod.	Main. Custod.	Main. Custod.	Elec. Mech.
Percent	54.5	63.6	38.7	52.8	55.8	69.4	48	64

TABLE III-24

Construction Elements to be Included in POEs

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Design	Housing Officials
First rank	Carpentry	Site Work	Site work	Site work	Plumbing	Moisture protect.	Site work	Plumbing
Percent	45.5	30.3	22.6	72.2	39.5	40.8	56	32
Second rank	Sitework	?	Concrete	?	Sitework	Mechanical Equipment	Carpentry	Site work
Percent	31.8		19.4		32.5	36.7	36	30.5

TABLE III-25

Attitude Toward Whether Use of the POE Provides a Competitive Edge

Groups:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Mean Score	2.095	1.73	1.70	1.53	1.69	1.71	1.42	1.59

would be for designers, they also feel there are benefits for builders and owner-operators as well (see Table III-26).

3. Bearing the Cost of POEs.

Question 7a on the questionnaire asks whether the respondent's organization would benefit enough from POEs to bear a portion of its cost and question 7b asks what percentage of that cost. Most respondents indicated a willingness to bear the cost of POEs (99%) and the range of estimated cost to be borne was as follows in Table III-27 on page 151.

4. How would your agency employ POE personnel?

Question 8 asked which of four ways the respondents' agency would use to employ POE personnel if they were doing POEs (see Table III-28 on page 152). Bankers, federal employees, builders, planners, architects, and housing officials would prefer in house staff either part time or full time if their agency were doing POEs. Landscape architects and interior designers would prefer outside consultants.

5. Most Effective Language for Communicating Results of POEs

Question 12 asked respondents to rank seven methods of "languages" which should be used to communicate POE results (see Table III-29 on page 153).

Trade journals are the most preferred "language" to communicate POE results for bankers, builders, planners, interior designers, and housing officials. Counting overall responses shows 46.9% favor this method. Yet, the results of the Cogen, Holt study show that this method, and in fact all methods have been ineffective in having a significant

TABLE III-26

Type of Firm that Would Benefit Most from Use of POE

Group :	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Designers	Designers	Designers	Designers	Designers	Designers	Owner-Operators	Designers
Percent	50	48.5	51.6	77.8	69.8	65.3	68	64.2
Second rank	Builders	Owner-Operators	Builders	Builders	Builders	Owner-Operators	Designers	Owner-Operators
Percent	45.5	45.5	48.4	38.9	51.1	57	52	51.8

TABLE III-27

Average Percentage of POE that would be borne by Respondents' Organizations

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
Average Percent	56.3	58.3	67.9	61.4	50.3	58.2	62.4	20.6

effect on housing policy. While respondents may generally favor this method as one being the most familiar to them for purposes of communication, it should be kept in mind that trade journals will not necessarily produce any change in the use of POEs.

It should also be pointed out that performing a POE and the use of POE information are two different propositions. While conducting a POE itself may be considered by some as too costly and require an expertise that is beyond obtaining, the use of information gained from POEs may be welcome and immediately applied. More research needs to be done on the POE information issue.

6. Legal Responsibility of those Carrying Out POEs.

One of the questions often raised by architects in the use of social scientists is how legally responsible should the social scientist be? If the social scientist feeds incorrect information to the architect there is nothing the architect can do to recompense because only the architect is responsible. The law fixes on the architect the legal responsibility for all design decisions regardless of the source of information. Therefore, the question arises, how legally responsible should the person be who does post occupancy evaluations (see Table III-30)?

Totalling all responses, 45.6% favor public standards such as licensing and certification but 42.4% favor making the conductor of POEs as legally responsible as architects and contractors. Only federal employees choose no legal responsibility as a first choice, although builders and interior designers have it tied for a second choice. Most clearly favor

Most Preferred Way to Employ POE Personnel if Respondents Agency Were Doing POE

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	In house part time	In house full time	In house part time	Outside consultants	In house full time	In house part time	Outside consultants	In house part time
Percent	40.9	51.5	41.9	47.2	46.5	59.2	40	44.4
Second rank	In house full time	Outside consultants	Outside consultants and academics	In house part time	Academics	In house full time	In house part time	In house full time
Percent	36.4	39.4	35.4 (each)	38.9	41.8	44.8	32	33.9

TABLE III--29
Methods of Communicating POE Results Ranked Most Effective

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Trade Journals	Performance Requirements	Trade Journals	User Need Statements	Trade Journals	Performance Requirements	Trade Journals User Needs	Trade Journals
Percent	63.6	42.4	67.7	58.3	48.8	59.2	48	45.7
Second rank	User Need Statements	User Need Statements	User Need Statements	Schematic Drawings	Performance Requirements	Trade Journals	User Need Statement	Performance Requirements
Percent	22.7	39.4	32.3	41.7	46.5	46.9	40	38.3

Preferences for Legal Responsibility of Person Who Conducts POEs

Group:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Officials
First rank	Licensing	No way	Same as architects	Same as architects Professional Board	Licensing	Same as architects	Same as architects	Licensing
Percent	55	39.4	48.4	50 (each)	58.1	53	44	50
Second rank	Professional Board	Professional Board	Licensing and No way	Licensing	Professional Board	Licensing	Professional Board No way	Same as architects
Percent	40.9	36.4	35.5	31.6	46.5	46.9	36	40.7

some sort of legal responsibility. This issue, however, is not one immediately of consequence to the use of POEs. It belongs to a future time when POE procedures have become more standardized.

7. How Important is the POE?

While all the preceding questions on attitudes deal with the many aspects of the POE and its possible applications a central issue is just how important is it that the POE be done? If most professionals do not feel it is an important issue, then many of the attitudes become less important to consider.

Question 16 asked respondents to rate on a five point scale how important was it that POEs be done on housing (see Table III-31 below).

TABLE III-31

Ratings on the Importance of Doing POEs on Housing

Groups:	Bankers	Federal Employees	Builders	Landscape Architects	Planners	Architects	Interior Designers	Housing Official
Mean Response	3.85	2.2	3.3	1.82	2.4	2.25	1.65	2.29

A mean score of 3 would be neutral. One is very important and 5 is not important at all. Therefore, mean scores below three tend to be favorable while those above three tend to be unfavorable. Only bankers and builders see the POE as tending toward the unimportant side while all other groups see POEs as being important, especially landscape architects. These data are consistent with other questions that have dealt with the favorableness or unfavorableness of POEs. Bankers and landscape architects have usually appeared at the opposite extremes. From these and other data it would seem the bankers and builders will be the hardest to convince of the importance of POEs.

Strategies for dealing with professional attitudes towards POE will be dealt with in Tasks IVa and IVf.

TASK IVa

Identify, Develop, and Describe Strategies to Overcome
Restraints to the Use of Post Occupancy Evaluations

1. Basic Strategy for Social Change

One of the chief problems in implementing the POE is the failure of most professionals to see the POE use in the context of our society at large. If the POE is seen as a recent technological innovation that is beginning to be adopted by our society, then it has a set of problems common to other attempted technological innovations. This view is more often adopted by anthropologists who have studied the problems of technological innovation in foreign cultures (Spicer, 1952,* Goodenough, 1963)**. The research community in the United States, however, generally does not concern itself with technological innovations in our own culture. It is assumed that research findings will be utilized on a basis of their own merits. Any attempt by a researcher to implement his findings is seen as too partisan and tending to show the researcher is not objective.

The result is that the majority of POEs have found their way into scientific or semi-scientific publications with the assumption that is all the further they need to go.

The fact that POEs have not been accepted is well established. Not only did the Cogen, Holt (1975) report show that housing policy research in general had failed to be accepted, but Reizenstein (1975)*** in a survey of architects and planners found that only 20 per cent reported using any social science research even though 87 percent were aware of the research and 96 percent felt the physical environment influenced behavior. The chief reason why social science research (and, hence, POEs) is not used is that the basic training for the related professions does not include it. Both Cogen and Holt, and Reizenstein found this to be the case. Therefore, in looking at our society as a whole, a central strategy to be followed in getting POEs accepted is to change the training of professionals to include POEs. This may not be satisfying to the administrator who wants POEs now, but without the change in training, each future generation of professionals will have to be introduced to the POE in a never ending process of social change. One of the first priorities, then, is to introduce the POE in the undergraduate and graduate levels of schools of architecture, landscape architecture, psychology, sociology, and planning, and in the training of housing officials. Training packages, courses, textbooks, and all the paraphernalia of education must be focused in order to accomplish this task. An efficient way to accomplish this might be to contract out the educational effort, but it should not be done without including HUD staff as part of the educational effort. In any case, if the only way to involve HUD staff was by doing it in-house, then the in-house route should be taken. Interviews with a number of HUD headquarters staff indicate a skepticism about the usefulness of POEs and a very pervasive lack of knowledge about the subject.

A second part of the strategy of social change is to educate the general public in the usefulness of the POE concept in helping to resolve

*Goodenough, W. Cooperation in Change, Russell Sate Foundation, 1963.
**Spicer, E. (ed.) Human Problems in Technological Change, Russell Sage Fd., 1952.
***Reizenstein, Janet. Linking Social Research and Design, JAR, 1975 4, 26-38

many of the problems they've had with housing. Educating the public is an art (or science) not too well practiced. Witness the public education program on smoking. Yet some attempt must be made to bring the public to a point where they can ask such questions as: Does the design of this building incorporate the findings of previous post occupancy evaluations? Has a POE been done on the building I'm living in?

But public education is an enormous undertaking that could require millions. The operation of POEs could be done in such a way that POE research and findings involve public hearings at which residents who are to be surveyed or who have been surveyed can provide for resident input into the process.

Further, HUD memoranda are all that is required to insure that POE results are publicly posted and/or distributed in the language of the layman.

2. Strategy of Communication

One of the secondary constraints to the use of POEs has been the lack of communication of the importance and usefulness of POEs to professionals in the field. This was of special concern to builders in the survey and most professionals felt the trade journals should be used to communicate POE results. Most professionals also felt the awareness of POEs needs to be increased among all professions.

It was previously pointed out that trade journals do not produce the changes needed. While the professionals think this method may be the most effective way to communicate results, the evidence would seem to indicate this is not effective.

Another, but less favored method of communicating was by changing the existing standards like HUD/FHA minimum property standards. Existing standards was also rated the easiest of the relevant constraints to change (even though it was not the most relevant). The thinking behind the standards strategy was that professionals will notice standards they have to abide by.

In this regard federal employees (alone among the professionals) wanted legal sanctions as a more effective method. But a great deal of resistance was uncovered toward any new requirements or legal restrictions coming from the federal government. The resistance was expressed in comments made on the questionnaires and in reasons for refusing to fill out the questionnaire. Nevertheless, changing standards must be an ultimate goal of POE use. Most professional groups agree that POEs should affect the future design of housing and this can most effectively be made permanent by changing existing standards.

Yet the confusion and lack of knowledge about POEs must at least in some part be due to the fact that not a single program was using POE on a continuing basis. This was true of all the POE studies discovered with the notable exception of Sweden. All POE studies were of this "one shot" character so that the most effective use of the POE over time has not been fully demonstrated. AIA Research Corporation did a demonstration on POEs with three government agencies cooperating (Eberhard and Goglia, 1977)* The National Institutes of Health (NIH), The General Services Administration (GSA),

*Eberhard, John and Margaret Goglia, Post Occupancy Evaluations, Washington, DC., AIA Research Corporation, 1977.

and the Department of the Army.* This again was a one shot demonstration of POEs and while it called for their continued use, was not a demonstration of their effectiveness over the building cycle.

The Construction Engineering Research Laboratory (CERL) also has used POEs in several studies (Dressel, et al, 1975**Gibbs and Cramer, 1973)*** the POE was not used at any location over one building cycle. All POEs were used as one-time evaluations of a particular building or series of buildings. Such a demonstration has to be the basis of any effective communication about the usefulness of POEs. It has to be shown that POEs, used over several steps in time, result in measurably better and more effective housing designs. At least one, but preferably more longitudinal case histories would be the sine qua non of any effective communication. Therefore a more comprehensive demonstration of POE effectiveness is necessary.

3. Strategy of Implementation

The original RFP issued by PD and R on April 16, 1976 called for methods of implementing POEs at the operational level. Yet our research turned up a consistent picture of over-worked harassed officials who were in reality not able or just barely able to fulfill existing requirements. Time and again some consultant or official would recommend we call "X" local housing authority as the "best" example of some facet of housing operations, and when this lead was pursued the results were invariably the same. The operation was running at such a pace that it was extremely doubtful any procedure such as a POE could be introduced without actually adding new staff. There was no time to do luxuries like preventive maintenance, no time even to examine the data they now collect. The idea of collecting any new data was strongly resisted.

The same was true of architect's offices. At the time of writing (January, 1978) a number of architect offices across the country had gone out of business or consolidated. Only well-established offices had survived the last two years of tight budgets. There was little room for any added expense. In the survey architects showed more concern over the financial aspects of POEs than any other group. Yet they, more than any other professional group surveyed, felt they were the ones who could best perform POEs.

The few architectural firms that had begun to include POEs in their operations could be counted on the fingers of one hand. However, the number is increasing even during the time in which this report was written.

Given the above facts there is one further constraint that must be taken into account in implementing the POE. This is what amounts to a political constraint on the way research is done. Increasingly, in the past several years, the length of research contracts has been shortening. In the early 1960s and 1950s it was possible to do long term research that was justified by the nature of the problem being investigated. More recently, the time and budget constraints have forced shorter and shorter perspectives. In agencies with large turnover in personnel, such as HUD, it has always been difficult to achieve continuity over a period that is longer than an elected administration's term of four years. One year projects are

*HUD also assisted in this project but did not have a POE done on its buildings.

**see page 159

***see page 159

becoming the norm, with two years seen as the longest time period, but this is not enough time to see a POE demonstration through a building cycle. Shorter research projects may become even more prevalent with zero-based budgeting. It is conceivable that in a fiscal year following a POE demonstration grant a new group of administrators, not familiar with POEs would see no justification for continuing such "long term" research.

On the other hand, it is just as likely that POEs, once demonstrated, could become the basis for many judgements on zero-based budgeting. The POE could become a prime basis for evaluating designs and design programs. It could become a prime budgeting evaluation instrument.

Given the above constraints and the facts surrounding them, a clearing house strategy seemed the most viable method for implementing POEs in the housing system. The clearing house strategy is suggested because it circumvents the problem of having to directly intervene in an already overburdened system. The full strategy is outlined in Task IVc.

The reasons for justifying a clearing house strategy are as follows:

1. The clearing house can be superimposed over existing operations without actually changing any aspect of current procedures. In effect, it would only see that current procedures (reviews, evaluations of proposals) were done better.
2. The clearing house could be done as a demonstration project allowing a test period without an involved commitment to change if it doesn't work. This also means that imperfections can be worked out before full scale implementations if it is successful.
3. The clearing house permits a testing of implementation to be done simultaneously with a POE demonstration.
4. Other strategies proposed such as changing minimum property standards and social impact criteria were adjudged to require much more time and to be too diffuse in nature for an optimal demonstration of the effectiveness of POEs. Nevertheless, the clearing house could begin to work on changes in both the MPS and social impact criteria that would go beyond the possible life of the clearing house itself. While changes in standards are an ultimate goal, the clearing house is seen as an appropriate method to begin such changes.

**Dressel, D. L., et al, Army Family Housing : Preferences and Attitudes About Housing Interiors, Champaign, Illinois, Construction Engineering Research Laboratory, 1975.

***Gibbs, W. J. and R. W. Cramer, Dinning Facility User-Attitudes and Environmental Design Research at Travis AFB, California, Champaign, Illinois, CERL, 1973.

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TASK IVb

Develop a Model Delivery System

Before considering the model delivery system, the reader should read Task IVc, the Research and Demonstration, because this recommendation is really the content of The Model Delivery System. The Clearing house Strategy is in a very literal sense imposed on the existing model of the HUD housing system. Then the reader will be better equipped to consider the following:

POE Implementation in the HUD Program Through the Clearing house.

POE information via the clearing house can enter HUD program processes at several points: Housing Assistance Plan (HAP), Site and Market Analysis (SAMA), Developers' Packet, and the various proposal and design stages (see Exhibits 1, 2, and 3). Among the many HUD requirements for project approval, are compliance with the Minimum Property Standards (MPS) and the required environmental clearance which may result in an Environmental Impact Statement (EIS). In addition, every project not constructed on Federal land is required to comply with State and/or local building regulations. Thus, POE information can also enter HUD programs through environmental clearance, MPS and building regulations or codes.

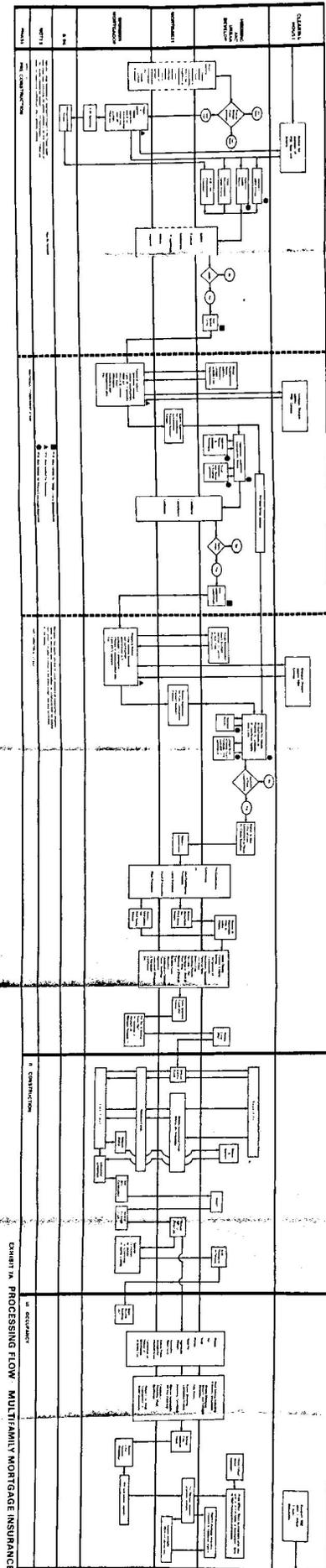
Where environmental review, MPS and codes impact upon Multifamily Mortgage Insurance (MFMI), Section 8 New Construction, and Public Housing (Turnkey) programs are indicated on the basic processing flow diagrams for these programs (see Exhibit 7a, b, c, pages 161-163).

The MPS is a comprehensive codification of design standards which are applicable nationally. They include an established procedure for their revision and modification. Variances or revisions to the MPS may be making changes to building regulations and the MPS is included in Exhibit 4 (page 120). The Clearing house may suggest a planning and design change or a materials and products change to the MPS at one of several levels. A local, non-repetitive or single project variance may be achieved in a relatively short time, and may be based on one POE.

A change in the MPS is also possible, but this requires following a more complex process which can take considerable time (see Exhibit 5, page 121). Before a change to the MPS is initiated, a number of POEs would have to identify a particular issue of general occurrence which could only be addressed effectively by changing the MPS.

Environmental Clearance (EC)

Environmental Clearance (EC) procedures which are shown in Exhibit 6 (pages 122, 123, and 124) have been outlined and published in the Federal Register (Vol. 38, No. 137, July 18, 1973). Once a potential developer files an application with HUD, an environmental assessment begins. Under several conditions an Environmental Impact Statement (EIS) will be required for a project. At the appropriate stage in a project, the determination about the EIS needs to be made and the appropriate action taken: during the SAMA stage in MFMI, the developer's preliminary proposal stage in Section 8 and the



PROPERTY IN PROCESSING FLOW - MULTIFAMILY MORTGAGE INSURANCE

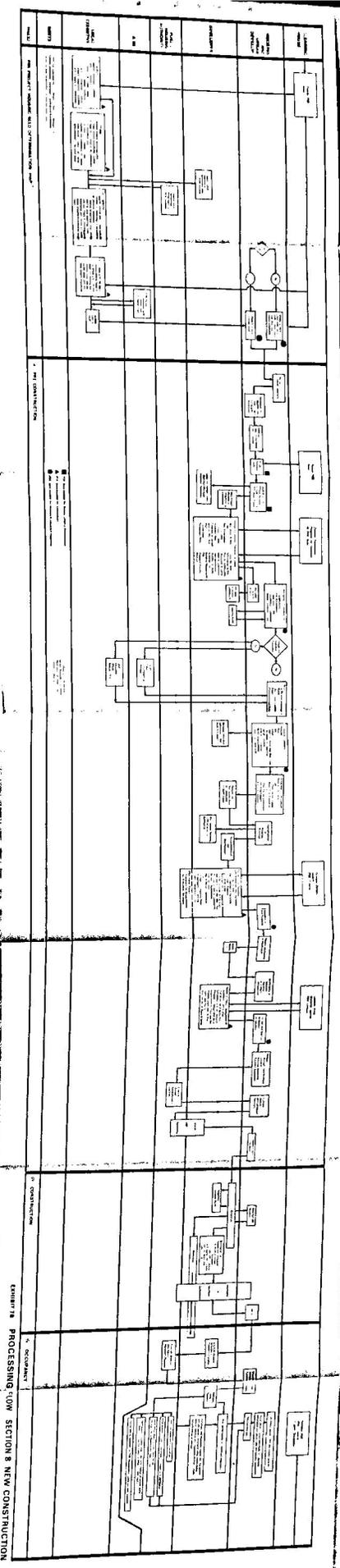
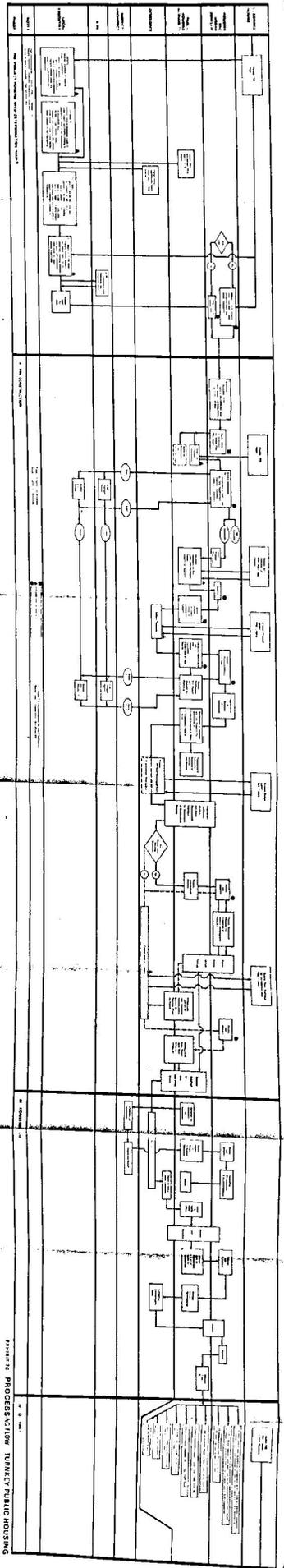


EXHIBIT 18 PROCESSING LOW SECTION 8 NEW CONSTRUCTION



FURNITURE PROCESSING - TURNKEY PUBLIC HOUSING

Developers' Packet development stage in Turnkey Public Housing. The EIS can take as long to process as revising the MPS, depending upon whether, for example, any subjects addressed are controversial or complex.

The wording of the National Environmental Policy Act (NEPA) on which the HUD EC is based, can and should be interpreted to include the full range of POE issues. However, this is not currently done, perhaps because EC, as an activity, has been under-funded by HUD headquarters.

The Environmental Clearance Office (ECO) exists as an internal function within HUD, with EC Officers assigned to HUD area offices. So far, the effectiveness or ineffectiveness of the ECO has been the result of local initiative. Since POE information can impact upon an environmental clearance determination, POE could be an extended function of the ECO.

The Housing Assistance Plan (HAP)

POE information can enter HUD program processes earlier than the entry points for the MPS or codes. This early entry is through the Housing Assistance Plan (HAP) which precedes HUD's program announcements for Section 8 and Public Housing as well as other forms of housing assistance. The HAP was instituted as part of the Community Development Block Grant (CDBG) Application in FY 1975, following the passage of the 1974 Housing and Community Development Act.

The intent of HAPs is four-fold:

- (1) to describe the condition of the housing stock in a community;
- (2) to estimate the housing assistance needs of lower income households residing or expected to reside in a community;
- (3) to specify annual and 3-year goals for the number of dwellings or persons to be assisted;
- (4) to indicate on a map the general location for proposed new housing construction and proposed substantial rehabilitation construction for housing lower income households.

When it is submitted to HUD, the HAP can provide the basis for HUD's determination of how many housing units, of what type and location will be subsidized in a fiscal period. POE could become an extension of and a complement to the HAP process, or at least it could provide some information for the HAP process. In some HUD area offices, ECOs provide information for a HAP. Thus, whichever function --HAP or EC--includes POE information in its activities, POE data can be made available and used early in the processing flow.

In actual practice a HAP has less impact than was originally intended. HAP is a potential contributor to HUD's housing assistance programs, but is falling short of this goal in its implementation. (1) A similar criticism can be made of ECO activities.

(1) The entire HAP process is the subject of an evaluation by Berkeley Planning Associates for PD&R; OE, CP&D. The four volume report is currently being reviewed by HUD. The contact at HUD headquarters is Mrs. Judy Kopff.

POE is intended to impact both on HUD assisted programs (Section 8, Public Housing) and on its unassisted (MFMI) programs. Proposals for assisted housing are submitted in response to HUD, or HUD/PHA, announcements. Therefore, as shown on the processing flow models, those announcements reflect HAP information, and consequently could also reflect POE information.

MFMI projects are initiated with sponsors who go to HUD with proposals. A Site Appraisal and Market Analysis (SAMA) appraiser/underwriter verifies such information as HUD projects which are being funded (e.g., permits issued) and what is being built privately as part of the Analysis. He does not use the HAPs directly. However, since POE data should be included in a sponsor's initial application (along with SAMA application data and environmental impact data), it is essential for SAMA reviewers to understand how HUD's assisted programs are influenced by HAPs.

A HAP is prepared by an applicant community for HUD assistance. A HAP consists of four major stages as stated above (see phases I and IV on the models, Exhibit 2b and 2c). Local HAP processes differ across the country, according to the Berkeley Planning Associates study for HUD. A HAP is prepared by the mayor's office, city manager, the Community Development Department, City Planning Department, citizen task forces, consultants, or others. Not every city prepares a HAP each year although it is updated annually.

With certain exceptions, HAP data should be drawn from generally available materials, published or unpublished, that are readily accessible to the applicant and to HUD. These include materials from the Census Bureau, records of code enforcement agencies, and records of other public agencies, particularly local public housing agencies or renewal authorities and local, regional, or state Section 701 housing elements and comprehensive plans as well as the materials provided by HUD as described below.

Applicants are expected to develop improved and additional data, as needed, for the preparation and implementation of their HAP.

Applicants are required to provide the definitions of "substandard" housing and housing "suitable for rehabilitation" which are used in surveying the condition of housing units in the community. Data sources for each entry of required information, the methodology used for any calculation or estimate also must be identified, and a complete description of any sampling methods employed must be included. A copy of any surveying instrument and interviewing instructions also must be provided when the applicant has undertaken an independent survey of housing conditions.

Goals for new, rehabilitated and existing units should relate to the findings regarding the availability of vacant existing units, the availability of units suitable for rehabilitation, and the types of housing assistance needs identified by the applicant (stage II of the HAP phase on the models, Exhibits 7b and 7c, pages 162 and 163). The distribution of assistance should be made taking into consideration the objectives of: conservation and preservation of the existing housing stock, curtailment of housing deterioration, promotion of neighborhood stability, minimization of detrimental environmental impact, avoidance of undue concentrations of low-income persons and economic feasibility.

With respect to POE, the current survey and estimating processes, (stages I and II of the HAP phase on the model, Exhibits 7b and 7c, pages (162 and 163) can be expanded to collect more detailed data on the condition of housing stock in the community, especially in order to determine relative to new criteria which will provide better housing and result in fewer defaults, the number of dwelling units in acceptable condition and the number of those in substandard condition which are suitable for rehabilitation. Therefore, POEs can become a part of the process at this point as an activity to be carried out by or under the auspices of the group now doing HAP work. If POEs are done by another group not directly associated with the local executive, such as a Clearing House, POE information could be made available by that group for use in a HAP.

Depending on the size of the HAP area, it may be impractical and/or unnecessary to conduct POEs on all existing HUD projects during stages I and II of the HAP phase. Looking ahead to stage IV of the HAP phase (locating proposed housing on a map), the anticipated location of projects may more narrowly define those housing types which because of zoning, economics, etc are most appropriate for subjects of POE studies. Thus, the POE might be done during stage IV instead of earlier in the HAP phase.

HAPs receive A-95 reviews at the State and Areawide Planning Organization (APO) levels. HAPS are then submitted to HUD. The Economic and Market Analysis Division (EMAD) of HUD reviews HAPS as statistical data sources for formulating its programs. In areas where HAPs do not exist, other data sources are used, such as area wide housing plans, state housing plans or special housing needs consisting of, for example, national disaster recovery programs, related community development activities, and other available data reflecting changes in housing needs since the previous census. Also, HAPS from nearby areas are used. From these data, judgments are made for programs in non-HAP areas.

Another point where POEs can have an impact is when HAP goal achievement is evaluated by the HUD area offices. This occurs annually and usually when communities receiving CDBG funds submit "performance reports." At this point HUD could provide sanctions (e.g. withholding some approvals or even funding) or incentives (e.g. additional funds) for communities incorporating POEs or POE recommendations into housing design.

HAPS are meant to be an integral part of the HUD subsidized housing delivery system. HUD uses the information in HAPS to determine how many units it will subsidize, particularly in Section 8 New Construction, and also in Public Housing programs. By increasing local awareness of housing conditions, needs and policies, HAPS could also impact on MFMI programs in the SAMA and pre-construction stages.

POE Study Indicators

In response to problems within HUD in regard to implementing its programs over the years, HUD, from time to time, has created new offices and systems in an attempt to alleviate problems. An example is the Multifamily Early Warning System (MEWS) which was developed in 1974 to alert field office personnel to potential mortgage defaults. MEWS should be useful to POE because it suggests projects upon which a POE should be carried out. This is

based on the premise that projects on the verge of defaulting are prime candidates for evaluation. As with HAPs, MEWS has less impact than was originally intended. While it is a potential contributor to HUD's housing assistance programs, MEWS is falling short in implementation. (2)

Implementation of POEs Through the Clearing House

Constraints to any change in HUD programs are exemplified by the long involved processes required for preparing an EIS and changing the MPS.

Environmental Clearance procedures also have not proved very successful. Similarly, the recent introduction of the HAP to determine housing needs, increase equity and improve the efficiency of housing programs has not been taken full advantage of in some areas, and in other areas it is not used to advantage at all. MEWS--also recently introduced--is a means of alerting HUD to potential defaults which has been even less fully utilized to advantage than HAPs.

POE adds one more stage consisting of a series of steps in the phases of the present processes to the already lengthy processes for constructing housing. As a voluntary activity, nothing is likely to come of POE. HUD foresaw the potential value of POE when it awarded a contract for this study. HUD must next endorse POE and include it as a mandatory step for the demonstration areas in its assisted and unassisted programs.

POE information is needed on three levels, and perhaps in different forms at each level.

Level 1 is the development of design criteria (indicated in the models as ■). HUD (also PHAs in Public Housing) develops the criteria as a basis for issuing NOFAs and SAMA letters, and for preparing developers' packets for PHAs to issue invitations for proposals.

Level 2 is the submission of data (e.g., HAPs), proposals, drawings, and specifications by whomever is responsible for those activities (indicated in the models as ▲). In order to respond, the submitter must have access to POE information, by whatever means necessary.

Level 3 is the review, evaluation and approval of submission with respect to POE information (indicated in the models as ●). HUD is the ultimate participant at this level (with PHAs in Public Housing, and where applicable with the A-95 review and the local Executive). These participants must have the POE-related information with which to review, evaluate, and approve submissions.

In addition to these three levels, which designate participants' roles, the degree of specificity of required POE information varies depending upon where in the process (i.e., which activity or task) that enters.

The HAP stage is non-project-specific. POE data in this stage can assist HUD to determine what housing will be assisted in Section 8 New Construction, and in Turnkey Public Housing programs. POE information which is useful to the development of a HAP is general in nature. A POE could include the

(2) MEWS contact at HUD is William Fox, Room 6138.

Survey (stage I of the HAP phase) for describing the condition of housing stock in a community. POEs could help and confirm the Estimate (stage II) of housing assistance needs. POE data could be used in Specifying (stage III) annual and three-year goals for the number of dwellings or persons to be assisted. Finally, if POE data are inadequate to develop stages I through III of the HAP phase of the process, the indication on a map (stage IV) of the general location proposed for new housing construction and housing rehabilitations can suggest which existing projects should be the subject of POEs in order to obtain the necessary data. HAP could also indicate local specific revisions to the applicable codes and standards. Once a HAP is submitted, it is reviewed by HUD.

For early, preliminary project-specific submissions, more general, less detailed POE data are sufficient. At the other extreme, final submissions may require specific, technical POE data (e.g., building product characteristics). This is best discussed program by program.

Multifamily Mortgage Insurance (MFMI) Exhibit 7a)

During the SAMA stage, the sponsor/mortgagor needs POE information of a general nature which applies to site approval, marketability, and environmental clearance. This SAMA application and other required submissions, such as environmental impact data, which are submitted to HUD's Program Manager/Chief Underwriter includes information which can come from POEs (shown on the models as ▲). For example, POEs can help determine site acceptability; the marketability for a multifamily housing project with respect to type, size, composition of units, rent and specific amenities; and the environmental impact of a project.

For the SAMA appraiser/underwriter to review, evaluate and approve submissions with respect to POE (shown on the models as ●), he needs access to POE data of equal specificity.

Finally, the SAMA letter issued by HUD (shown on the models as ■) should include appropriate POE design criteria and should specify the level of detail of the POE information required by the architect at the various submission points. Thus, the POE information available to HUD at this point should be both general and specific.

During the Conditional Commitment stage, the sponsor's architect submits a schematic design and other required submissions. POE input can be general at this point as it applies to the location of a project on a site, unit types, sizes, composition, layouts, marketing and management plans (shown on the models as ▲). HUD review (shown on the models as ●) and the issuance of a conditional commitment (shown on the models as ■), should be based upon equivalent knowledge of POE information.

During the Firm Commitment stage, the most detailed POE information is needed. This information may be as specific as hardware types, such as kitchen cabinet hinges. From the SAMA letter, the architect needs to know what is expected and how to respond during this Final Commitment stage when preliminary designs, final designs, and construction specifications are submitted (shown on the models as ▲). HUD must have the POE information

in order to review, evaluate and approve final submissions (shown on the models as ●).

Section 8, New Construction (Exhibit 7b)

HUD utilizes information from HAPs and other sources in determining its Section 8 assistance program, developing design criteria which are included in the developers' packets and issuing NOFAs (shown on the models as ■). POE data must be both general and specific, and appropriate as criteria for the preliminary proposal, the final proposal with preliminary drawings and outline specifications, and final drawings and specifications.

For submission (shown on the models as ▲) and review of the preliminary proposal (shown on the models as ●), general criteria would require a general response and review. These criteria relate to site identification and planning, housing description, rents proposed, and building management, for example.

Final proposals which include preliminary drawings and outline specifications need of greater specificity of POE information, both in submission (shown on the models as ▲) and in review (shown on the models as ●).

Final drawings and specifications would require the most detailed POE data.

Turnkey Public Housing (Exhibit 7c)

HUD utilizes information from HAPs and other sources in determining Turnkey Public Housing assistance programs.

Before developers submit proposals and preliminary and final drawings and specifications, HUD and PHAs have a series of issuances, submissions, and reviews (shown on the models as ■ ▲ ●). At the outset, HUD must always provide the general as well as the most specific criteria it will require a response to. The PHAs initial submission for a program reservation can contain general POE information. In the PHAs second submission to HUD of the invitations for proposals and developers' packets, the general and specific design criteria must be included where it is appropriate. Developers' submissions require the same specificity described for Section 8 projects.

Conducting POEs

The handbook prepared by ERDF discusses POEs and such topics as who should conduct them. Where POE relates to the HUD processing flow models, Exhibits 1, 2, and 7, the following symbols are used: ■ ▲ ● . The detailed steps for conducting a POE on an existing building, if relevant data are not available, are described in the ERDF Handbook.

These are the same steps necessary for conducting POEs on buildings yet to be built and occupied.

Three Alternatives for Implementing the POE Concept

- I. Internal--Environmental Clearance Office (ECO)
- II. External/Internal--Housing Assistance Plan (HAP)
- III. External--Clearing house

I. Environmental clearance procedures have been established internally by HUD. Exhibit 6 (pages 122-124) outlines the procedures. An Interim Guide for Environmental Assessment was prepared for HUD by Alan M. Voorhees & Associates, published in June 1975. How POEs could fit into EC have been discussed earlier in this report.

II. HAP has been discussed also. It represents a quasi-external process in that HUD supplies the funds as part of Community Development Block Grant funds for the Local Executive to prepare HAPs. HUD then utilizes HAPs in developing its annual assistant program.

III. A clearing house could function as a repository for POE information. Its staff could also conduct POEs, develop criteria and review proposals, designs, and specifications against POE findings and criteria. The clearing house could be an external entity outside of HUD. Exhibits 7a, b, and c (2a, b, c, revised) illustrates where and what clearing house activities could impact on the three HUD programs--MFMI, Section 8 New Construction and Turnkey Public Housing, respectively. Exhibit 3 further illustrates the activities of a clearing house.

The clearing house staff could provide the information needed during the HAP stages. For Turnkey projects, clearing house staff could review the Public Housing Authority's invitation for proposals and the developers' packet for the inclusion of POE data and criteria. For Turnkey and Section 8 projects, clearing house staff can critique and approve developers' proposals, designs, and specifications. For MFMI projects, clearing house staff can review the sponsor/mortgagor's preliminary and final designs and specifications.

The clearing house staff can also provide POE information and otherwise assist the Environmental Clearance officers in their tasks.

Once housing projects have been occupied the staff can conduct POEs, which not only adds to the amount of POE data available, but also functions to validate POE information.

TASK IVc

Propose a Research and Demonstration that will Test the Effectiveness of POEs in the Housing System

1. Introduction

Task IVc calls for developing a research and demonstration project that will test out the usefulness of the POEs within the HUD housing system. As much as is possible, the data collected in other tasks is brought to bear on how this demonstration could best be carried out. Several of the decisions, however, had to be based on the advice of experts within HUD as to what would most likely work with the system as it now exists. It is because of this advice that the clearing house strategy was adopted as the most likely to succeed because of creating the least conflict within the system.

2. Inferences from the Data

From over a thousand post occupancy evaluation references collected world wide, it was discovered that only 296 post occupancy evaluations done in the United States had data accessible for analysis. Of these, 31, or only 10% were conducted by professionals involved in some phase of the design, production or management of housing. Yet every one of these few studies was used either in the modification of existing buildings or the construction of new buildings. By contrast, the 90% of POEs done by non-housing professionals resulted only in 11% being used for new buildings and 8% on existing buildings. It seems more likely then that having POEs done through housing professionals does result more often in a direct impact on housing design. Therefore, the most practical course might seem to be to have housing officials conduct the POEs.

But such a conclusion has other consequences. After talking with the particular individuals who conducted POEs within the housing authorities it became apparent that the purpose of the application of the results was for immediate reasons of their own which did not include installing the POE as part of the system. The application of results was intended from the beginning, but any further institutionalization of the POE did not occur. It was a one time affair with no continuity.

A second difficulty with selecting housing officials for conducting POEs is that they generally lack knowledge about the ultimate usefulness of POEs and how to conduct them.

Yet, despite these difficulties, it is the housing authorities themselves that must eventually learn to deal with the POE and incorporate it within their system. Therefore, any implementation of the POE into the process must take these limitations into account.

3. Recommendations

A POE demonstration has two purposes. The first is to demonstrate clearly and beyond any question that the use of POEs results in a better quality of life for housing residents. This result should have financial

benefits as well as measurable aspects of better quality of life. A second, and perhaps ultimately more important purpose, is to demonstrate how the POE can be institutionalized in a system already overburdened. Certainly, without the second purpose being demonstrated, the first can be considered a mere academic exercise. Yet to incorporate the second in a demonstration project greatly increases the financial resources required.

Accordingly, the demonstration suggested will consist of two parts, one to allow the financial and quality of life aspects to be tested, and the other to outline implementation procedures in the housing system. It is suggested that the demonstration described be used as the basis for an RFP issued by HUD.

1. Post Occupancy Evaluation Demonstration - First Phase

A. Selection of Sites

According to evidence collected in this study, the POEs already done in housing are not geographically nor demographically representative. A major portion were done in housing authorities of 500 units or less, in northeastern states, testing high rise apartments, and involving elderly, and black populations. In order to gather more representative data and attempt to increase the generality of results an effective POE demonstration should attempt to sample geographical locations, project size and building type, urban and non-urban situations, type of population, and type of agency. Yet the difficulty of this correct sampling procedure is illustrated below:

- 1. Geographical Distribution. HUD has already administratively divided the United States into ten regional offices. These should be surveyed from inventory data to determine those with significant differences on variables such as population, housing type, project size, urban-non-urban distribution, and types of local agencies. The ten regions then may be merged to form fewer than ten or all ten may prove to be statistically separate.
- 2. Project Size. Although recent directives from HUD limit public housing projects to no more than 50 units, many larger projects exist and are still being built. An inventory of these should be used as a data base to determine what natural distribution of project sizes exists. There may be only two or as many as a dozen or more distinct clusters of project sizes. These clusters should then be used as a stratified sample base combined with geography.
- 3. Building Type. In the POE research, high rise buildings predominate, but an inventory of building types should be used to determine what kind of stratified sample of building types can be made.
- 4. Urban, Non-urban. It may turn out that there are too few non-urban locations to generalize from. However, if data indicate a

significant number of non-urban units throughout the geographical regions, this would become another level of sample selection. However, the Farmers' Home Administration has usually been responsible for rural housing as opposed to HUD.

5. Type of Population. Population sampling must try to be truly representative of existing housing populations. Present census data are outmoded, so up-to-date HUD records of projects will have to be used.
6. Type of Agency. Three levels are seen as relevant to sampling, the local housing authority, the state housing agency (if it exists and is viable), and the regional or area office of HUD. Regardless of whether a PHA or a state agency is chosen, the corresponding HUD offices must be involved, so sampling will be of the former two types. Any agency selected should be one with an actual developer prospect. Even though any agency may have active development in the past, it must have future prospects to be selected.

The question of private developers is a large one. Theoretically, the private developer should be represented along with public agencies. However, this would double the size of any demonstration and it may be that one or two private developers would be sufficient for demonstration purposes.

In general, the six criteria above must be followed in order to obtain a representative sample that is truly generalizable for the United States. However, resources are not likely to permit such a sampling. It is still possible to select one PHA, one state authority, and one private developer, for example, as a bare minimum, to demonstrate the usefulness of POEs in practice. This would preclude the kinds of general principles that could result from a larger study but the demonstration could serve as a "case" type example for POE use.

B. Composition of Team

1. The POE Committee. Regardless of how sites are selected a team must be chosen whose charge is to maximize responsibility at all levels in the housing system. Wherever each demonstration takes place, a committee should be chosen to oversee the POE operation. This committee should minimally consist of: 1) the PHA director, the state director, or the local developer, 2) the maintenance foreman of the target project (or equivalent), 3) a construction engineer and architect from local firms, selected from professional committees, 4) the housing manager of the target project, 5) a resident representative, 6) a representative of local city or county government, 7) a representative of local financial institutions, and 8) a HUD representative (s). In some or possibly most of these cases the committee's time will need to be reimbursed. Volunteer participation will not be sufficient.

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It may sound excessive to require participation of local or state housing directors or the developer himself, yet, the research data show that directors are more often ignorant of POE potentialities than their employees. Therefore, if the demonstration is to serve its educational function, it must educate the top decision maker in the organization.

The maintenance foreman, or the director of maintenance is required because this level of personnel must be educated as well as having a person on the committee knowledgeable about the maintenance problems of the particular project. The construction engineer and the architect should be a representative from the local or national committees of the ASCE* and AIA.** It should be the responsibility of these committee members to report back to both local and national committees on housing and environmental design.

A local resident (who is a member of the local tenant's organization) should sit on the committee. This person should be an official representative of the organization and should report back to that organization on the progress of the POE.

The housing manager of the target project (or the head of the management agency in the case of a developer) is a must for involvement in the committee. In terms of available time this will be resisted even more strongly than participation by the housing director or developer. Housing managers are notoriously overcommitted. Yet, in terms of education for all other committee members, management is the least represented element in design decisions, as the housing system now exists, and the committee needs to have strong, knowledgeable support from management.

Local county and city officials are necessary because of the potential tie-in of POEs to MPS or local codes and zoning. A careful examination of the local government structure is necessary to determine who should be represented on the committee. It may be the head of the City Development Department, or the chief of housing inspectors, or an assistant city manager. Not only should it be someone who can communicate the use of POEs but someone who has the motivation. Local conditions will dictate this selection.

The participation of financial institutions is critical. Since it may be financial institutions that become the main benefactors of POEs, the representative should be the president of the local Savings and Loan Association, or the equivalent in local bankers (or both). Some tie-in to Federal Home Loan Bank Board and the NSLA should be made at committee level.

Finally, a HUD representative is necessary. The HUD representative should be the person from the area office who is responsible for construction feasibility decisions. The multiple family processor is a good candidate.

*ASCE-American Society of Civil Engineers
**AIA-American Institute of Architects

In addition to the Area office representative a committee in the HUD National office should monitor the demonstration project. There should be representatives from PD and R, Management, Research, and Construction offices. Each representative should be critical of the unfolding of the project from his own office's point of view.

The researchers should not have a vote on the committee but should attend committee meetings to answer questions about the research and to keep abreast of committee deliberations.

Selection of additional members to the committee should depend on the local situation. In many cases certain local officials could be included to great advantage. By no means should these suggestions be seen as a rigid formula.

2. How the Committee Will Function.

Whether the agency is selected by RFP competition or directly through the HUD National office, the first act will be to select the committee outlined above. The members of this committee will be approved by the National office and then the committee members will meet and write their own RFP to select researchers for the POE. HUD will provide guidance by critiquing the RFP before it is issued and by providing some general guidelines.

The committee will then issue the RFP through the Commerce Business Daily and local newspaper advertisement and select a research firm or university to do the POE.

The function of the committee will then be to meet as required to monitor each phase of the POE: selection of methods and instruments, sampling, data collection, analysis, and acceptance of the final report. The committee will then make its own evaluation of the POE in writing and in relation to the value to each of the constituencies represented by the members of the committee.

If the implementation phase is part of the demonstration then the committee will monitor the incorporation of the POE into the housing process and meet every six months afterward until the implementation demonstration is ended.

3. The Research Team.

The agency sponsoring the POE (local, state, private, etc.) should contract with a research organization of individuals to do a properly scientific POE. There are enough organizations or individuals capable of doing POEs to be selected in any geographical area of the country (see Appendix I).

The research team should have a Ph.D. level (or equivalent) director who has published several POEs previously and is considered to be an expert in the field. It may be possible

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for only one researcher to conduct the POE by training and supervising local residents. However, the team should include an architect and a behavioral scientist. The architect should be one who is classified as "behavioral" in the government job classification (see CERL job specification)* if possible, and the behavioral scientist should have expertise in statistics, sampling, and field research, preferably POEs. The director of the project could be either an architect or behavioral scientist or they could serve as co-directors. A team that has worked together on previous studies should be given preference.

Preference should also be given to hiring local residents for data collection but this should not be strictly adhered to if the researcher makes a good case for not doing so because of time limitations or the requirement of sophisticated knowledge for his methodology.

4. Selection of POE Methods.

The committee may elect to direct that certain methods be used in the POE or it may choose to leave the selection of methods entirely to the research team. In any case, it should be a requirement that each method used in the POE be justified by the following criteria.

1. A method shown to be proven useful by use in previously successful POEs.
2. A method shown to be effective with the target population. This is especially important where elderly, children, and minority groups are concerned.
3. The use of methods that are compatible with each other and can provide reliability and validity data. **

* CERL is the Construction Engineering Research Laboratory of the U. S. Army Corps of Engineers. The job specifications for a behavioral architect can be obtained by writing them at P. O. Box 4005, Champaign, Illinois 61820.

**Reliability and validity are technical terms used by the American Psychological Association. For a method to be reliable it must have shown itself able to get the same results when used several times. A method that cannot get the same results over time is said to be unreliable and not stable. For example, an IQ test should not give a markedly different IQ for the same person each time he takes the test. Validity refers to what the method claims to measure. How do we know a certain method measures what it claims? For example, we know that observation can measure how many times a housewife washes clothes because any independent person can see that is what she is doing and there is the evidence of the clothes. But when it comes to measuring hopes and dreams, for example, the question of validity is harder to answer. It is necessary to take the person's word for what his hopes and dreams are.

4. The use of methods which can be easily analyzed by current statistical practice such as ANOVA, Chi square or non-parametrics.*

The committee may want to hire an independent consultant to advise it on the proper selection of methods and/or researchers.

Methods used should always be complementary with agency data already collected such as repairs, complaints, incident reports, and work orders.

Methods also should directly tie specific or general design features with behavior.

The committee should have access to the POE handbook, and this handbook could be one of several guides in writing the RFP and judging the performance of the research team.

II. Post Occupancy Evaluation Demonstration - Second Phase

Following completion of the first phase of the demonstration, HUD will have collected from three to sixteen or more examples of Post Occupancy Evaluations done on currently existing buildings. But this is only half of the POE process. Still remaining will be the implementation of the information in new housing designs.

The agencies selected in the first phase must be those already determined about to build new facilities. The same agencies or new agencies about to contract for new housing units will be the operators of the second phase.

In order to properly incorporate the POE information into the second phase, the first set of POEs will need to be combined and summarized. In addition, design information from other POEs should be incorporated as part of the literature search on Phase II.

Let us assume a minimum of three agencies chosen again for Phase II. These agencies would have to agree to include POE results in the design for their new buildings, and to evaluate whether the new designs are superior to the old. This is a third phase of POE which is the true measure of effectiveness. Ideally, the agencies chosen for Phases I and II should be the same so that a rough pre-post measurement could be followed. The program for such a demonstration is as follows:

<u>Phase I</u>	<u>Phase II</u>	<u>Phase III</u>
Measure old buildings	Design and build new bldgs (POE input to design)	Measure new buildings

Final implementation would involve looping the feedback from Phase III to Phase I and continuing the cycle for all new buildings.

*ANOVA, Chi square and non-parametrics are technical terms for particular statistical tests. All the reader needs to know is that the researcher should know how to use them.

phase II would differ from Phase I as follows:

1. Although the same committee would continue to monitor the operation, that committee would now proceed to work with the architect hired to design the new buildings. This would probably include an obligation to work with the committee as part of the architect's contract.
2. Part of the contract with the architect would be his agreement to incorporate POE findings. The committee would be free to have the architect hire his own behavioral scientist or to contract separately for the same POE research team to continue for this phase. The contract with the architect would be an unusual one and probably require more than the usual fee. A prime requirement would be to document every design decision based on the behavioral data supplied. For decisions that did not seem to have data support, the behavioral assumptions would have to be specified. The behavioral scientist would have to work with the architect at every step and indicate in writing his own responses to the design decisions.
3. The second phase would consist of
 - (a. literature search, (b. programming behavioral input,
 - (c. design process, and (d. final drawings.

Construction should be done with the architect supervising so that the implementation of the design is certified in the final "as built" drawings.

The committee would monitor this process through to occupancy of the buildings carefully documenting any changes from original design in the final product.

III. Once the new buildings are built and occupied, the third phase should begin about one or two years after initial occupancy. Negotiations for the third phase can begin six to 18 months after initial occupancy. The third phase consists of another POE as much like the one in Phase one as possible.

Some controversy exists as to whether the same research team should do the POE in Phase III as did the POE in Phase I. On the one hand there is the conflict of interest issue which assumes that the researchers might be prejudiced to evaluate their contributions to the design as positive. On the other hand, there is the very serious problem of continuity. Experience with longitudinal studies like this shows that it is difficult to provide continuity even with the same team over time, let alone introducing a new team. Idiosyncrasies of data and methods are forgotten. Original intentions are often not made known and a great deal of information is lost.

Considering both sides of the issue it is probably better to select the same research team for all phases. However, the selection of the team is a critical variable. A research organization with high turnover of personnel

is almost the same as selecting two different organizations for both phases. There are the same problems of continuity.

The architect who designed the new buildings in Phase II needs to collaborate closely in Phase III. This should be part of his contract in Phase II and adequate funds for his participation should be provided.

The research design for Phase III should approximate the research in Phase I as closely as possible. The researchers should be prepared to defend any changes in procedure to the committee.

It may be necessary to issue a new RFP for Phase III if the committee decides it does not need, or the researchers cannot provide, continuity.

The final POE will be an evaluation of the new design features incorporated in the building as a result of the behavioral input from Phase I. The research program should be directed specifically toward evaluating these "new" design aspects. However, new designs invariably have unanticipated outcomes and the researchers need to provide for measurement of these in the methods chosen.

After the researchers complete the final POE, the committee must evaluate the entire POE procedure in terms of the performance of the researchers, the usefulness of the information to each constituency, and the feasibility of instituting such a procedure in the housing process.

The three phases described could serve at maximum as a demonstration of how POEs can improve housing quality for the United States. At minimum, with only three agencies selected, it could serve as a case study showing how POEs might improve housing quality if used throughout the U. S. It would, strictly speaking, not be generalizable to the country as a whole.

Yet the problem of implementation remains. Having demonstrated the usefulness of POEs, how does one implement them into the housing system? Implementation could be seen as following the POE demonstration or as occurring simultaneously with the POE demonstration. Three possible methods of implementation have been recommended, 1) a clearing house at the national level, 2) minimum property standards strategy and 3) an environmental impact strategy. Considering the pros and cons of each issue, HUD is free to choose any one. Much of the choice will depend on partly political and partly funding decisions. Funding may be the most critical issue. Yet there are a variety of funding sources available. For example, the debt service for modernization could be expanded to 20 years or POEs could be mandated to be part of the development cost of both new and existing housing modernization.

However, in the experience of ERDF researchers, unless a new office with staff directly and solely responsible for POEs is employed, the likelihood of success in a demonstration is diminished. A clearing house is the most likely candidate to fulfill these requirements under demonstration conditions. Further, changes in MPS and environmental impact enforcements could involve more time and generate court cases that require legal decisions while the

clearing house operates on a procedural basis that can be handled by memos. Also, once the clearing house is in operation, it can act to bring about MPS changes and environmental impact changes.

The clearing house demonstration can be set up on a full scale national basis or as an operation in one of the area offices. In either case the staff required would be small, a Ph.D. director, who had experience with POEs (could be either architect with POE experience or behavioral scientist) two research assistants at Masters level, at least one an experienced architect, and one a behavioral scientist with POE experience, a secretary and a library researcher.

If arranged simultaneously with the three-phased POE demonstration, the implementation would still involve all of the area (or selected areas if national) jurisdiction.

A memo directive* would go to all federally funded housing authorities, both local and state that are within the HUD system mandating all new housing designs would have to include POE input and, in turn, each new design evaluated by POE and that individuals within the organization be designated as responsible to perform these tasks.

Since this might impose an unreasonable burden on already overstrained PHA it would be explained that until enough POE knowledge was accumulated, they would be assisted by the clearing house. The first POE expenses could be paid from architect's fees and the architect or the PHA could contract with POE researchers. These POEs could be cheaper than the main POE demonstration (under \$5,000).

Each time a housing agency would want to build, it would consult the clearing house which would then supply a POE literature search, offer to help the architect or authority in selecting researchers and then approve of the POE plan and its implementation. The final design would have to be monitored (but not necessarily approved) by the clearing house on a basis of criteria that showed behavioral data from the POE were incorporated. At first, these criteria would of necessity be incomplete. However, as knowledge was gained, they would become more specific and could even become very comprehensive on the new building and send the report to the housing agency. Success or failure of the design would be judged with recommendations for new construction. Meanwhile, the clearing house would be building up its library of POEs and accumulating information specific to its particular area.

The success of this operation could be judged by the end of a building cycle of five years. By that time the operational problems of instituting

*The HUD memorandum dated March 29, 1977 to all regional administrators and full service office directors from Federal Housing Commissioner Simons is an example of how level of housing quality and prototype cost limits can be raised within the current legal authority of HUD. A similar memorandum detailing POE procedures to be included in prototype costs may be possible.

POEs would have been worked out, and enough evaluations done on new buildings to demonstrate the efficacy of the methods.

By no means is the formula for implementation fixed. The clearing house could do both the pre and post POE, or neither.

During the course of this operation the same committee in HUD that monitored the POE demonstration would continuously monitor the implementation demonstration and at the end of the five year period would evaluate the success and decide whether to enlarge the focus to a national level, attempt a new strategy, or cancel the effort.

In the meantime, other strategies would not be neglected. The clearing house staff would attempt to influence MPS and environmental impact statements through professional committees and updating literature.

COSTS

The costs of the demonstration are influenced largely by the time required for an efficient POE to be performed. The framework chosen is one month. Research data show that academic performances of POEs have taken too long and cost considerably more than necessary. Eliminating the extravagant POEs shows an average cost near \$5,000. Thus, the cost of a single POE for phase one is \$5,000. The time and expenses of the committees for the demonstration are an additional cost. The period prior to the POE and during its performance may require meetings more than once a week and of some duration. Estimating an average 5 hours per member per week is 320 hours for two months. Allowing \$25 per hour, this amounts to \$8,000 but expenses of travel, hiring a consultant, and supplies may bring this to \$10,000. Thus, each POE for Phase I should cost about \$15,000. If three areas were selected, this would amount to \$45,000.

Phase II would require part time pay for a behavioral researcher to work with an architect and an increase in the architect's fee. The architect's fee increase could conceivably be in the tens of thousands of dollars. But, it might be possible to require the documentation with only an additional \$10,000. This is based on an hourly rate of \$25 for 400 hours. Allowing a part-time behavioral scientist to assist would be another \$5,000 (200 hours at \$25 per hour). Current consulting costs are at this rate. (\$200 per day).*

Phase III would require another POE for the standard \$5,000.

Total cost for all three phases at one site should be \$45,000. For three sites this would be \$135,000. Using a larger number of sites would increase the cost pro-rata, depending on the geographical representation desired.

Implementation would be more costly. The director of the clearing house would need to have a starting salary of \$36,900 to attract a suitable professional.

*Some consultants object that this is too low a rate and should be \$300 per day minimum. The final RFP issued should consider this rate.

The two assistants would require \$25,000 each, the library researcher \$10,000, the secretary \$12,000 for a total of \$108,900 in salaries for the first year. Overhead to run an office and pay for benefits amounts to 37%, or \$40,293. Allowing for 5% increases in salary per year, the total cost would be:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Year 5</u>
Salaries	\$108,900	\$114,345	\$120,062	\$126,065	\$132,368
Overhead	<u>40,293</u>	<u>42,308</u>	<u>44,423</u>	<u>46,644</u>	<u>48,976</u>
TOTAL	\$149,193	\$156,653	\$164,485	\$172,709	\$181,344

The total cost for the POE demonstration is \$135,000 and for the implementation demonstration, \$824,384, or both, \$959,384.

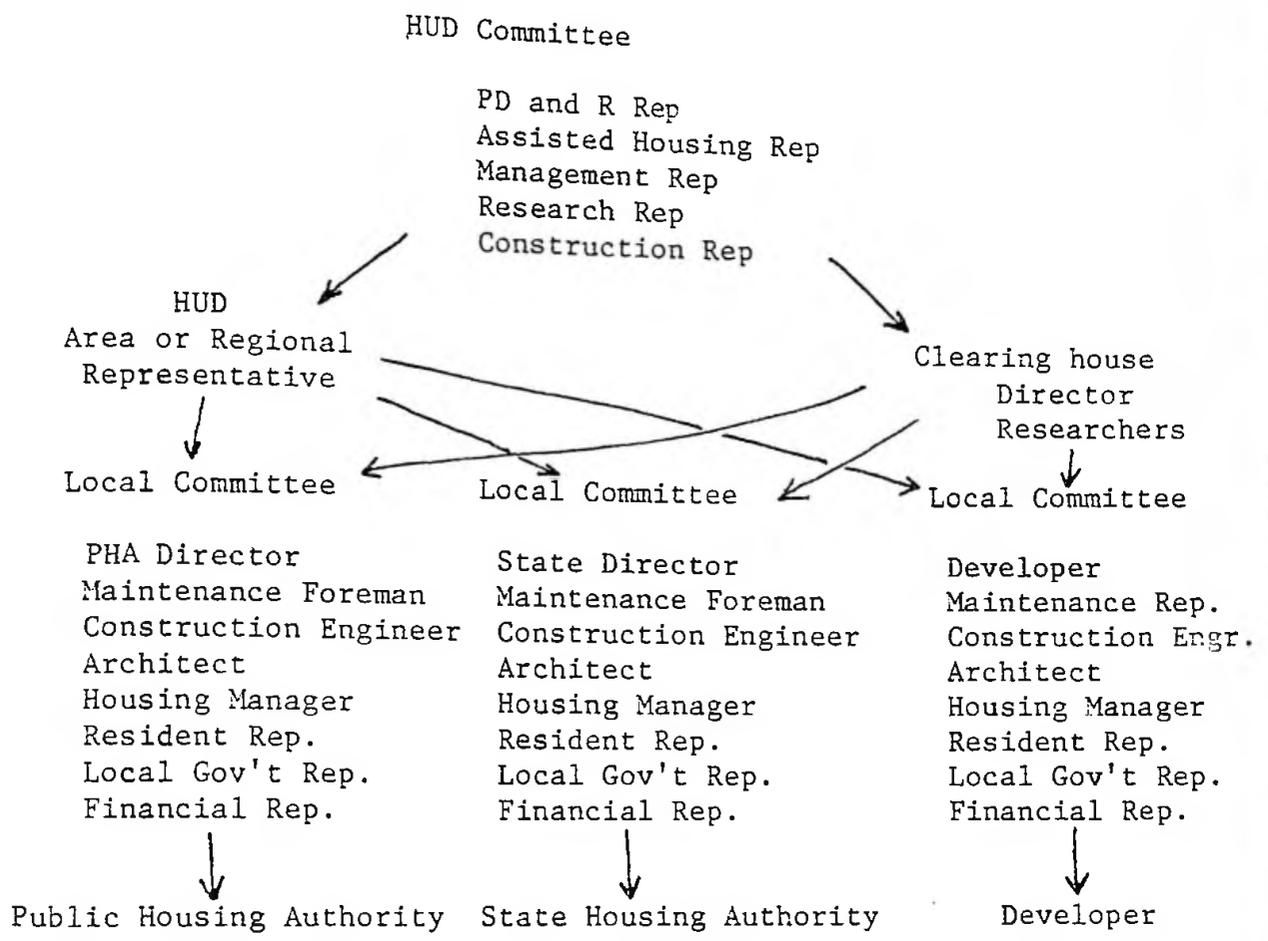
These are austere budgets by some standards but they are ones which are workable given the hiring of experienced personnel and at current rates in the field (January 1978).

FIGURE IV-1
SUMMARY OF POE DEMONSTRATION

ational Level

Area or Regional Level

Local Level



Sequence of Events:

1. HUD Committee forms, issues RFP for Clearing house.
2. Contract given for Clearing house.
3. Clearing house forms, locates near selected Area or Regional Office
4. PHA, State Housing Authority, Developer selected
5. RFP issued for POEs at local levels
6. POEs carried out at local levels
7. Design and construction done at local levels using POEs
8. Clearing house evaluates new construction
9. Effect of POEs evaluated by HUD committee

TASK IVd

Develop a Framework

This task was interpreted as essentially a market strategy for "selling" POEs to various agencies. When asked how POEs should be promoted, professionals chose "Increasing the housing industry's awareness of the need for post occupancy assessments," as the most effective method for promoting POEs. Other choices were, "Make post occupancy assessment results more accessible to the housing industry," and "Provide financial incentives for doing post occupancy assessments." These suggested methods did not vary for private or public housing.

1. The First Step - A POE Data Base.

The most essential strategy then is to increase the awareness of the need for POEs. In one sense that kind of task can be self defeating because it could involve showing how current housing has so many faults that POEs are needed to correct them, and while housing professionals will all agree to this abstract idea, there is a resistance to applying a method that may show they are not doing the job as well as they might. The POE, then, can be a feared change because of its very evaluative nature. Such a strategy would not be productive.

A more positive approach is to show what benefits the POE can bring and what costs can be saved. Yet this is not immediately possible because most of this information is still "locked up" in the 1,305 POE studies uncovered. It is necessary to take the first step of summarizing current POE information contained in the POE studies. This information is a compendium of "what works" and what does not work in housing. The information is largely inaccessible because it is usually written in language that only a trained social scientist can understand. Further, even a social scientist would have difficulty sifting which facts were more certain than others and then combining facts across studies. The summary of the 1,305 studies is more properly an effort requiring a team of social scientists and architects familiar with the literature, and with a background of POE experience.

The summary itself would then need to be put into language acceptable to the architects and housing officials who could best make use of it. A complete re-writing would be required with proper graphics. The end product should be a highly useable, well-indexed handbook on what works in housing. This can be accomplished by pretesting on front line housing officials, developers, and designers. The summary should precede all other steps since it is necessary to use these data for implementing subsequent POEs most effectively. Such an approach assumes there is already a need for the kind of information that POEs provide. Evidence would indicate that there is such a need among the decision makers in housing. Requests for such information has increased dramatically in the past few years according to reports from members of the Environmental Design Research Associates (EDRA).

The literature summary would be the chief instrument for increasing the awareness of POE information. However, as mentioned in Task IVa, it would be necessary to make the content of the summary part of courses at graduate and undergraduate levels in order for the importance of POEs to become part of the awareness of future professionals.

In summary, the first step is to make POE information available because the need for such information is already present.

2. The Second Step - The POE Demonstration

Once the POE data base is established, the POE demonstration outlined in Task IVc needs to take place. The successful completion of this demonstration will then provide the most convincing case for the validity of POEs in housing operations. This, plus an English translation of the Swedish cases should form a second data base on POEs carried out over the length of the building cycle. It may be necessary to go to Sweden and collect data on their system as it actually operates rather than depend on the abbreviated English reports.

The demonstration cases should illustrate the financial advantages of using POEs as well as document the most efficient designs and hardware. Projected costs and savings should be worked out for implementing POEs in the housing system.

3. The Third Step - Training Packages.

Once the demonstration has produced the kind of data needed for POE demonstration cases (assuming success) training packages need to be developed for two levels: the continuing education of practitioners and the undergraduate and graduate training of professionals. While the content of the training packages will be essentially the same, the level of approach will be different.

According to current training practices there will be some objection to making the content of the training packages similar across several professions. Some would prefer that separate training packages be developed for housing managers, maintenance officials, designers, and architects. Certainly, this will be true as far as the level of sophistication and the type of language used. But one of the great lacks uncovered is the failure of design professionals to learn about management or maintenance and the failure of management and maintenance to understand how design relates to their concerns. Therefore, the basic content of the training packages should be the same across all professions especially so each profession can see how closely his concerns are tied to the others. This is one of the basic lessons that POEs have to offer. The designer must learn how to design manageable housing with low cost maintenance, and the managers and maintenance professions must learn how they can benefit from good design.

In any case, the training must begin with HUD headquarters staff before moving out to the professional levels. Then conferences can be called with schools of architecture, builders, financiers, and practicing professionals. Perhaps even subsidies considered for implementing POE courses in academic schools.

4. The Fourth Step - Final Implementation

Possibly even simultaneously with the training would be the final implementation in the HUD system itself. Given existing regulations, it would be possible to require POEs at the most critical points in the system by executive memos or the clearing house, in revised form, could be expanded to include the rest of the system. A combination of both the clearing house and executive memos would suffice to start the POE process in the entire HUD system. This could only be successful if the educational program was carried out at all levels. It is not likely that any new legislation would be required to implement POEs. Exhibits 7a, 7b, and 7c illustrate how the clearing house could be implemented into the three programs modeled in Task IIIa (see pages 161-163).

To depart from the clearing house concept would certainly be possible but not without making certain that personnel with POE capabilities were introduced at the local levels. Given the existing ignorance of POEs, it is not too likely that enough such personnel will be available for some time. The clearing house makes a much more efficient use of the manpower that is likely to be available.

In conclusion, there are four steps to developing a framework that will sell POEs to the housing professions. First, make the POE information available to them at appropriate levels. Second, provide a long term demonstration of the POE in the housing system. Third, provide training packages for continuing education and for graduate and undergraduate schools. Fourth, implement the POE into the housing system on a permanent basis. The primary basis on which the POE can be "sold" to the professions is the underlying need for POE information which already exists and is not being satisfied.

TASK IVe

Suggest Alternative Methods for the POE

This task was interpreted as requiring a POE handbook. Three factors led to this decision. First, although the majority of POEs used three methods, nearly all excluded what seemed like necessary features such as the walk-throughs.

Second, there really exist very few alternatives in methods for the POE such that if several methods are used in a POE these will already comprise a majority of the tools available. The few other methods such as cognitive and behavioral mapping and ecological psychology are so rarely used that they do not really provide alternatives given the existing state of knowledge and the number of people who can use them.

Third, the state of POE methods is so chaotic, it was thought that it would be better to construct a minimal framework for POEs, if you will, a performance criteria, so that laymen not acquainted with POEs would have some basis for judging whether a POE has been done properly.

The handbook, then, is not strictly an alternative method for POEs but a map so that one can find his way through the POE maze.

WHAT ARE POST OCCUPANCY EVALUATIONS?

A Layman's Guide to the POE for Housing

PREFACE

The following POE Handbook is not intended as a cookbook publication which can be used by any layman to perform a POE anywhere in the world. The scientific knowledge required for a useful POE is beyond what can be obtained by reading a few pages. The sampling and statistical skills alone require years in graduate school in order to become minimally proficient.

This Handbook is a description of what goes into a POE so that the average housing official could study it as a guide, and consult it to determine whether the people proposing POEs or performing them are doing a good job. Often, the unskilled layman is left entirely at the mercy of a researcher not knowing a single fact on which to base any judgment of how the researcher is performing. At least here is an outline which the layman can use to ask the researcher about. It probably contains more than any layman really wants to know about POEs but it will not be sufficient for a person to use in performing a POE. This is one of those bridging attempts between layman and social science that will, hopefully, make the world of POEs less mysterious.

INTRODUCTION : WHAT IS A POE?

General Definition

Post Occupancy Evaluation (POE) - The three words have an unfamiliar sound. What kind of an evaluation? is the usual response. But the words say exactly what it is. An evaluation made after people occupy a house. And it means the evaluation is made some time after people move in because it takes time to adjust to the many features of a new building. A post occupancy evaluation should not be made too soon after the building is occupied. A good time for such an evaluation is two years after people first move in.

But what kind of evaluation is it? Many people are familiar with building inspections for safety or fire-hazards or for inspecting whether the electrical wiring was done properly. A post occupancy evaluation is somewhat like these kinds of inspections except it tests whether the building was designed and built to suit people's needs. Obviously, if the building is not constructed well, or the wiring is dangerous, it will not suit anybody's needs. But once these features are taken into account, the POE examines the suitability of a building for people to live in it.

A post occupancy evaluation is like a time and motion study of how people use a building. The housewife is asked how she uses her kitchen and she is often watched to determine if she has to make too many trips to the stove, or whether the refrigerator location is in her way. The design of each room is tested to see whether it serves or hinders. And the arrangement of rooms is also considered. Many times people are unaware of how they use a building because they have become so accustomed to living in it, they no longer pay attention. This is where scientific measurement becomes necessary. People can be asked about their activities, but the answers must be checked by observation or against information gathered in previous studies.

The sections below describe eleven steps in making a proper POE. Many people might think that such complicated steps are not necessary, that the information can often be gathered by merely talking with people and finding out how they like living in their houses. Talks with people about their houses can be useful - but only as a start. Much more information is necessary in order to supply the architect and building manager with information they need for designing and managing a building. It is important to realize that merely talking to people without scientific sampling can be very dangerous because the people you talk to may not be representative of the population that will live in the building. The only way to guarantee a representative sample of people is to follow a procedure called random sampling which will be described as the fourth step below.

The POE Cycle

One aspect of POEs that is confusing is that POEs are supposed to be part of a cycle of study and design application that results in better buildings. Yet most POEs seem to be a single study of building or a project that is complete in itself. For example, Zeisel and Griffin's study of Charlesview *

*(see POE bibliography for full references)

reports on a low income project in the Boston area that critiques what the designer intended as opposed to what was finally built. But, it does not visibly result in any new building. In fact, most POEs are of this type, they are not part of an ongoing process. For a POE to operate as it is intended, it should be part of an ongoing operation in an architect's office or a housing agency. Only the first time it is done does the POE start with old housing. After each design cycle a POE results in increasingly better design of new housing.

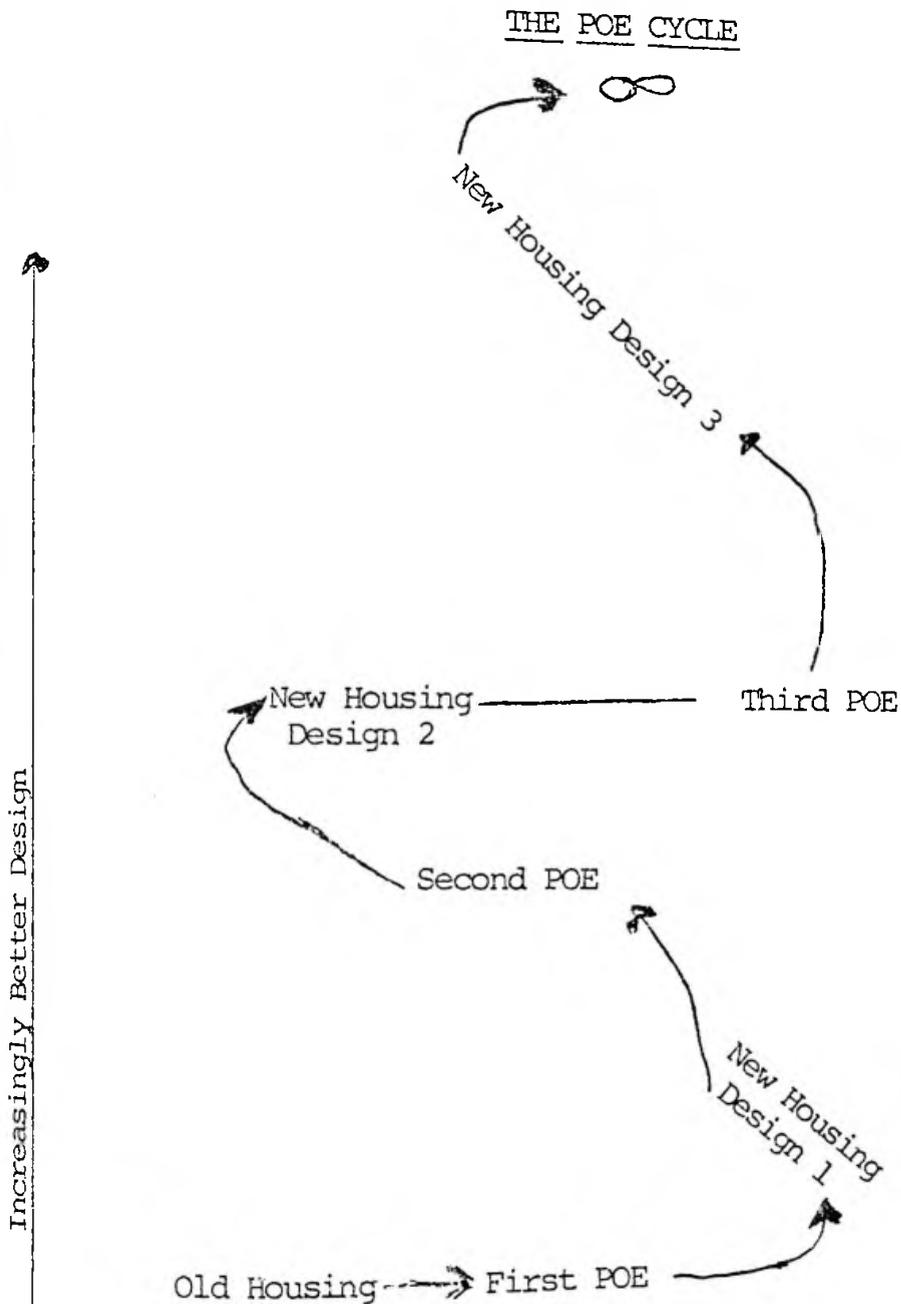


Figure IV-2

Who Should Do the POE?

Perhaps the most important single question to answer about POEs is who should do them. While literally hundreds of people have done POEs, very few have mastered the methods of doing POEs, and most have taken too long or cost too much money to be practical. And it is important to realize that a POE is a team effort rather than the effort of any single individual. The essence of a POE is to have behavioral information that is tied to design aspects and currently there are no architects with sufficient research experience to do the POE entirely on their own, nor are there behavioral scientists with sufficient design experience to do the POE without architectural help. Therefore, at a bare minimum there must be an architectural-behavioral scientist team. It is the behavior scientist's role to collect the behavioral data, the architect's role to collect the architectural data. Both must work together to tie the behavior to the design aspects, and both must work together to see that behavioral input gets included in the architectural program.

How are these roles defined? In some cases the architect has been the director of the POE, in other cases, the behavioral scientist. Yet, legally, the architect is responsible for the final design product however much the behavioral scientist may contribute to that product. Therefore, more often the architect ends up being a first among equals.

Often, however, there are two architects involved in a POE. When a POE is being done on an older building the architect who first designed the building is consulted and the architect who is conducting the POE may also be the one who will design the new building. Actually, three architects could be involved: the designer of the old building, the architect on the POE team, and the designer of the new building.

Ideally, it would be best to have the same architect for all three levels, but it is often considered a conflict of interest for an architect to do a POE on his own building.

When looking at a potential POE team it is best to ask three questions - 1) Have they worked together previously and produced an acceptable POE? 2) Does the architect know enough about behavioral science to be able to work with it? and 3) Does the behavioral scientist know enough about design to be able to meet the time constraints and work demands of architectural practice? At first, one might be inclined to think that if the answer to question one is positive, the answers to the remaining questions must be positive also. But many times what appears to be an acceptable POE on paper actually covers a multitude of problems and neither team member really understands the discipline of the other.

In selecting an architect for the POE, one must be chosen who feels comfortable and familiar with social science concepts and language. One of the most difficult stumbling blocks for an architect is the verbal world of the social scientist. Architects are taught to express themselves with drawings while social scientists use words.

The work together cannot be a one sided affair where one team member goes all the way in learning the language of the other. The exchange must be truly mutual.

More common than the architect's problem of failing to understand the language of social science, is the behavioral scientists' unwillingness to work within the time constraints and work requirements of the architect. Social scientists are trained to find answers by posing a single question and manipulating the various influences on that question in a laboratory to find the answer. The architect wants to know the answers to a seemingly endless number of questions and he wants those answers immediately - It should be understood that no POE ever answers all the questions the architect wants. But most social scientists cannot work under these conditions. It requires a scientist with experience in working with architects. Even the best of these, however, only answer a few of the questions needing answers. The architect and behavioral scientist must agree on which questions get top priority. Only by the buildup of information from many POEs do the rest get answered.

Who does the POE? A team composed of a designer and a social scientist; preferably a team that has worked on several POEs.

What Topics Does the POE Cover?

All POEs are limited in scope. None really covers the universe of topics that could be included whenever a housing environment is evaluated. Yet, even the most limited POEs always assume that design and behavior cannot be separated. There is some definition of what design elements are critical and what behaviors must be measured. The best POEs attempt to measure the successes and the failures of a design according to the behaviors they either enhance or interfere with. The POE tests whether that prediction was correct.

But the design aspects can cover many areas. There are considerations of site, exterior design, interior design, and furniture as well as interactions among these. Most POEs will cover more than one of these elements but very few cover all of them equally well.

The designers of the POE, then, usually focus on certain predetermined topics. Most have concentrated on problems of interior design in housing units. Very few deal with site selection consequences. Almost all try to deal with interactions of several topics.

Common topics covered by POEs are:

Site elements

1. Location of amenities (transportation, services)
2. Location of building in relation to views
3. Location of buildings on site in relation to each other
4. Neighborhood character and quality
5. Site plan
6. Play spaces
7. Parking

Exterior design elements

1. Image of house
2. Personalization of exteriors
3. Identification of dwellings
4. Social status and exterior design
5. Exterior maintenance and crime or other social behavior
6. Preferences for house designs
7. Housing types (high rise vs. garden apts., etc.)

Interior design features

1. Layout of rooms and halls
2. Amount of interior spaces
3. Room design and location of furniture
4. Interior colors and textures
5. Interior traffic patterns

Furniture

1. Furniture arrangement
2. Functional aspects of furniture

Many POEs deal with the interaction of these topics, such as the relation of play spaces for children to the kitchen window or of parking to the front and/or back door. Indeed, many of the most useful POEs show how changing one aspect of exterior or interior can have an influence on behavior both inside and outside the house.

Thus, the important thing to understand about POEs is that they cannot cover all topics but that they usually focus on a few topics that are considered of prime importance. Who decides what those topics are, and how it is decided can often mark the success or failure of a POE before it begins.

When a POE is being considered, the persons most concerned with the results must define its focus. Some POEs are very limited in scope, like one that deals with the effectiveness of a certain type of lock in preventing break ins, while others are remarkably broad.

While many researchers have different styles and methods for conducting a POE, the POE should involve at least the eleven steps described below.

The First Step - Literature Search

One of the common expressions among researchers is "Why reinvent the wheel?" Yet, that is what many designers and researchers do when they investigate a new building. They begin as though no one has ever done the same thing before. Actually, there is a vast literature on almost all aspects of housing. On POEs of housing alone there are between one thousand to fifteen hundred studies, depending on how one wants to define a POE. This bibliography is contained in Appendix II, and includes foreign as well as U. S. studies. Thus, before beginning any POE, the literature needs to be searched to determine the findings relevant to the particular building being

evaluated. If the building is a high rise, then the literature on high rises should be looked up. If the population is poor white or black, then the literature dealing with high rise buildings with those populations should be researched. Generally, type of building, population, and particular design features are the index concepts used in searching the literature. Titles are usually not enough of a clue to the content so abstracts of the articles must be read in order to determine if they contain information on building type, population, and design features.

Where does one search beyond the bibliography attached? There are magazines and journals often dealing with POEs. These are listed at the end of Appendix II. The literature search is begun by a dialogue between the researcher doing the search and the designer. The designer conveys to the researcher what questions and concepts he has in mind concerning the new building. The researcher probes further to see in what directions the designer is thinking. He then begins his search. During the course of finding material he may get back to the designer with preliminary findings and this discussion may lead to further searching.

Time can be saved by hiring a researcher who already knows the literature. And, since the literature search is a part of every POE, any POE researcher with experience will have a head start.

The function of the literature search is to find out all that is known about the anticipated type of building and the needs of the people who will occupy it. Very often the literature will describe design features that worked or didn't work. Designs for increased security, safety, and comfort are sometimes even diagramed. But this literature function cannot be realized unless it is put into a form that can be useful to the designer of the new building. A written report alone is usually not satisfactory. The researcher who compiled the report must be available to the designer to answer questions.

If a knowledgeable person is selected for the literature search it should not take over a week. On some highly specialized matters, however, it may take longer because experts will need to be contacted and material sent through the mails that is not available in local libraries. A person not knowledgeable about POEs can take considerably longer.

The first product of the literature search should be the result of a dialogue between designer and researcher. The researcher should submit a rough draft of his findings to the designer. The designer will then respond with comments and questions which may require more searching. The final report should be in language the designer fully understands. In some cases the designer may want to write the literature findings in his own language. Nevertheless, the researcher needs to be available to the designer at later steps when the architectural program is written. The architectural program lists the specifications which the design must meet.

The Second Step - Talking with Management, Maintenance, and Residents

The second step is often the only step taken by many designers. Some feel they can gain enough knowledge about a project by chatting with the

people who manage and live in it. This is certainly a necessary step, but only one of many. Several false impressions can be gained from this step that need to be corrected later.

For example, in a large public housing POE (Bechtel, 1977)*, both residents and management told the researchers that the vandalism and damage done to the project was the work of outsiders. Later research showed very few outsiders entered the project and those that did were regular visitors who did no damage. The outsider myth is a frequent explanation for vandalism, crime, and many kinds of harmful events. Thus, these first impressions gained by talking with management and residents can be valuable but sometimes misleading.

But a talk with management, maintenance people, and residents is a useful way to begin familiarizing ones self with the population and building to be evaluated. These talks should be done with at least the designer and researcher together.

Talking with management and maintenance personnel and residents should not be entirely casual. Introductions should be made through some proper authority, the housing director or head of the resident council. An explanation should be given of how the information will be used to build better buildings and any questions should be answered. The manager should be asked about his main problems and about design features such as office space, pathways, access, etc., which may help or hinder his job. Managers will almost always have very specific ideas about how the buildings could be better designed.

Maintenance personnel will talk eagerly about their main problems. In public housing it will likely be broken windows, lock outs, and plumbing. But many more specific aspects can be uncovered.

Residents can sometimes be most informative of all. They can talk about location and size of kitchens, the need for a second bathroom and many other features that might escape even a sophisticated observer's eye. Yet, one must be aware that residents often form themselves into factions that have certain "axes to grind" and this can be misleading. After a time the composition of these factions will become all too evident.

The results of the conversations with the managers, maintenance people, and residents should form a first picture of the total environment. The impressions one gains from these encounters should be written down for later reference. Don't trust these impressions to memory. Often, there are too many details one cannot remember and many of the details will not have meaning until they are fitted into a large picture later.

Following these conversations the designer and researcher should have their own "wrap up" to exchange impressions. Designers and researchers have different ways of looking at things. Often the designer's notes will be in the form of sketches and schematic drawings, while the researcher's notes will tend to be entirely verbal. A good comparison will reveal how behaviors noted go with design features and often new questions will be raised.

*Enclosing Behavior by R. Bechtel, Dowden, Hutchinson and Ross, 1977.

After becoming familiar with the project through the above conversations, the designer-researcher team should arrange for the architect who designed the buildings to walk through the site with them.

The Third Step - Walking Through the Project

1. Walk-Through with the Architect

The designer, the researcher, and the architect who designed the project need to walk through the entire site, preferably, with "as built" drawings. The architect can then relate his decisions as he remembers them on site selection problems, building location on site, form of the buildings, layout of the units, size of rooms, and other design features. This discussion should result in a number of questions central to the POE. Especially important is to discover whether the architect operated on a general over-arching design principle. Some architects operate without a general over-arching design principle. Some architects operate without a central, unifying concept. Others would not think of beginning a design without one. Some have gone through an extensive programming sequence.

Another important set of facts to uncover is how many change orders were executed which made the final construction different from the original design. Some of these changes are "cost cuts" to save money on construction and hardware. Sometimes, however, the change order can enable an astute client to slip in amenities that add to the cost.

In practice many of these are not recorded. Strictly speaking, it is required that any changes be recorded but they often are not. The architect may have a few surprises when he looks at the construction, or he may try to ignore certain changes that were not recorded. Almost always, change orders result in increased costs. The purpose is not to chastise but to learn, so the team needs to be aware that there may be some sensitive areas and not to give the impression of searching for mistakes. The architect may have opinions as to how these changes will affect behavior that are important to learn.

A list of the design decisions made by the architect should form the basis for questionnaire construction and observations made later.

2. Walk-Through with Maintenance and Management

Once having obtained the basic design details from the architect, a walk-through should be made with maintenance and management personnel to solicit their opinions about the same design features. They may have no comments on some of these features, but a surprising number may solicit comments such as, "too hard to keep clean," "can't find parts," and other useful information. Also, don't neglect to ask about site problems such as access. Access that is adequate for residents may be quite inadequate for maintenance purposes.

3. Walk-Through with Residents

Usually a group of residents is more informative than one or two. The group tend to stimulate each other and remember more incidents. They should have each design feature, each maintenance and management problem pointed out for comments. These responses are also source material for questionnaires. Once stimulated, a group of residents can carry on for long periods about the problems and virtues of living in a building. Sometimes these sessions can become largely a "gripe" list so that it may be necessary to ask what features are positive.

The walk through should include at least one example of each type of housing to be studied.

The Fourth Step - Defining the Population and Sampling

Once the buildings are more familiar as a result of the conversations and walk-throughs, the definition of population is necessary. If the POE is to be done on a specific site, the population living on that site is, by definition, the best for a POE. Sometimes a POE may cover several sites and several building types. For a small project of, say, 50 residents it may be possible to interview each one. However, it is usually necessary to take a representative sample of the population.

The sampling procedure depends on the kind of questions to be answered by the POE. Should the sample contain only heads of households? This would be reasonable if heads of households are the ones who could answer best the questions about design features. But to sample only heads of households eliminates teenagers, children, and most housewives. A better strategy is to sample by type of unit and talk to the entire family in each unit if there is not a wide age or race disparity in the population. This is, in effect, a sampling of houses rather than population. Therefore, it is necessary to insure that a bias is not introduced into the sample. For instance if there is a minority of blacks in the project, their houses must be sampled in exact proportion to the population figures. Age is another problem. If elderly are present, then elderly households must be sampled in direct proportion to their existence in the population.

But with children, the problem is not as simple. The profile of children's ages must be examined to determine whether a sampling bias would be introduced by randomly selecting houses.

Random selection by stratification, that is, by arranging the population divisions for representativeness, is a science in itself. The basic process of a random sample is to assign a number to each person (or house) in the population that will be sampled and to then pick a fraction of these. The numbers can be written down on scraps of paper and picked from a hat. Modern computers are often involved in doing the sampling to save the human labor of writing down the numbers and selecting.

The researcher selected for the POE should be familiar with sampling techniques and able to apply them.*

*A standard reference on sampling is Survey Sampling by L. Kish. Published by Wiley & Sons, 1965.

When the entire family is interviewed, some care must be taken in recording responses. For example, when there are questions about teen age activities answered by teen agers, these cannot be written down as though one person answered all the questions. Some purists would even require that the persons talked to in a household should be selected at random after the house has been selected at random. Such adherence is only necessary when that degree of randomness is required by the kinds of analysis methods employed.

The rationale of randomly selecting houses rather than people is that the design features are the object of measurement. In keeping the population representative one must be certain that biases are not introduced by age, sex, race or other variables.

The Fifth Step - Questionnaire Construction and Activity List

The reader should be aware that researchers have used many different methods in POEs. Only two are being described here because they are the most common, but for some occasions they may not even be the most appropriate. There is no hard and fast rule for which methods should be used for which problems. Sometimes cost is the biggest determiner of method. The researcher must choose the method he can afford.

A list of typical methods follows:

1. Interviews, open
2. Interviews, structured
3. Cognitive maps
4. Behavioral maps
5. Diaries
6. Direct observation
7. Participant observation
8. Time lapse photography
9. Motion picture photography
10. Questionnaires
11. Psychological tests
12. Adjective check lists
13. Archival data
14. Demographic data

The method, then, must be left to the researcher to choose, but he should be able to justify his choice. The questionnaire and activity list as described below are the most commonly used.

1. Questionnaire

The science of questionnaire construction is beyond the scope of this description. But the pitfalls are many even for the most expert. To begin with, the way questions are asked often determines the way answers are given. "Do you beat your wife" is the kind of question that will always be answered no. It asks for a response that would be too embarrassing if the answer were positive. There are many variations of

how not to ask questions. The double negative is another example: "Do you agree we should not teach our children not to like Sunday School?" What does it mean? Should we teach our children to like Sunday School? Many people cannot understand double negative statements. It is generally poor practice to include negative statements in a questionnaire.

In the case of a POE, questions should be derived directly from the walk through and conversations in previous steps. Each question should evaluate the success of some aspect of the design elements uncovered. If the architect designed a grand entrance so people could feel proud on entering, then a question should be asked about the entrance to determine whether this purpose was realized. The general-followed-by-specific is a good technique. First, the general question. "How do you feel about the entrance when you come through it?" The question does not specify any way the respondent should feel but leaves it entirely to him to say anything he wants. The question does specify, however, when you come through it, causing the respondent to remember a feeling as he was in the act of approaching and going through the entrance. The response is left open to the subject and he can say "proud" if he feels so inclined, but the question itself did not prompt him.

The open ended question is then followed by a specific one which attempts to determine if "proud" is a reasonable term to apply to the subject's response. He is asked to choose among several words (usually five or less) of which proud is one. The architect's original intention is then tested by answers to these questions. If most subjects answer "proud" or similar words like "inspired", then the purpose of the design is considered successful at least in that particular aspect. In a similar fashion in the more specific question if the word "proud" is chosen significantly more often than other alternatives, the purpose is also confirmed as successful.

But the second type of question is not considered as strong a confirmation as the first. In the first instance the subject could choose among a seemingly infinite number of responses so that if he chooses "proud" among all these possibilities it is a much stronger case than if he only chooses among five or less.

Some researchers will begin questionnaire construction by first asking open-ended questions and then choosing among the answers to develop multiple choice answers. There is usually not time, nor often sufficient population in an ordinary POE, so the general and specific technique of asking two questions on the same topic is most useful.

Above all, be certain that all aspects of the design are covered. If the questionnaire becomes too long, it can be cut in half and each half administered to different random samples.

2. Activity List - design specific

The activity list is constructed from direct observation of behaviors. The observations should take place after the design questions have been formulated. Using the "grand entrance" example again; if the architect intends the residents to feel proud when they enter, is there any visible evidence of this from watching residents enter? Do they raise their heads higher? Is there a look of pride on the faces? Can any behavior be tied to the visual impact of the entrance? Is there evidence the residents look at the entrance? One could easily substitute other design features such as kitchens or doorways and treat them the same way. What is important is to determine whether there is a consistent observable behavioral response and whether this can be linked to a design feature.

A list of possible activities can then be made up and linked to each design feature. However, in some cases this kind of list can become horrendously long. The activity list should be seen as an accompaniment to the questionnaire, not a substitute or a repetition. It should involve questions of behavior that are not dealt with easily on the questionnaire. For example, it may be necessary to find out how people feel about a manager's office in a large housing project. In constructing the questionnaire, it is discovered that many people simply don't go there. It then becomes necessary to observe those people that do and record their behavior with some estimate of how many people out of the total population do go there.

Another case of when the activity list for specific features is necessary is when people cannot say how they respond to a given design feature. After composing the questionnaire, if it is discovered that most people simply don't know how they respond to a design feature, observation is then necessary to measure the behavior that takes place.

The specific activity list is used to cover areas which the questionnaire cannot cover.

3. Activity List - general

In addition to the specific activities, residents need to be measured on their more general activities. How much time is spent in various recreational pursuits? Where do these take place? Some general activity lists are already available such as the time samples of Chapin (1974)* of Michelson (1975)** or the behavior setting

*F. Chapin. Human Activity Patterns in the City, Wiley, 1974.

**W. Michelson, and P. Reed. The Time Budget, in W. Michelson (ed.) Behavioral Research Methods in Environmental Design, Dowden, Hutchinson and Ross, 1975, pages 119-179.

survey of Roger Barker (1968)*** as adapted by Bechtel (1977)****, but whichever more general activity list is chosen, it should give an annual picture of activities in the house so that the behavioral effects of all seasons can be measured and the ratios of different activities calculated. The general activity pattern over a year gives the overall picture of how the house is used and can provide a central concept of design. For example, in extreme climates it was discovered that residents were forced to spend a great deal of time indoors. This made the use of the house for recreational purposes the most important activity. Thus, the houses needed to be redesigned for children and adults. (Bechtel and Ledbetter, 1976).*****

Similarly, the general activity patterns tell how much time is devoted to working in the home, cooking, repairing things, and various other activities that need to be accounted for. On military bases it was discovered that officers and noncoms bring home a significant amount of work so space had to be provided for it.

The methods of applying an activity pattern are three. One is by observation, the second by some form of diary and the third as part of the questionnaire. The questionnaire format is the easiest in terms of time and research effort, but it must be done with care. The questions about time must be related to specific activities. For example, how many times a month the person goes to the movies, or how many times he attended bowling league. Travel times are also included.

The problems with a diary and observation are that they must take place over the period of a year in order to get annual data. This is one of the principal objections to the use of Barker's (1968) original behavior setting survey - that it requires a full year to complete.

Sometimes, however, the diary and/or observations are used for shorter periods of a week or even a few days to validate resident estimates of time spent in various daily activities.

Different researchers employ different methods and the merit of any method must be judged separately for each case.

The activity list will usually accompany or be a part of the questionnaire as a whole and observations or time diaries will be supplements.

Sometimes in addition to the questionnaire and activity list, a researcher may want to administer standard psychological tests to measure particular qualities of a population.

***R. Barker. Ecological Psychology, Stanford University Press, 1968.

****R. Bechtel. Enclosing Behavior, Dowden Hutchinson and Ross, 1977.

*****R. Bechtel and C. Ledbetter, The Temporary Environment, Cold Regions Research and Engineering Laboratory, 1976.

A standard psychological test is one that has met the standards of The American Psychological Association and has been administered to several populations so that scores of these populations can be compared with the population being studied. The use of such a test, however, should be consistent with the purpose of the POE.

The Sixth Step - Pretesting

Once the questionnaire and activity list are constructed they are not ready for administration until they have been pretested on the same population to be studied, or a reasonably similar population. Pretesting is a necessary part of the use of any questionnaire. The purpose of pretesting is to "work out the bugs" of the questionnaire and activity list. Generally, the wording of the questions needs to be tested, and the coverage of the questions needs to be checked. Wording is tested by asking a respondent to answer the question as it would be normally asked but then asking the respondent to explain what the question means to him. It is often startling to discover the wide disparity between what the most careful researcher thinks a question says and what the respondent sees as the meaning. If wide disparities exist, then the wording of the question must be explored until the exact wording is discovered that will convey the researcher's intent in the question.

Coverage is checked by exploring with respondents beyond the answers given. Even if all the questions are understood as the researcher intended, there still may be important areas the researcher has missed. These areas can often be discovered by having the resident expand on his answers. It is also a good practice to ask if there is any other area the resident can think of not covered by the questionnaire or activity list.

Of course, wording and coverage are not the only aspects to check in the pretest. The order of presentation of questions is sometimes critical and needs to be checked. Sometimes the pretest can be split into two groups to test for order effects.

Another aspect of the pretesting is to provide accurate data on the length of the interview. Interviews are ideally optimal at 20 minutes. Interviews that go two hours run into serious trouble. If at all possible, length should be kept under one hour.

How many residents should be included in a pretest? There are no accepted rules, but a handy guide is usually 10% of the expected sample size.

Part of the pretest should be a review of questions by management and maintenance personnel.

Experience of the researcher is a critical ingredient. Usually a researcher who has done several POEs has covered enough design features to gain a sense of coverage and to gather together a set of proven questions. Yet each situation can contain its own set of surprises for even the most experienced.

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The Seventh Step - Administering the Questionnaire

Interviewing with a questionnaire is a well understood procedure and several very useful manuals exist. Perhaps the one that reflects the most nationwide experience is the Interviewer's Manual (revised edition) published by the Survey Research Center of the Institute for Social Research at Ann Arbor, Michigan (1976). It must be noted that this is a handbook for national survey sampling rather than for POE use, but the chapters on Introduction to the Interview (2), Using the Questionnaire (3), Probing and other Interviewing Techniques (4), Recording and Editing the Interview (5), and Call and Callback Strategy (6), are important to study. The Telephone Interviewing (7), and Sampling Principles and Procedures (8), chapters are also useful. Any person seriously involved in interviewing should have this handbook to refer to.

POE interviewing is different from survey sample interviews chiefly in the content of the interview. The POE concentrates on design or physical features of a house and how they relate to behavior.

Before the interviewer arrives at the door of a house selected for a POE several events should have preceded him. First, information about the interview should have been publicized in local media. If the residents are part of a public housing project, the questionnaire should already have been approved by the resident council and housing management. Notification of interviews to be held should have been published in the resident newsletter and/or a local newspaper. The article should state the purpose of the study, the researchers doing the work, and give a telephone number to answer questions.

The housing authority, or developer, or agency in charge of the housing to be studied should write a letter to each subject selected, explaining that an interviewer will call on them and, if possible, naming the interviewer. The letter should also explain the nature and purpose of the study and provide a number to call for questions.

In most survey samples the interviewers operate from an address list and go from door to door. If the resident is not at home they call back.

For POEs it is often more expedient to operate by calling the resident and making an appointment. This way the interviews can be scheduled with a minimum of wasted travel time and callbacks. Further, the interview can be scheduled so that all members of the family can be present. While this may mean working evening hours for the interviewer, it results in more complete information. Time for the interviews should be spaced according to the time limits discovered in the pretest. Travel time between locations must be allowed for.

Once the interviewer is at the door a conventional greeting is usually most effective. The interviewer must adopt a style of dress and manner that will not "put off" the resident. It is good form to present a letter or card of identification to the resident before entering. The letter can be from the housing manager, or developer, or from the head of the research firm.

Inside the house, the interviewer should take quick note of design features that are the subject of the POE. Most interviews either take place in the living room or at the dining room table. The interviewer needs to take care that a walk through the house is made after the questions have been answered to verify responses. Going to the bedroom, comments should be made like "This is the wall you don't like to put the bed against," or "This is the place you can't get warm." In other words, locate each behavior in its appropriate place as mentioned in the answers to the questionnaire and activity list. Also, when going through the house the resident may remember things he forgot to mention on the questionnaire.

Asking questions of the resident is a process that is rehearsed with the researchers prior to administration of the questionnaire. If experienced interviewers are involved, the rehearsal amounts only to one or two sessions. Sometimes the researcher chooses to hire local residents as interviewers. This requires several training sessions with the researcher "role-playing" (pretending to be a resident) while the resident administers the questionnaire. Usually the researcher will go with the resident interviewer for one or more interviews before sending the new interviewer out on his own.

If there are several interviewers it is worthwhile to have them gather at the end of each day and share stories about the interviews with the researchers. This gives the researchers a better feel for the kinds of responses the questionnaire and activity list are getting.

A principal part of the administration of the questionnaire is the recording of answers. A good questionnaire has answer spaces provided along the right hand side of the page so that card punchers or tabulators can read quickly down the page without any distraction. Such a format saves considerable time in coding and tabulating responses even if they are not to be used in a computer.

The interviewer will also want to take notes about unusual or qualified responses. These should be written right on the questionnaire form so that it is clear which question they belong to. It is also important to quote some comments literally so that they can be used by the researchers to illustrate what some answers meant to the residents.

What form should answers take on a questionnaire? Should they be yes-no answers? Experience at questionnaire construction indicates that if some sort of judgment is to be made, ranking of yes-no responses are not adequate. If possible a 1 to 5 scale should be used with 5 being the most positive response. This kind of response code also saves a great deal of trouble in analysis of the data. Of course, activity data is recorded in number of hours.

Terminating the interview is sometimes difficult for beginning interviewers. The experience of being interviewed may have excited the resident so much he wants to continue far beyond the length allotted for interview time. The best excuse the interviewer can give for leaving is the next appointment.

The Eighth Step - Analysis of Data

The analysis of data is best left to an experienced researcher. The kind of analysis is decided upon before the questionnaire is in final form so that the kind of coding in the answers and the questionnaire format are suited to the type of analysis. And it is usually customary to use a computer for any extended analysis.

But some analyses are more extended than others. When the data are put in the form of percentage of responses, this is the form familiar to most people. This is sometimes referred to as tabulation or only descriptive statistics.

The "real" statistics that researchers use actually test whether differences in responses differed significantly from chance. In fact, the statistical tests usually are much tougher than most people might expect. The standard practice is not to accept a finding if there is more than 5 percent chance of error.

The statistical tests themselves have complicated sounding names, Analysis of Variance, Discriminant Function Analysis, the T Test, the F Test, Chi Square, and others. All are designed to test whether differences between groups are significant. But on a POE, there may only be one group of residents. In that case, different statistical tests must be used to test for differences within a group.

What statistics generally tell you is what answers are more likely to be important than others. Statistics are best, however, at telling which differences are most important. They really compare things rather than tell what they mean.

There are not only statistics to tell what answers are different from chance but there are also statistics to tell you what answers go together. In some cases the statistics can tell you if the answers that go together are almost identical. These statistics of association have fancy names also, regression, covariance, factor analysis, cluster analysis, and correlation. Sometimes it is good to know what questions go together so they can be eliminated. At other times it is important to know what things go together for the association itself, for example, what behavior goes with what particular design features.

It is beyond the scope of a layman to know whether the researcher has chosen the proper statistics. This is, unfortunately, a sphere left entirely to the researcher's judgment unless the person who needs to know hires a second researcher as a consultant.

However, the designer or interested person has every right to demand that the results of statistical testing be made meaningful to him and the researcher who fails in this task has not performed the most significant part of his job. Statistics are used to support the interpretation of results and every statement about the results of the questionnaire or activity list should be supported by some statistical figure.

Once the analysis of results is finished, the report of results is usually written by the researcher. In certain cases, this may be written in cooperation with the architect depending on the nature of the team.

The Ninth Step - Testing Results with the Architect and Management.

The report of results is not final until the architect who will design the new facility and the management of that facility have responded. In cases when the POE is done before an architect has been picked, an architect who has designed similar housing should be hired as a consultant to review the results. The purpose of this review is to make all of the results clear to architects in general, and useable for new designs.

Similarly a management person should go over the results with the same purpose in mind.

At present there are simply too few researchers who can write results in a language acceptable to architects and managers. This step is necessary in order to make the POE results useful to others.

The Tenth Step - Consulting on Design

Assuming that the POE results are now in a form understandable to architects and housing managers, the next step is to implement the results into a program which is then translated into a design. The most ideal situation is for the researcher who performed in the POE to be the same researcher who consults the architect. Likewise, the architect who does the program and new design should have been on the team who performs the POE. Then both have had time to establish a working relationship, and can move into the design phase without spending time developing a relationship.

Some architects do not develop a program but go right into the design stage. Sometimes the architect who does programming is separate from the designer. There are even a small group of professional programmers who are not architects.

The design consultation is essentially a dialogue between researcher and architect. The researcher presents the POE results. The architect responds. The researcher clarifies. After deliberation the architect develops the preliminary design concepts. The most effective dialogues evolve when the researcher can present the designer with a central behavioral characteristic around which the design can be formulated. For example, the architect Howroyd researched villages in desert areas of the middle east and derived the central concept of Protection against the Climate as his principal theme. The central theme then determined the site choice, which was protective, the site plan, which was a cluster plan, and the house design which was inward looking.

Even among architects who do not work from a central concept, there is a need to be able to order the POE findings in terms of importance. Is recreation more important than parking? Many times it is not very easy to answer questions like this, but very often the importance of a behavior can be determined by the amount of time spent on it. At other times the values

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placed on a behavior determine its importance. It is up to the researcher to interpret his findings (having measured them properly) to provide this ordering of priorities.

The researcher responds to the preliminary drawings by testing them against the behavioral findings of the POE and other POEs. He may suggest modifications or additional concepts. The architect may then respond with a second set of drawings.

Working styles among architects differ - some may want to follow a fast track system, others use a more contemplative method, some use design teams, others use the consultant model. At some point, however, the design must reckon with the cost factors and it is at this point that many design elements are compromised and many human amenities are lost. When construction cost is used as the chief determiner of feasibility, as is currently the practice in most housing, many of the design features that make a building a better quality environment are lost, because it is these very features which make construction cost high. Thus, the conflict over construction cost is usually one where good design loses.

But it is at this very point that the researcher needs to assist the architect in supporting good design. Architects claim that 80% of the design of housing is done by the financial institutions and the building and property regulations. This permits only a very narrow margin in which to be creative. And these institutions work from an initial construction cost basis. Thus, when the POE results point to including amenities which make management and maintenance cheaper and it is often these amenities which threaten cost feasibility at the construction level. This is not to say that POEs will not recommend design features that could save on an initial construction cost, but it is true that the full benefit of the POE can only be realized on a life cycle cost basis because it is more often the amenities after construction on which the greatest benefit of the POE is felt.

A major part of the input to the architect will be to show the usefulness of including post construction benefits. For this reason it is also critical that the architect himself becomes involved in the building beyond the construction point. Architects relate that of all the constraints to POEs, the easiest to change would be to increase their involvement in the building after it has been built. This response was the most frequently chosen among 24 alternatives.

How this involvement might be implemented in the architect's own office will be discussed in the next step, but how this involvement can be implemented through the housing agency needs to be considered here because it is an essential part of the POE.

Several paths might be followed in getting the architect to become involved in the building beyond the construction stage. One way is to make a POE of the new building part of the architect's contract so that he must be part of the team that evaluates his building and gets paid for this

involvement only after the POE is done. Some problems with this approach are that the architect would be in a conflict of interest situation if he evaluates his own building; it becomes administratively difficult to follow through on a contract that stretches over the long time period from POE to construction and second POE; there may be legal problems in allowing this kind of contract in various federal, state, or local contexts.

A second approach would be to set up an architectural review committee through the local AIA chapter to review a POE done on the building and have the architect respond to the POE results. A problem with this approach is that architects are extremely reluctant to criticize each other in public and this matter would have to be handled either in the same way that physician's boards are handled (i.e. in private), or as a review committee for housing awards.

A further method for increasing involvement would be for the housing agency (or a clearing house agency) to contract out for its own POE and either require the architect to respond as part of his contract or pay him as a consultant.

Any of these approaches has its own shortcomings and only if the housing agency has its own way of implementing POE information does it make any sense to involve the architect beyond the construction point.

The housing agency itself is not able to take advantage of POE information unless it invests some staff person with authority to implement POEs. First, there has to be a file of POE information which not only contains the records of all POEs done by the housing agency but has a complete cross-indexed breakdown of design and hardware features and their behavioral consequences and outcomes. The POE officer must have authority over approving design decisions. If he is only in a "suggesting" role, his voice can be too easily ignored. Only the director should be given authority to override his decisions.

Housing management is a key factor here. Both public housing managers and private developers who manage their own buildings complain that current requirements for construction are not adequate for the management task. Therefore, management should have a much stronger voice in design decisions and not be brought in after the design is built. It might be feasible to have the POE officer be a management person. At the same time, it is also necessary that the POE offices be knowledgeable in the social science research field.

These two requirements are necessary, then, a POE file that can be useful and a POE officer with some authority and input from management.

The Eleventh Step - The Professional Archive

Every human endeavor has its own body of knowledge no matter whether it is raising babies or raising bread. There are places to go where this knowledge can be looked up and people who practice in it that are considered expert. Without these two ingredients the knowledge of any human endeavor

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can be easily lost. POEs have both, a body of knowledge and a group of expert practitioners. It is almost as though the POE as a practice has arisen simultaneously in several parts of the world out of the same necessity : to evaluate whether buildings serve human needs. Yet the knowledge is piecemeal and obscure and the experts are scattered and from such diverse backgrounds that it is difficult to find information or learn from the experts. Aside from the bibliography in Appendix II no attempt has been made to collect the information together.

Therefore, it is a necessary part of any POE to collect information on other POEs and to build up an archive of information and experts. The literature search cannot be accomplished without this. More important, there is no way to provide continuity with the next POE unless there is an archive. Yet the archive is only as useful as personnel make it, and a group of people must be made aware of the archive and become skilled in its use. This must be done under the authority of someone fairly high in an architectural office. The tendency on new operations is often to give them to younger and more junior staff members. In the case of POEs this would mean a junior person evaluating the work of his senior. The fear of job security alone would be enough to threaten the integrity of any POE. Therefore, a senior member of the firm must be made in charge of POEs.

The whole question of self interest is involved whenever a firm does its own POEs. But economics being what they are, the likelihood of many firms hiring outside consultants to do POEs is small. The burden of honesty then rests within the firm.

A further mistake is to assign a task like this to only one person. In fact, knowledge from POEs must be distributed among all members of a firm so that any aspect of design is influenced by that knowledge. A much better method is to have reviews of designs after POE data has been collected in which all personnel take part. This would mean a systematic review of every firm's design product, using POE information. These reviews should be recorded and decisions made about what elements to improve in the next design. The results of these deliberations should then be made part of the archive so that they are available for the next designer.

What is true of the design firm is also true of the housing and development agency. Unless a similar procedure is followed, knowledge from POEs will not be distributed widely. The ability to use POE information should not be restricted to those few who do the POE or who keep the archive. Reviews should involve all elements of housing operations, security, management, maintenance, and tenants.

A final word must be addressed to the reader before we leave the subject of how to perform a POE. It is taken for granted that the POE will be a new topic in housing for some time to come. Even though the practice is a long way off. So for some time the POE will have the status of a new thing. The latest "gimmick" or perhaps even a symbol of further encroachment from the federal government.

All new things are at first resisted. They are a threat to the old way of doing things. But POEs are more threatening than most new things because

they evaluate the success of a building. The practice has been to forget about old buildings and go on to new ones. Suddenly, the POE appears and says you must now begin to learn from your successes and mistakes. Several professions are now having their work evaluated when they have only had their peers to answer to before. The results may be better environments for everybody but that is a goal too distant for most people to grasp. Many will find numerous reasons to reject and fight against the practice of POEs. Arguments will be raised about the orderly course of business in an infinite number of ways.

One must choose which side of the argument is in his own best interest. On the one hand is the old way of doing business. But this has not resulted in a system that allows the product to improve systematically. On the other hand is the POE which operates under the assumption that at the very least we should be able to measure what we are doing in housing and be able to learn how to build better houses. The implementation of something new and useful is not accomplished by avoiding this issue. Anyone who attempts to do a POE will encounter this resistance in some form and must be prepared to deal with it for some time to come.

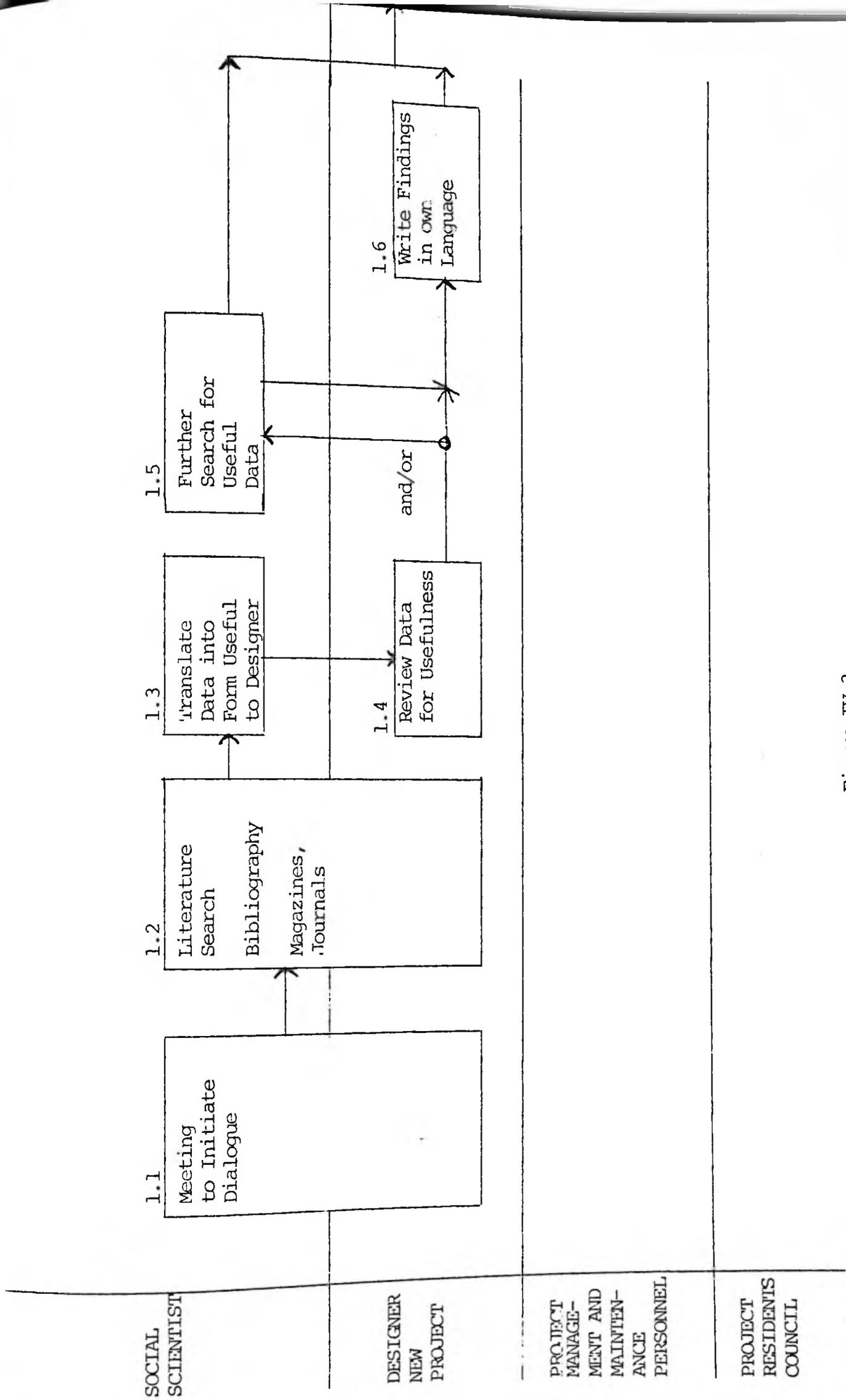
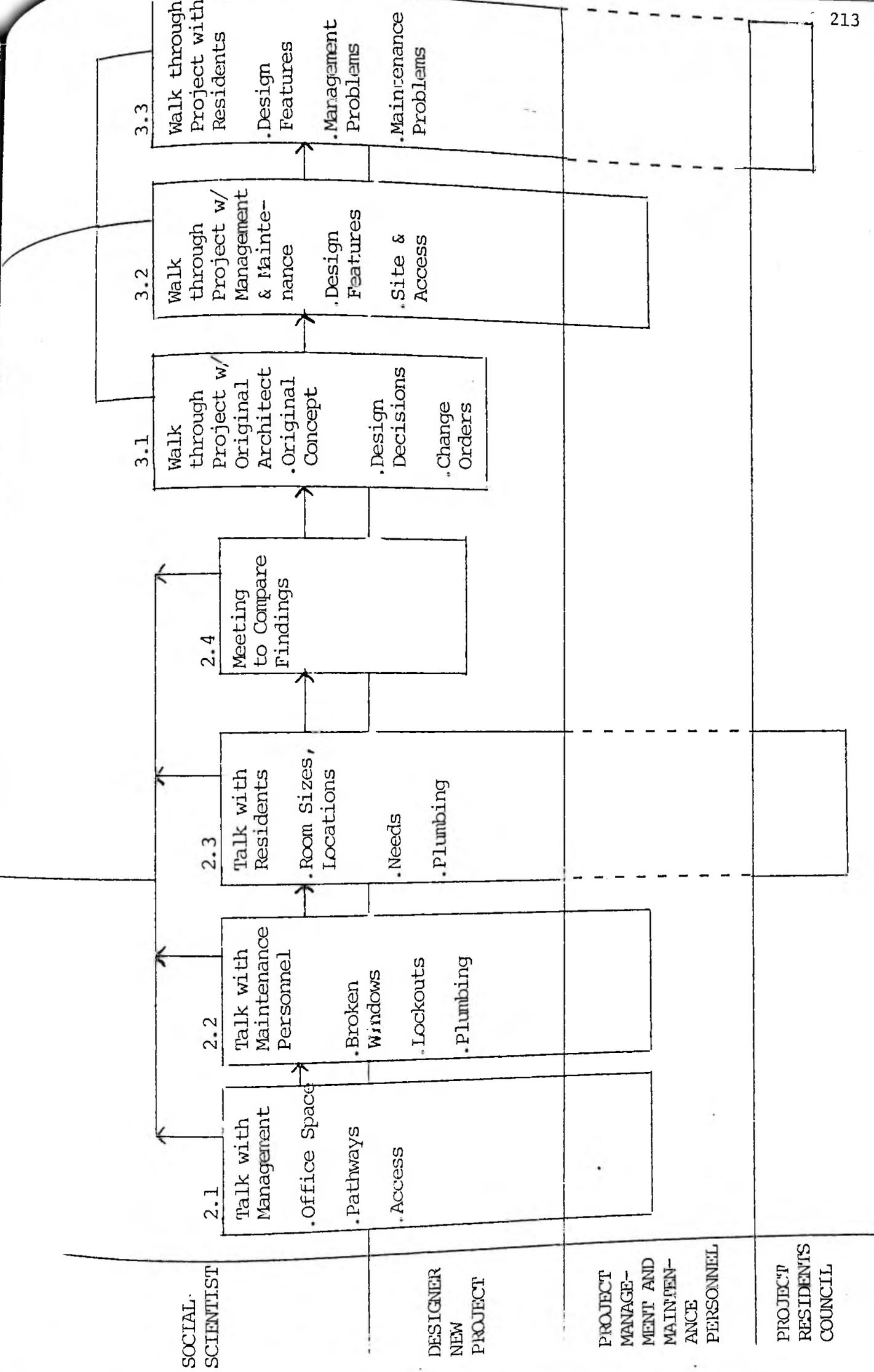


Figure IV-3

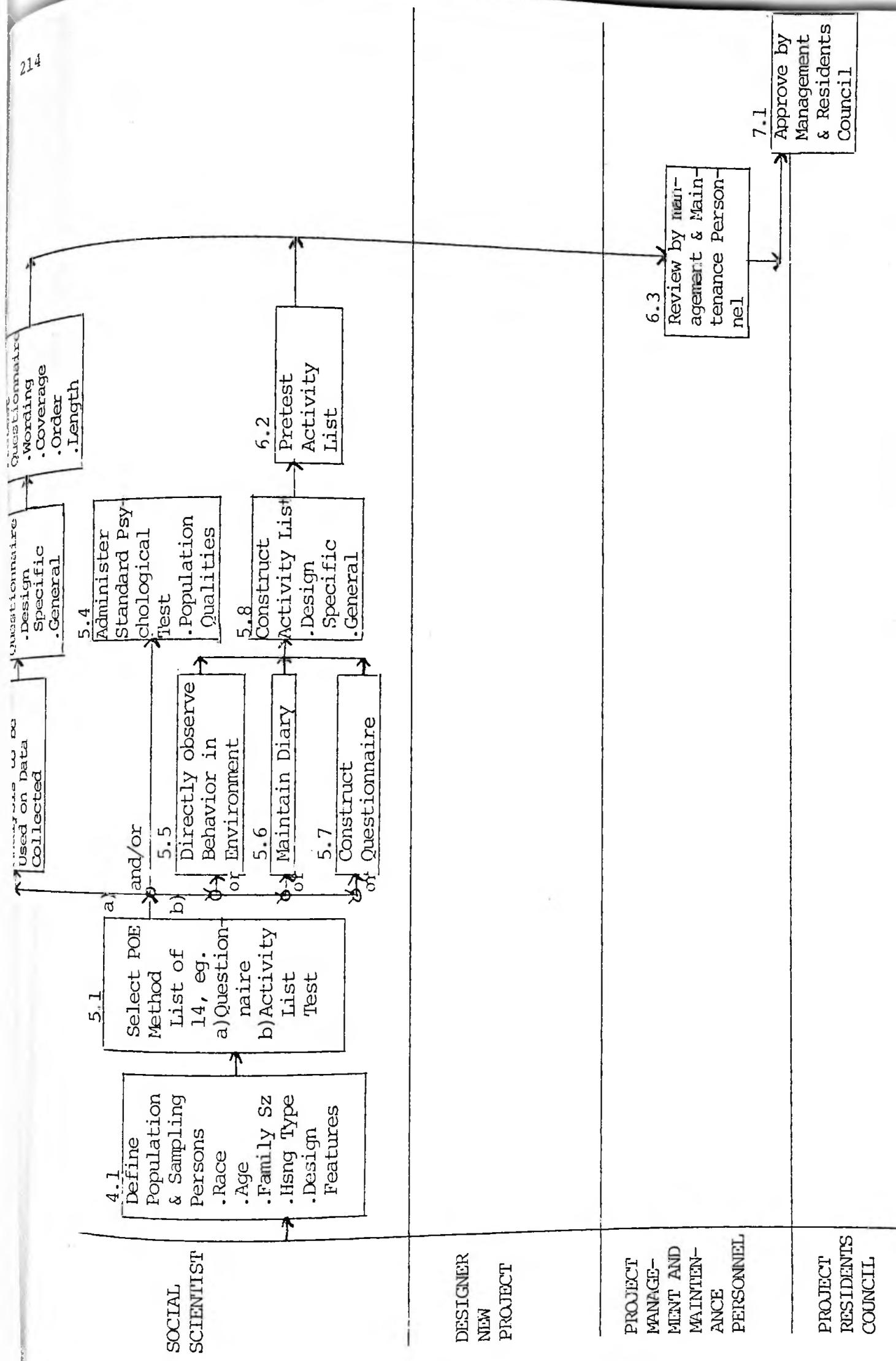


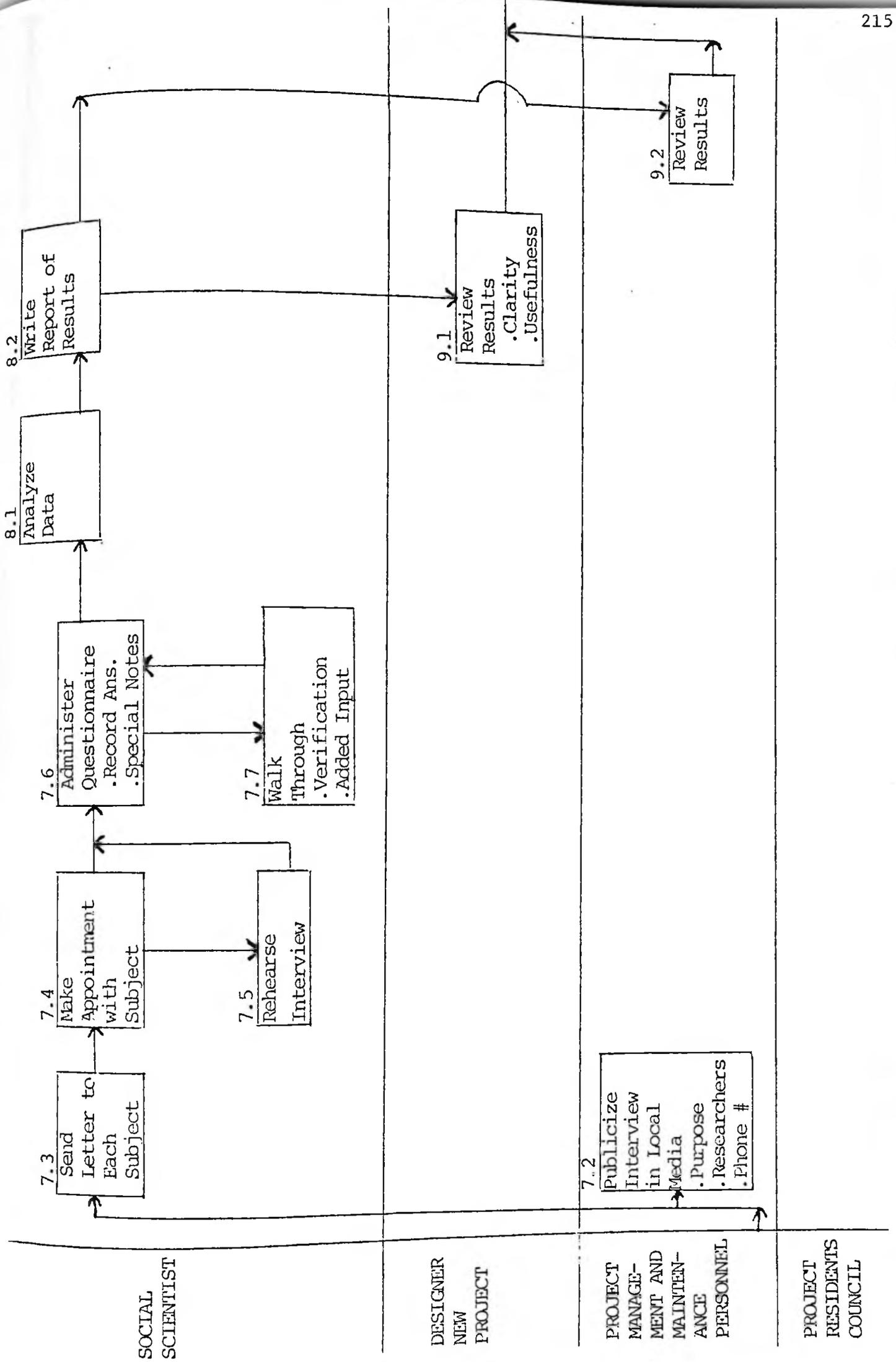
SOCIAL SCIENTIST

DESIGNER NEW PROJECT

PROJECT MANAGEMENT AND MAINTENANCE PERSONNEL

PROJECT RESIDENTS COUNCIL



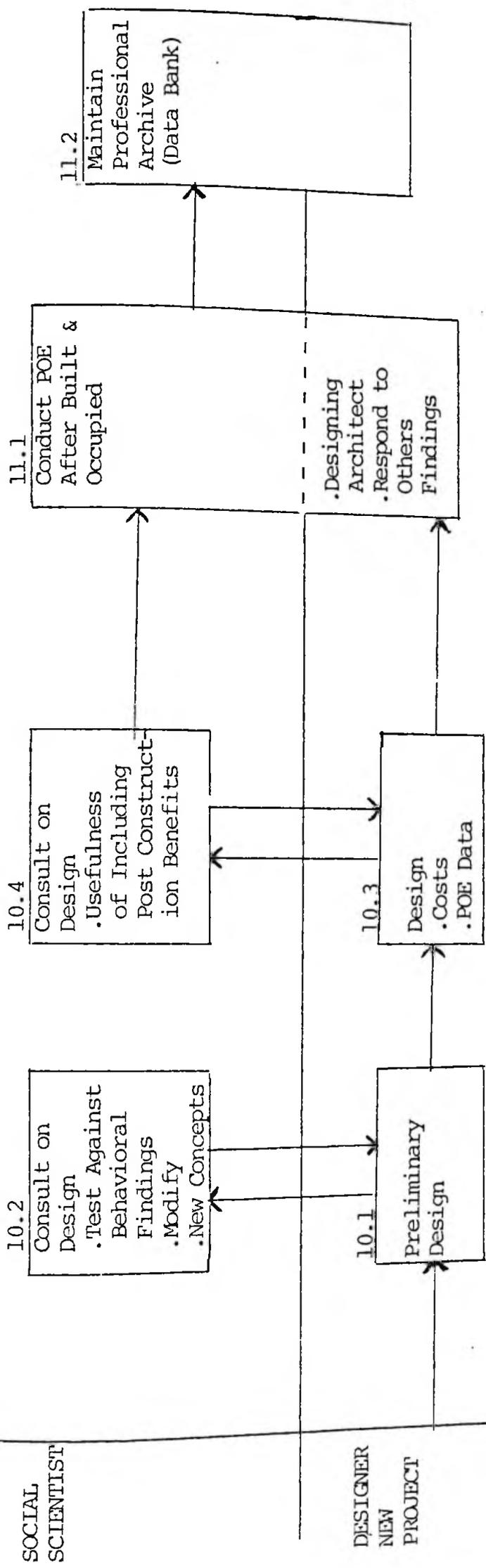


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SOCIAL SCIENTIST

DESIGNER NEW PROJECT

PROJECT MANAGEMENT AND MAINTENANCE PERSONNEL

PROJECT RESIDENTS COUNCIL

TASK IVf

Develop a Strategy for Dealing with Constraints Identified by Professional Societies Representing Building Sciences

The main strategy for dealing with constraints was discussed in Task IVa. The constraints identified by professionals were described in IIIb. The overriding constraint identified across professionals was the lack of involvement in the building after construction. Secondary constraints were current financing practices, lack of a legal mandate, and the current system of fee structures. Of the most relevant constraints, lack of involvement after construction was also rated the most easily changed.

It must be understood from the outset that involving professionals beyond the construction point is a significant change in most of the professional roles. It has already been mentioned how financial constraints operate against involvement past the construction point and it has also been discussed how professional training seems to fix the mold of professional practices so that they are difficult to change. It would seem, therefore, that part of any strategy must involve changing both the financial and training components.

1. Financial Criteria

The financial component, from HUD's point of view, has already the potential for change in the current requirements for estimating operating costs beyond construction. Unfortunately, the final construction cost is the criteria used for prototype cost allowance.* To begin with, the prototype cost allowance needs to be calculated on a projected 40 year life of the building so that the deciding factor in feasibility is this figure of total life cycle cost.

Admittedly, the projections of life-cycle costing are not as accurate as they could be, but this is largely because the empirical data that already exists has not been brought to bear on it. As POE data are generated the estimates on maintenance, management, and replacement costs will become more and more exact. The important step is to institute the life cycle cost as the criteria for the prototype cost allowance at the HUD headquarters level and the judgment of feasibility at the PHA level.

Such a procedure would change the reward system for local housing authorities. Instead of being rewarded for the largest number of units constructed at the cheapest price per unit they would be rewarded for the largest number of units that require the least operating cost. It is the operating cost of units that require the least operating cost (de Leeuw, 1971)** and it is this cost which is the chief cause of problems between HUD and the PHA.

Similar changes would also be required for financing among the savings and loan institution and the banks. Before HUD insured loans, it would be required that life cycle costs would be the basis of loan feasibility. Of course, the temptation to show low operating costs would be very great in such a situation. But it could be required that the life cycle cost be substantiated by existing data on current costs. This, in effect, forces

*Although prototype cost allowances can be raised. See reference to Simon memo, p.180.
**de Leeuw, F. Operating Costs in Public Housing, The Urban Institute, 1971.

the builder-developer and financiers to perform POEs. Each agency seeking a loan would have to keep current operating costs for all types of housing in order to have a data base for loans. Banks would need to have such data in order to evaluate loan proposals. Architects, engineers and interior designers would need similar costs on all the elements they propose included in any design. Eventually, this may even pressure more manufacturers to provide reliable data on their products.

2. Education and Implementation

The educational aspect of implementing POEs has already been discussed and it would need to accompany the change to a life-cycle cost criterion. An educational program should include workshops, university courses, and published articles in appropriate trade journals.

But from the point of view of social change, the educational aspect should be coordinated within the housing committees of each organization. These are listed below:

Organization	Committee
American Institute of Architects	HUD/AIA Liaison Task Force
American Society of Civil Engineers	Interprofessional Council on Environmental Design
American Institute of Planners	Special Committee of the Urban Design Department
National Association of Home Builders	Special Committee
Federal Home Loan Bank Board	Special Committee
American Society of Landscape Architects	Committee on Policies
National Association of Housing and Redevelopment Officials	Housing Production and Housing Maintenance and Management
American Society of Interior Designers	Residential Design Forum

Each committee must be contacted to review the POE report and make recommendations to its members on what action needs to be taken. Educational packages can then be developed with the help of these various committees, or with educational or professional advancement committees adding their cooperation. At the time of writing of this report most of these committees had already been contacted.

Although there are no provisions in the current contract, ERDF plans to continue working with the committees until final recommendations are made for each agency.

The main committee for helping to coordinate the life cycle cost criterion is the HUD/AIA Liaison which has already proposed such a criterion.

TASK IVg

Develop Mechanisms for Continuous Data Collection

Housing officials may not realize it but they are constantly doing POEs as they manage housing. It's just not organized. Each time a maintenance manager orders supplies he's reflecting POE techniques and generating POE data. What's needed is a sensible way to collect and use these data.

The RFP for this project anticipated ERDF would be able to develop some mechanisms for continuous data collection at the local housing authority level. Our main finding in this regard was that such a mechanism would be regarded by local housing authorities as merely another burden. Consistently, even the data being collected was not being put to proper use. Data collection was described as being burdensome and of questionable value. It was clear that PHAs were too harried to make proper use of data at the local level.

Consequently, fourteen levels of data collection were examined for their potential in providing data that would complement POE information.

1. Tenant Status Review (TSR)

Every family in public housing must have an annual tenant status review. This is usually done only every two years for elderly. At one time this annual review was done by a visit to the dwelling and a maintenance worker would accompany an assistant manager to appraise the need for next year's maintenance. The maintenance appraisal is now usually dropped because of lack of time and the annual status review itself has become shortened over time.

Nevertheless, this review is entered into a case record file for each family and these case record files contain a history of the families in every project. The chief use of this file is to determine eligibility and rent levels. Very little use is made of any other data except for annual reports and the HUD eligibility reports which are filled out every six months. Annual reviews are given for both conventional and Section 8 tenants.

The annual review is essentially an updating of the original eligibility application filled out by the prospective tenant to get into public housing. Many housing authorities are in the process of computerizing these records or have already done so.

2. Work Orders

Each time a repair must be made in public housing, a work order is filled out describing (usually) the kind of repair, amount of labor and materials required. Housing authority maintenance offices have tens of thousands of these records typically filed away. Summaries are often contained in annual reports but seldom if ever is a sophisticated use made of the information.

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The work orders contain the potential for setting up a complete preventive maintenance program. They contain data that would permit estimating repair and maintenance costs for every type of housing and the life expectancy of every type of hardware. Unfortunately, some work orders do not record the type or brand name of the hardware but only the cost and a generic name. While it would be possible to recover brand names by the use of a catalogue, this would be a costly operation.

All authorities contacted indicated they did not have the time or resources for a preventive program. It was regarded as a luxury that may be possible "some day."

One exception to this picture was the New York City Housing Authority which had even set up an architectural program using work order data for programming.

3. Turnover Time

Each time a public housing unit is vacated, a maintenance worker goes over the unit using a check list for needed repairs. The unit is then put into a state of reasonable repair for the next tenant. This process involves an accumulation of the check lists and a series of purchases that were made in order to restore each unit to proper condition. The knowledge gained in this process is largely lost. While the purchasing agent or the local authority gains a fair amount of personal experience from this process it is usually lost when he leaves.

No further use is made of the check list data once repairs are made. Repairs become part of annual reports.

4. Property Control Inventories

Inventories are usually taken annually and kept reasonably up-to-date. The potential for these inventories is that they contain enough information to calculate the life expectancy of all hardware stocked. This is especially true for larger housing authorities who can order large lots economically and have a high turnover in items.

5. Preventive Maintenance

While very few authorities will even pretend to have a preventive maintenance program, those that do have certain ingredients to make it successful.

1. A record system adequate to program maintenance schedules.
2. An inspection procedure that diagnoses maintenance needs.
3. A staff assigned to do preventive maintenance rather than "borrowing" the regular staff.
4. The proper materials, tools and logistics to accomplish the task.

The preventive maintenance program, in short, must provide its own kind of POE through its inspections and keep records of the successes and failures of the materials it uses.

6. Complaints

Every authority has some manner of dealing with tenant complaints. Very few actually record them in systematic enough fashion to make optimum use of the data. Some do not even have a particular office through which all complaints must go. Others separate types of complaints into managerial, security, and maintenance. Some do use forms that are filled out by the telephone operator and passed on to management.

Very seldom are the complaints utilized in planning or management decisions. Sometimes complaints can be a misleading source of data because of the presence of highly vocal individuals.

7. Incident Reports

Security officers are required to fill out incident reports when they receive a call or discover a burglary or vandalism. These reports are filed in the security office and are often summarized in annual reports but seldom are the data utilized for future planning or analysis of trouble-some areas.

8. Site Selection History

One area that is the least recorded in terms of available data is the site selection history of each project. The only available data is that contained in the environmental impact statements which is unsatisfactory for revealing why a particular site is chosen. Site selection history is even more obscured for turnkey projects because these sites are more at the discretion of the developer even though final plans are approved by the PHA and HUD.

Some form of data collection on site selection is necessary in order to evaluate this aspect of a housing project. Site selection is a very critical part of any POE and it will be necessary at the beginning of the POE to try to reconstruct the site selection history. Evidence abounds (for example, Srivastava and Good, 1969)*that poor site selection can isolate residents and deprive them of necessary support systems.

Since this is an area where so little data is collected before the final decision stage, new methods for data collection will have to be created. It is as critical to know what sites have failed the test of feasibility as it is to know which ones are finally selected. What are reasons for site failures? Costs, zoning, and inability of the developer to acquire land are important bits of information to know about.

9. History of Opposition to Projects

Present day use of public hearings leaves little record of the opposition to any housing project. Almost always some group of citizens oppose a project for any number of reasons. Hidden behind racial and class prejudice are the masks of concern for overloading sewers, increasing the crime rate, blocking the sun and/or view and many other obstructionist

* (see POE bibliography for full references)

protests. In addition, many quite legitimate protests are often raised against a new building or project.

A catalogue and record of these objections can provide the basis for policy in the presentation of projects to the public and the anticipation of objections coming from various neighborhoods. Thus, it is possible to learn from presentation to presentation how best to deal with the public relations aspect of project feasibility.

10. Change Orders

Interviews with architects and housing officials lead to the conclusion that change orders in the construction process are dealt with in an unsatisfactory fashion. Each time a change order is made there should be complete documentation with signed orders. This does not occur in many cases. At least one architect actually refused to sign the "as built" drawings because change orders were so poorly documented. He continues this refusal as a policy.

Yet even when documentation is strictly according to the rules, it fails to record the reasons for the change and no one evaluates (and records) how the changes are expected to affect the original design. It is not possible to conduct an effective POE unless change orders are recorded with the reasons for change and the expected outcomes.

Even in cases where the contractor is allowed to substitute a cheaper form of hardware for another, the expected results are a critical part of the POE process.

11. The "As-Built" Drawings

After construction, the builder is required to submit a set of drawings from his architect which show the building as it was finally constructed. Yet, in practice, it is difficult to follow up to determine whether the drawings are accurate. It is especially difficult in turnkey projects because it is the developer who pays the architect and therefore the architect has little motivation to call the developer to task. What is needed is some independent method for determining the accuracy of the "as built" drawings for POE use.

12. Project Redesign

One of the most common experiences in architectural practice is for the architect to present a design concept and have it changed in order to save money on the construction cost. Typically, these changes remove the amenities that were included to satisfy human needs (Zeisel and Griffin, 1975)* These changes are never recorded. The design available for POE evaluation is the one that is approved after the changes were made. Thus, in evaluating a particular design it is not known whether the original intention was quite different. It is important to know how many designs were arrived at in this fashion and the kinds of cuts that were made from original design intentions. Many of our consultants insisted that this knowledge would go a long way toward explaining housing failures.

*(see POE bibliography for full references)

Indeed, the famous (infamous) Pruitt Igoe housing project in St. Louis is a classic example of how the final cuts contribute to failure. The original design called for elevators that would stop on each floor and for ground level public toilets. It was the removal of these features from the final design which is generally credited with contributing most to the failure of the project. Since there were no toilets on the ground floor, children were unable to reach their apartments on the elevators before having to relieve themselves. Since the elevators stopped on only alternate floors, the process was further complicated. Very quickly elevators and hallways became virtual cesspools.

Perhaps a separate study of predesign changes would suffice to show the kinds of cuts that result in housing failure most. It would then be possible to show that such cuts are not a savings.

13. Hardware Specifications

Construction contracts specify a particular brand name to be used on a project. For example, in electrical wiring it might be specified that General Electric switchgear be used or its equivalent. The problem is that no data exist as a basis to decide which switchgear would be equivalent. The all too frequent result is that the contractor substitutes cheaper hardware and insists it is equivalent. Thus, another contribution is made to housing failure.

A way to prevent this from happening is to develop performance criteria for the hardware. For example, instead of specifying GE switchgear specify switchgear that can withstand 120,000 on and off turns without failure. Of course, the only way such criteria can be arrived at is by collecting data on actual performance and unless a testing laboratory is developed, HUD must rely on service records in the field. Such data already exists except that substitutions in the construction process are often not recorded and no systematic use is made of existing data.

In order to use the information to best advantage HUD should consider a regional code system. An example of how this can work is provided by the State of Massachusetts which passed codes more stringent than HUD's.

It should also be noted in this regard that political pressure is often brought to bear by manufacturers to prevent just such codes from ever happening. This is just one of the constraints against the use of POE information.

14. Report Forms

Local housing agencies are required to send a number of reports to HUD on a regular basis. In order to accomplish these reports and keep their own records, the local housing authority has to fill out a number of forms. Among these are the following:

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Form No.

Name

2264	Project Income Analysis
52564	Operating Budget
52720	Formula Data Collection Form
9801	Occupancy Report
92458	Rent Schedule
92558	Income and Operating Expense
92470	Physical Inspection
9605	Rental Rates and Survey
9601	Physical Property Report
9615	Report of Physical Condition
9650	Record of Acquired Multifamily Housing Property

Contained within these forms are all the financial data necessary to catalogue costs by housing type, size of family, and other significant factors. Also, the records of physical repair needed by housing type and family type are also potentially available from these records if the data are properly combined. Therefore, within data already collected it is possible to determine which factors contribute to costs on both a social and hardware basis. Since some authorities are computerizing their data the job would be safer.

Conclusions

Already existing data that are collected by local housing authorities is not put to optimum use in cutting down operating expenses. The existing system permits inefficient design of housing and use of cheap materials which drive up operating costs. To remedy this situation three studies of data are needed.

1. Hardware Analysis. Using work orders, purchasing records, repair records and other data an analysis of all hardware also should be done on a region by region basis with a view to determining better HUD standards.
2. Design Cuts Study. Using both the existing data of operating costs and newly collected historical data that would document pre-design changes, an analysis should be made of what factors on cost cutting to lower construction cost have contributed to project failures. A sample of failures should be compared with a random sample of successful projects.
3. Existing Data Study. On a national basis, existing data should be analyzed to determine what data collection procedures can be dropped. Redundancy exists across many of the forms and among the reports that need to be sent to HUD. In addition, since many agencies are computerizing their data gathering, some thought should be given to using data terminals with a central regional or semi-regional computer rather than having each agency spend the capital outlay and operating cost of its own computer.

The data continuously collected will be a necessary part of any POE. The data on families will determine the statistical sampling for any behavior studied and the data on repairs and operating costs will be necessary for an evaluation of current designs.

CONCLUSIONS

1. The Number and Extent of POE Studies.

The single most important finding of this study was the large number of POE studies uncovered, their extent, and the range of variables and methods used. Before this study was undertaken even the most knowledgeable experts would not have predicted the magnitude of these findings. This in itself is overwhelming evidence that post occupancy evaluations are developing into a discipline in their own right and can even be considered the main movement within environmental design research.

2. Few Real Constraints to the Use of POEs Discovered.

A surprising finding was that there are not any overwhelming obstacles to the use of POEs in the housing system. The chief constraint according to a majority of professional opinions is a lack of involvement in buildings once they are constructed. This lack of involvement can best be remedied by using life cycle cost as a basis for housing feasibility and by implementing POEs as a part of the design approval stage of housing. These are changes long overdue in any case.

3. A Surprising Degree of Acceptance of POEs.

Among housing officials, architects, landscape architects, builders, financiers, planners, federal employees in housing, and interior designers there was surprising agreement on the necessity and usefulness of POEs, what should be included in them, who should conduct them, who should pay for them, and how they should be financed. In both private and public housing there were surprising degrees of agreement on all these areas and statistical tests could not discriminate among the professionals except in very minor ways. This indicates a great deal of support for POEs among the professionals. Most even indicated a willingness to help pay for POEs.

4. No Legislation is Required, so POEs Could Be Implemented Now.

After studying all of HUD's housing programs many points were discovered where POE information could be mandated merely by executive memo. The three largest programs, Multifamily Mortgage Insurance, Section 8, and Turnkey Public Housing were outlined in detail.

5. Foreign Countries are Taking the Lead in POE Research.

Canada does more POEs, relatively, than the U. S. and is now planning to implement POE principles in its government building programs. England is also ahead of the U. S. in the use of POE research in government housing. Sweden, however, has gone ahead of all others and its POE system is examined in detail.

RECOMMENDATIONS

1. Summarize the POE Literature.

The 1,305 items discovered in this research as well as those presently being conducted need to be translated and summarized in useful form for housing professionals. Such a translation and summary is a major research undertaking that involves translation skills in foreign languages, a firm background in POEs to be able to summarize and extract the most useful knowledge from the studies, and a series of tests with professional audiences to arrive at the proper language and format.

A commercial publication should result from this effort, capable of being revised periodically.

2. Demonstrate the Effectiveness of POEs in the HUD Housing System.

Details of the demonstration are given in Task IVc, but the demonstration is geared to showing how the quality of housing life can be improved by application of POEs during five years in the building cycle of HUD housing programs.

3. Conduct an Educational Effort for POEs.

Using POE literature and findings training packages should be developed for POE conferences with architects, planners, housing officials, housing financiers, builders, landscape architects, interior designers, HUD frontline staff, and HUD central office staff. In addition courses and training packages should be developed for continuing education in all the professions and in the undergraduate and graduate professional schools.

4. Change the Criteria for Feasibility of Housing.

Instead of final construction cost, prototype cost, MPS and other criteria used for determining housing feasibility, life cycle cost and performance criteria using POE data should become the constantly improving basis for housing feasibility. HUD local and area offices should be rewarded for largest number of units at lowest operating cost rather than largest number of units at lowest initial cost.

5. Mandate the Use of POE.

Following the presumed successful completion of the POE demonstration project, HUD should mandate the use of POEs in all housing programs.

APPENDIX I

INDIVIDUALS AND ORGANIZATIONS WITH EXPERTISE
IN
POST OCCUPANCY EVALUATION
OF
RESIDENTIAL ENVIRONMENTS

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MAY 1977

PREFACE

This document has been prepared by the Environmental Research Development Foundation (ERDF) in partial fulfillment of its contract obligations with HUD under Contract No. H-2405. Especially, it completes Task IIb.

It lists the names of individuals and organizations with Post Occupancy Evaluation expertise. An individual or organization is considered to have expertise in this area if he has studied or participated in the study of the residential environment after it has been partially or fully occupied, collected data primarily from its occupants although other kinds of respondents and sources of data have also been utilized, focused primarily on the functional - behavioral aspects of the environments although other aspects such as structure, design, engineering, social, economic, racial, geographical etc., have also been considered. While post occupancy evaluation expertise of most of the individuals and organizations listed here is documented in the form of published research reports, monographs, books, journal articles, etc. there are some whose POE studies have not been published such as some students who did these studies as part of their degree requirements and never published their theses or papers based on them. Thus, publication is not a requirement for inclusion in this list.

Individuals and organizations have been listed separately and in alphabetical order.

The primary purpose of these listings is to provide information on sources to which anyone interested in learning about POEs could go directly. Attempt, therefore, has been made to provide full address and phone number for all listings although in some cases only partial information has been provided simply because that is all that has been available. This partial information, in many cases, can provide a starting point from which a persistent enquirer would be able to locate the listed individual or organization. In some cases where even partial address and phone number are not available other relevant information has been provided such as the author's publisher, the journal or magazine publishing the author's POE related papers, the coauthor's address, the place where the author worked, the agency that funded the POE study etc., all of which can either provide the author's or principal investigator's address or can forward communication to him.

Many different sources of information were used for these listings. These sources are identified below.

1. POE Bibliography. It was prepared in completion of Task IIId of HUD Contract No. H-2405. Since some of the references dealt with methods and techniques of POE and related matters, each listing in the bibliography was examined to determine if it represented a post occupancy evaluation study of the residential environment. If it did, the author or the principal investigator and the organization conducting the study were identified as the individuals or organizations with POE expertise. In most cases the authors and principal investigators were the same but not in all cases. Where the two were not the same both were listed. In cases where the author or the principal investigator was part of an organization devoted, at least in part, to POEs, all three were listed. However, only the authors or the principal investigators of a POE were listed and not the organization if they were part of an organization which had nothing to do with POEs. There were

instances where no author or principal investigator was identified and the POE was documented as the product of an organization. In such cases only the organization was included in the present list.

2. POE Fact Sheets. Fact sheets listing specific information about sample, methods, study topics, etc., were prepared on those studies which were exclusively devoted to the scientific evaluation of an identified residential environment. This was also done as part of the HUD Contract No. H-2405. The information for these fact sheets was obtained either from the principal investigator or anyone else who was directly involved in the study and knew all about it. Each such respondent was also asked to mention the names, addresses and phone numbers of individuals and organizations which he knew to have expertise in doing post occupancy evaluations. These individuals and organizations were contacted directly and were included in the present list only if it was ascertained that they in fact had conducted post occupancy assessments of residential environments. This procedure was necessary because, in many cases such individuals and organizations had been identified who had done housing research but no POEs, or had done POEs but in environments other than residential.

3. POE Questionnaire. It was also developed as part of HUD Contract No. 2405 and administered to a number of different groups of respondents who had something to do with housing. Among other things, they were also asked to identify the individuals and the organizations who had expertise in POEs. Again, these individuals and organizations were contacted directly and included in the present list only if it was determined that they indeed had POE expertise.

4. Individual Authors, Principal Investigators, and Organizations. These were primarily identified from the POE Bibliography, POE Fact Sheet, and POE Questionnaires mentioned above. Attempt was made to contact all such authors, principal investigators and organizations which had conducted research studies in residential environments whether or not they were of POE nature and also to contact all those which had conducted POE studies whether or not they were in residential environments. These contacts were asked to identify other individuals and organizations with expertise in POE of residential environments. Before including all such identified individuals and organizations, they were also checked to determine their authenticity.

No geographical and temporal limits were placed in the preparation of this list. The listed individuals and organizations are from all parts of the world and they could have been active over fifty years ago and may not even exist any more or could have come into prominence in the field of our concern only recently.

No claim is made of the comprehensiveness of this listing and admittedly there are some individuals and organizations in some part of this vast world which remained unknown. However, it is fairly representative of the population of individuals and organizations in the world with expertise in POEs of residential environments.

The help received from numerous individuals and organizations across the world in obtaining information for this listing is gratefully acknowledged.

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INDIVIDUALS WITH EXPERTISE IN
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POST OCCUPANCY EVALUATION
OF
RESIDENTIAL ENVIRONMENTS

Addendum

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APPENDIX II

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POST OCCUPANCY EVALUATIONS
OF RESIDENTIAL ENVIRONMENTS

An International Bibliography

THE ENVIRONMENTAL RESEARCH AND DEVELOPMENT FOUNDATION
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APRIL 1977

PREFACE

This bibliography has been compiled by ERDF in partial fulfillment of its contract obligations with HUD under Contract No. H-2405.

It includes references dealing with post occupancy evaluations of residential environments.

Post occupancy evaluations have been defined as those research studies which study the environment after it has been partially or fully occupied, collect data primarily from its occupants although other kinds of respondents such as architects, managers, planners etc. may also be part of the respondent sample, and focus primarily on the functional-behavioral aspects of the environment although other aspects such as structural, engineering, architectural, etc. can also be included in the evaluations.

Residential environments refer to structures built for housing people, e.g. public housing, military housing, student housing, elderly housing, handicapped housing, singles housing, multi-family buildings, single family houses etc.

The references for inclusion in this bibliography must deal with post occupancy evaluation of residential environment but that does not have to be their exclusive focus. They may themselves be POE research studies, or they may be general books, monographs, or reports on housing that either wholly or in part include subject matter dealing with POE, or they may deal with methods and techniques of POE.

The references included in this bibliography are not limited by time or place. Thus, it includes references as old as 1914 and as recent as 1976 although the majority of references belong to the last decade. And, it includes both domestic and foreign references. In this sense it is an international bibliography. While no claim is made of its comprehensiveness the authors feel that it accurately reflects the current state of knowledge in the field.

Even though according to contract requirements this bibliography has been presented in final form, the work is still continuing. Information about more recent published and unpublished POE material is being received in ERDF offices every day from all parts of the world. It may be possible and necessary to compile another updated bibliography at a later date.

In order to obtain material for this bibliography dozens of journals and numerous books, monographs, theses, research reports, and personal communications have been studied and scanned. Listing all of these will essentially mean duplication of the bibliography. A list of journals scanned, however, is provided in appendix A.

This bibliography has been made possible by assistance received from numerous sources. They include federal, state and local government agencies, various academic departments in universities, particularly architecture, urban planning, sociology, psychology, housing, and related fields, many foreign governments and their housing ministries or housing and planning administrative offices, scores of research organizations all over the world, and literally hundreds of authors and researchers. Direct contacts by mail, phone and in person were made with many of these sources. They very generously gave their time, supplied us with reports, books, reprints and other published and unpublished material and referred us to new sources of information. All of them deserve a special recognition for their support and help.

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APPENDIX A
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Sociometry
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Transaction
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Urban Studies

POST OCCUPANCY EVALUATIONS
OF RESIDENTIAL ENVIRONMENTS

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Addendum

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Tucson, Arizona 85719

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APPENDIX III

POST OCCUPANCY ASSESSMENT QUESTIONNAIRE

POST OCCUPANCY ASSESSMENT QUESTIONNAIRE

OMB No. 63-576029

Approval expires January 19...

Instructions: Most questions will ask you to rank your answers in order of importance among a series of possible choices. Among five choices, for each you feel they are important in answering the question. Other questions merely ask for a single check mark or a factual statement.

Feel free to add your comments at the bottom of the page or at the end of the questionnaire.

Has anyone in your organization done any post occupancy assessments? If yes, could you list his (her) name, address and telephone number?

Name _____ Telephone No. _____
Address _____

To your knowledge, has anyone outside your organization done any post occupancy assessments?

If yes, could you supply their names? (list on back of sheet if necessary)

Name _____ Telephone No. _____
Address _____

Name _____ Telephone No. _____
Address _____

Name _____
Address _____

COMMENTS:

Please Do Not Mark For Office Use Only

1.

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No Yes No.

2.

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No Yes Ad Ad Ad

Which topics would you like to see post occupancy assessments cover in order for them to be most useful to you? You may answer in either the public or private sector or both. Please rank each topic you think relevant in order of its importance to you.

Private Sector Housing Publicly Assisted Housing

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		3a. Private	3b. Public
_____	1. Health and Safety aspects of housing	1	1
_____	2. Maintenance and Repair Problems	2	2
_____	3. Whether or not design and amenity features suit the activities and life styles of the occupants	3	3
_____	4. Whether or not housing management practices suit occupants	4	4
_____	5. What features sell better than others	5	5
_____	6. Whether the original design intentions were correct in predicting resident needs	6	6
_____	7. What choice from among different housing features people would make if they had a limited amount to spend	7	7
_____	8. The effect of locational aspects such as nearness to shopping facilities, work and schools on people's housing choices.	8	8
_____	9. Environmental and aesthetic qualities (i.e., privacy, noise, etc.)	9	9
_____	10. Regular operating costs such as utilities	10	10
_____	11. Maintenance and custodial costs	11	11
_____	12. Repairs problems	12	12
_____	13. Flexibility of interior spaces	13	13
_____	14. Adaptability of the housing as a whole to changing users and times	14	14
_____	15. Others (please specify) _____	15	15
_____	_____		
_____	_____		
_____	_____		

COMMENTS:

In your view, what should be the primary objectives of post occupancy assessments? You may answer in either the private or public sector, or both. Please rank each objective in its order of importance.

Private Sector Housing

Publicly Assisted Housing

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Private 4a	Public 4a
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12

- 1 To supply basic information to be used for making changes in existing housing to better suit residents
- 2 To supply basic information to be used for making changes in future housing to better suit residents
- 3 To supply a basis for changing housing management practices to better suit residents
- 4 To give housing consumers, especially renters more say in specifying what kind of housing they want
- 5 To provide a means for testing the original design intentions against actual performance after occupancy
- 6 To provide a better means of measuring and assuring better housing quality
- 7 To provide information which would allow housing providers to better pin point housing markets
- 8 To give housing lenders a better means to assess housing investments risks
- 9 To improve the general level of knowledge about the planning and design of housing
- 10 To reduce operating costs by reducing maintenance costs due to vandalism and other expressions of dissatisfaction
- 11 To provide effective procedures for operating preventive maintenance
- 12 Others (please specify) _____

COMMENTS:

4b After you have ranked the items in question 4a please indicate whether you feel each item should be a) applied at the planning stage, b) programming stage, c) Final Design, d) Construction detail, e) housing distribution, or, f) all of these stages. Indicate by writing the number of each objective beside the appropriate stage.

Private Sector Housing Publicly Assisted Housing

- _____ A. Applied at the Planning Stage
- _____ B. Applied at the Programming Stage
- _____ C. Applied as Final Design Stage
- _____ D. Applied as Construction Detail
- _____ E. Applied during Housing Distribution
- _____ F. All of these Stages

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Private 4b	Public 4b
A _____	A _____
B _____	B _____
C _____	C _____
D _____	D _____
E _____	E _____
F _____	F _____

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6a. Do you feel that the use of post occupancy assessments would provide private firms with a competitive edge over those that don't use them? Please check.

- 1.) Definitely _____
- 2.) Somewhat _____
- 3.) No advantage _____
- 4.) Some disadvantage _____
- 5.) Handicap _____

6a 1 - 5

6b. Please rank the type of private firm that you feel would benefit most from the use of post occupancy assessments. Rank from most benefitted to least benefitted.

- 1 Designers
- 2 Engineers
- 3 Real Estate
- 4 Builders
- 5 Financiers
- 6 Owner-Operators

6b

- 1
- 2
- 3
- 4
- 5
- 6

7a. Would your organization benefit enough from the results of post occupancy assessments to bear a portion of the assessment cost? yes_ no_

7a
No Yes

7b. If your answer was yes, indicate what per cent of the cost your organization might be willing to bear.

7b Percentage

8. If your organization were to routinely do post occupancy assessments would you (please rank by most preferred)

8

- 1 Employ in-house staff on a full time basis?
- 2 Employ in-house staff that were part time?
- 3 Hire outside consultants or consulting firms?
- 4 Hire an academic institution or non-profit research organization?
- 5 Other (please specify) _____
- _____
- _____
- _____

- 1
- 2
- 3
- 4
- 5

Who should pay for post occupancy assessments in both private and public sectors? Please rank in order of most preferred for each sector.

Private Sector Housing

Publicly Assisted Housing

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Private 9 Public 9

- _____ 1 Architect
- _____ 2 Builder
- _____ 3 City
- _____ 4 Consumer
- _____ 5 Developer
- _____ 6 Engineer
- _____ 7 Farmer's Home Administration
- _____ 8 HUD
- _____ 9 Insurance Companies
- _____ 10 Lender
- _____ 11 Local Housing Authority
- _____ 12 Management
- _____ 13 Manufacturers
- _____ 14 Professional Organization
- _____ 15 State
- _____ 16 Other _____
- _____
- _____
- _____
- _____
- _____

Private 9	Public 9
_____	_____
1 _____	1 _____
2 _____	2 _____
3 _____	3 _____
4 _____	4 _____
5 _____	5 _____
6 _____	6 _____
7 _____	7 _____
8 _____	8 _____
9 _____	9 _____
10 _____	10 _____
11 _____	11 _____
12 _____	12 _____
13 _____	13 _____
14 _____	14 _____
15 _____	15 _____
16 _____	16 _____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

What individuals would you select to actually carry out post occupancy assessments? Please rank in order of preference for both private and public sectors.

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Private Sector Housing	Publicly Assisted Housing		10	
			Private	Public
_____	_____	1 Architect	_____	_____
_____	_____	2 Builder	1	1
_____	_____	3 Building Materials Manufacturer	2	2
_____	_____	4 Developer	3	3
_____	_____	5 Engineer	4	4
_____	_____	6 Farmer's Home Administration County Agent	5	5
_____	_____	7 Home Owner's Association Representative	6	6
_____	_____	8 Housing Management	7	7
_____	_____	9 HUD Representative	8	8
_____	_____	10 Insurance Company Representative	9	9
_____	_____	11 Interdisciplinary Team	10	10
_____	_____	12 Lending Institution Representative	11	11
_____	_____	13 Local Building Inspector	12	12
_____	_____	14 Local Health Inspector	13	13
_____	_____	15 Local Housing Agency Representative	14	14
_____	_____	16 Local Planning Agency Representative	15	15
_____	_____	17 Occupant Himself	16	16
_____	_____	18 Social Scientists	17	17
_____	_____	19 State Department of Community Affairs Representative	18	18
_____	_____	20 Tenant Organization Representative	19	19
_____	_____	21 Other (please specify) _____	20	20
_____	_____	_____	21	21
_____	_____	_____		

30
 How should the results of post occupancy assessments be made public and available? Please rank by order of preference for both private and public sectors.

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Private Sector Housing	Publicly Assisted Housing		Private	Public
_____	_____	1 Through existing publications and memos of local building and housing departments	1	1
_____	_____	2 By being added from time to time to HUD minimum property standards	2	2
_____	_____	3 Through a new publication devoted entirely to post occupancy assessments	3	3
_____	_____	4 Through existing trade journals	4	4
_____	_____	5 Through a clearing house for post occupancy assessment results which operates at the national __, state __, regional __, or local __ level (check one).	5	5
_____	_____	6 With handbooks	6	6
_____	_____	7 With conferences	7	7
_____	_____	8 With seminars and workshops	8	8
_____	_____	9 Through in-house training	9	9
_____	_____	10 Collected by private firms and sold at a profit to interested firms	10	10
_____	_____	11 Other (please specify) _____	11	11
_____	_____	_____		
_____	_____	_____		
_____	_____	_____		
_____	_____	_____		

12. What is the most effective "language" for communicating the results of post occupancy assessments? Please rank by order of preference.

- ___ 1 Scientific language such as is found in scientific journals
- ___ 2 Language like that found in housing trade journals
- ___ 3 Prescriptive statements like that found in building codes
- ___ 4 Performance requirements
- ___ 5 Schematic drawings
- ___ 6 Detailed, design specific drawings
- ___ 7 User need statements
- ___ 8 Other (Please specify) _____

12. _____

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

8 _____

13. Please read over the list below. These statements are factors that may prevent your organization from doing post occupancy assessments. Select those factors which apply to your organization by placing a check to the left of the statement. Then go through those statements you checked and rate each statement at the end on a scale of one to five in terms of how easy it would be to change in order to permit doing post occupancy evaluations. (1= very easy; 5= very hard to change).

- ___ 1 The rising cost of housing _____
- ___ 2 Your organization's lack of involvement with housing after it has been built _____
- ___ 3 The inability to change fee structures or cost charges to cover the cost of post occupancy assessments _____
- ___ 4 The lack of a legal mandate to do post occupancy assessments _____
- ___ 5 The concern with construction cost as opposed to the life cost of the building which includes operating and finance costs over the life of the mortgage and beyond. Hence, even if it could be shown that post occupancy assessment results when applied save on operating costs, there would be no way to show the savings. _____
- ___ 6 The inflexibility of current financing methods which would not permit paying for changes which post occupancy assessments would show to be necessary _____

13 _____

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

Item 13. (Continued)

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- 7 The inability of current financing methods to pay for post occupancy assessments _____ 7 _____
- 8 The lack of adequate published planning and design standards against which the results of post occupancy assessments could be compared _____ 8 _____
- 9 The lack of adequate documentation of the original design intentions so they could be compared with any post occupancy assessments _____ 9 _____
- 10 The lack of adequate documentation of any changes made during construction which alter the original design intentions, thus making it difficult to determine whether the original design was carried out _____ 10 _____
- 11 The time gap between the original design and the occupancy of housing which, because original occupants and their needs may have changed, makes the testing of original design intentions difficult _____ 11 _____
- 12 Your organization just does not have enough decision making power to make better housing even if post occupancy assessments showed how _____ 12 _____
- 13 The lack of a common language between those who do post occupancy assessments and housing designers and builders _____ 13 _____
- 14 Your organization cannot find effective post occupancy assessment techniques _____ 14 _____
- 15 Cannot find trained personnel to do post occupancy assessments _____ 15 _____
- 16 Difficulty incorporating assessment results into the design and building process _____ 16 _____
- 17 Would be too difficult to change the existing way of doing business to include post occupancy assessments _____ 17 _____
- 18 The rising cost of design _____ 18 _____
- 19 Need for modified fee structures _____ 19 _____
- 20 Housing work is done in teams and only one member of a team cannot bring pressure to include post occupancy assessments _____ 20 _____
- 21 Lack of specificity of most post occupancy assessments regarding specific design areas _____ 21 _____
- 22 Inability of any one firm to work competitively against other firms who do not include post occupancy assessments as part of their fee _____ 22 _____

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- 23 Already deal with too much information _____
- 24 Others (please specify) _____

23 _____

24 _____

Select those methods below which you consider most effective in promoting the use of post occupancy assessments. Please rank the ones selected by order of their effectiveness for both private and public sectors of housing.

Private Sector Housing Publicly Assisted Housing

14
Private Public

_____	_____	1	Develop published planning and design standards	1	1
_____	_____	2	Develop methods to record original design intentions and construction changes	2	2
_____	_____	3	Train additional personnel to do post occupancy assessments	3	3
_____	_____	4	Increase housing industry's awareness of the need for post occupancy assessments	4	4
_____	_____	5	Develop better post occupancy assessments methods	5	5
_____	_____	6	Require by law that post occupancy assessments be done	6	6
_____	_____	7	Make post occupancy assessment results more accessible to the housing industry	7	7
_____	_____	8	Provide consultation and technical assistance to those interested in undertaking post occupancy assessments	8	8
_____	_____	9	Provide financial incentives for doing post occupancy assessments	9	9
_____	_____	10	Increase the decision making power of housing designers and builders	10	10
_____	_____	11	Revise the way that design professionals are trained to include post occupancy assessment skills	11	11

15. It is conceivable that in the future the results of post occupancy assessments might be used as evidence in court cases or as a basis for allotting housing funds. How legally responsible should the person be who does the assessment? Please rank in order of your preference.

- ___ 1. As legally responsible as architects and contractors are today
- ___ 2. Subject to public standards such as licensing and certification
- ___ 3. Responsible to a board of professional colleagues
- ___ 4. In no way legally responsible

15
1
2
3
4
16. 1 - 5

16. In general, how important is it that post occupancy assessments be done on housing? Please check one.

Very important Not important at all

THANK YOU FOR YOUR TIME IN FILLING OUT THIS QUESTIONNAIRE. IF YOU HAVE ANY FURTHER COMMENTS OR FEEL THERE ARE ELEMENTS WE MISSED PLEASE FEEL FREE TO WRITE YOUR COMMENTS BELOW.

KINDLY RETURN THIS QUESTIONNAIRE WITHIN ONE WEEK

APPENDIX IV

APPENDIX IV
POST OCCUPANCY ASSESSMENT FACT SHEET

POST OCCUPANCY ASSESSMENT FACT SHEET

437

Name of principal informant _____ Title _____

Organization _____

Address of organization _____

Telephone: _____

Name of project or area assessed _____

Location or address _____

Name of Organization doing the assessment _____

Address _____

Telephone _____

Name of Principal Investigator _____

Address _____

Telephone: _____

Client(s) _____

Address _____

Telephone _____

Organization sponsoring the assessment _____

Address: _____

Telephone: _____

Date design begun _____ Date design completed _____

Date construction begun _____ Date construction completed _____

Date first occupied _____ Were the subjects the first tenants _____

Date assessment begun _____ Date assessment completed _____

Date of final report _____

Is there a publication of the assessment? yes _ no _

If so, please give full title and reference: _____

Type of building

Number of Units

Number of rental units

- Single family
- Duplex
- Garden Apartment
- Low Rise Apartment
- High Rise Apartment
- Cluster Unit Development
- Planned Unit Development
- Other(s) (please specify)

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

What topics did the assessment cover?

Site, Locational and Community Related

- General community and neighborhood design
- Availability and accessibility of site amenities and services
- Relationship of buildings to traffic and parking
- Exterior lighting
- Other site and community design factors (please specify)

_____	_____
_____	_____
_____	_____

Functional and Spatial Related Attributes of Housing

- Room sizes
- Interior layout / floor plan
- Access to Exterior Areas
- Storage
- Amenities

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Quality of fixtures and hardware

Quantity and location of utility connections (electricity, water, etc.)

Other functional and spatial attributes (please specify)

Four horizontal lines for specifying other functional and spatial attributes.

Safety and Health

Fire prevention, escape and warning systems

Lock and security systems

Slip and other minor accident affectors

Cleanability of bath and kitchen

Structural soundness impression (Does it feel structurally sound?)

Other safety features (please specify)

Three horizontal lines for specifying other safety features.

Living-Environment Related Attributes of Housing

Acoustic and visual privacy

Natural and artificial lighting quality

Interior / exterior noise disturbance

Quality of views from the dwelling unit

Appearance / image / aesthetics of the dwelling as a whole

Ability to personalize the interior

Other (please specify)

Three horizontal lines for specifying other living-environment related attributes.

What topics did the assessment cover?
(Continued)

Cost / Time Related Attributes of Housing

Cost to operate electrical and mechanical utilities

Maintenance and custodial problems (cost and time required)

Repair (costs and time required)

Ability and cost to modify dwelling to better suit current occupant

Other (please specify) _____

What types of behavior did the assessment cover?

Preferences

Perceptions

Images

Activities

Attitudes

Complaints

Agency collected data (specify) _____

Other (s) (please specify) _____

What methods of data collection were used?

Questionnaires

Observation, direct

Observation, Participant

Interviews, structured

Interviews, unstructured

Time Budgets

Behavioral mapping

Ecological Psychology

Audio-visual (camera)

Audio-visual (tape)

Physiological measurements

Psychological tests

Other(s) (please specify) _____

What types of populations were measured?

Elderly only

Adults only, married

Adults only, single

Older families / children

Younger families / children

Children only

Handicapped

Black

Caucasian

Mexican-American

High income

Middle income

Low income

Other(s) (please specify) _____

Audience for assessment results

Paying client

Public at large

Government agency

What methods of data collection?
(Continued)

Private agency

Other(s) (please specify) _____

How were the results used?

Accepted (no action)

Rejected

Pending decisions

Applied to specific new buildings

Applied to changing existing buildings

Incorporated within system, partially

Incorporated in system, fully

Other(s) (please specify) _____

How were results documented?

Printed, published report

Mimeograph Report, large distribution

Mimeograph Report, limited distribution

Typed report, limited distribution

Micro-filmed

Journal publication

Book or chapter publication

Other(s) (please specify) _____

Was any attempt made to evaluate the assessment?

None

Review by outside consultant

Review by committee

Comparison with past research by assessor

Separate validation study

Internal validation by assessor

Describe how the results of the assessment passed from person to person in your organization. Where did it start and with whom did it end? (Interviewer is to gain enough knowledge to be able to diagram information flow).

What was the total cost of the assessment?

What were the total professional man hours used in the assessment?

How would you evaluate the success of the assessment from the viewpoint of your own organization?

Very successful

Moderately successful

Neutral

Moderately unsuccessful

Very unsuccessful

How involved is your organization in the building of housing?

Percentage of total business that involves housing

Number of housing units built in the last five years

Number of units of housing renovated in the last five years

Number of units managed at the present time

How many publicly assisted housing units have you built or managed in the last five years

Was a sample of population taken that was representative?

Yes

No

How were data analyzed?

Subjective

Statistical, parametric

Statistical, non-parametric

Tabulations without statistical analysis

Other (please specify) _____

Do you know of any other persons or organizations that have done post occupancy assessments?

If so, would you please list the names of persons we could contact about them.

Name _____ Telephone: _____

Address _____

APPENDIX V

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POE TOPICS

COST AND TIME FACTORS

Subcategories	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Cost and Time Factors N=103
Cost of buying and renting	17	6.4	16.5
Cost of preferred house	1	.4	.97
Cost to curtain	3	1.1	2.9
Cost to modify dwelling	13	4.9	12.6
Cost of proposed house	1	.4	.97
Cost to operate electrical and mechanical utilities	23	8.7	22.3
Economic factors	12	4.5	11.6
Profit	1	.4	.97
Rent, rental cost	3	1.1	2.9
Repair and maintenance costs, and time	85	32.1	82.5
Saleability of the house	3	1.1	2.9
Travel costs due to project location	4	1.5	3.9
No. of POEs in the category	103	39	-

DESIGN AND PLANNING RELATED TO NEEDS
AND LIFE STYLE

Subcategories	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Design and Planning Related to Needs and Life Style N=35
Agreement between planners and residents	1	.4	2.9
Changes in life style	1	.4	2.9
Design congruence with resident needs	4	1.5	11.4
House design, type, desired	3	1.1	8.6
Life style	6	2.3	17.1
Need for building modification to suit tenants	9	3.4	25.7
Suitability of buildings to life style	11	4.2	31.4
No. of POEs in the category	35	13	-

EXTERNAL SPATIAL AND FUNCTIONAL
ATTRIBUTES

Subcategories

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying External Spatial and Functional Attributes N = 191
Access to exterior areas	89	33.6	46.6
Bicycle paths	4	1.5	2.6
Change outdoor design, suggestions	0	0	0
Curbs	1	.4	.5
Design of exterior space and enhance- ment or inhibition of activities	29	10.9	15.2
Exterior appearance	1	.4	.5
Exterior environment	3	1.1	1.6
Exterior finishes and material	21	7.9	11.0
Exterior landscaping	11	4.2	5.8
Exterior lighting	35	13.2	18.3
External galleries	1	.4	.5
External relationships/Exterior design	1	.4	.5
Garbage, storage, removal, collection, location of trash cans	7	2.6	3.7
General outdoor facilities, amenities	20	7.5	10.5
Gutters	1	.4	.5
Lot or ground	4	1.5	2.6
Parking, availability	9	3.4	4.7
Paths	5	1.9	2.6
Pool, swimming pool	13	4.9	6.8
Recreational facilities	12	4.5	6.3
Relation of building to outdoors	1	.4	.5

External Spatial and Functional
Attributes (Continued)

Relationship of building to traffic and parking	94	35.5	49.2
Sidewalks, walkways	4	1.5	2.6
Use of outdoor space for private use	1	.4	.5
Yard space	16	6.0	8.4
<hr/>			
No. of POEs in the category	191	72	-
<hr/>			

HEALTH, MENTAL AND PHYSICAL

Subcategories	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Health, Mental and Physical N = 9
Buildings and health	1	.4	11.1
Buildings and perceived stress	1	.4	11.1
Health, health statues	2	.8	22.2
Mental health	6	2.3	66.7
No. of POEs in the category	9	3	-

HOUSING BUILDING, TYPE

Subcategories

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Housing Building, Type N = 34
Alternative type of housing, considered by occupants	1	.4	2.9
Building types, familiarity	0	0	0
Hogan vs. modern rectangular house	4	1.5	11.8
House type preferred	1	.4	2.9
House type, previous	9	3.4	26.5
Housing type, type of unit	12	4.5	35.3
Residence	2	.8	5.9
Self-help housing	6	2.3	17.6
Systems housing	1	.4	2.9
No. of POEs in the category	34	13	-

INTERNAL, SPATIAL, PHYSICAL, FUNCTIONAL,
AND LIVING ENVIRONMENT RELATED ATTRIBUTES
OF HOUSING

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Internal, Spatial, Physical, Functional, and Living Environment Related Attributes of Housing N = 236
Subcategories			
Accessibility within building	1	.4	.4
Acoustical and visual spatial privacy	133	50.2	56.4
Adult normal control and supervision	1	.4	.4
Age of structure	1	.4	.4
Alarms	1	.4	.4
Amenities	102	38.5	43.2
Appearance, image, aesthetics of the dwelling, looks, attractiveness	86	32.4	36.4
Appliances, home equipment, have, preference	1	.4	.4
Architectural assessments	2	.8	.8
Change inside design, suggestions	1	.4	.4
Changes in room sizes keeping the house area unchanged	2	.8	.8
Cleanability of bath and kitchen	38	14.3	16.1
Climatic factors	14	5.3	5.9
Codes	14	5.3	5.9
Color	1	.4	.4
Dishwashers	1	.4	.4
Eating utensils	0	0	0
Electricity	4	1.5	1.7

Internal, Spatial, Physical, Functional,
and Living Environment Related Attributes
of Housing (Continued)

Extinguishers	1	.4	.4
Flexibility	1	.4	.4
Flooring types, floors	5	1.9	2.1
Function of rooms, living room, kitchen, etc	2	.8	.8
Furnishability, furniture, furniture arrangement	19	7.2	8.0
General electric systems, problems	0	0	0
Heating control	2	.8	.8
Heating and cooling control	1	.4	.4
Heating equipment, and system	2	.8	.8
Heating fuel	1	.4	.4
Improvements made in past 12 months	0	0	0
Interior layout/floor plan	179	67.5	75.8
Laundry	10	3.8	4.2
Light switches	8	3.0	3.4
Lights	7	2.6	3.0
Material and equipment, preferences	7	2.6	3.0
Mechanical systems	15	5.7	6.4
Natural and artificial lighting quality	64	24.2	27.1
Noise disturbance, quiet	89	33.6	37.7
No. of rooms	15	5.7	6.4
No. of stories	1	.4	.4
Orientation of house, east, west, north, south	4	1.5	1.7

Internal, Spatial, Physical, Functional,
and Living Environment Related Attributes
of Housing (Continued)

Physical features	2	.8	.8
Plumbing	2	.8	.8
Quality of building material	15	5.7	6.4
Quality of dwelling unit, quality of housing, quality of construction	22	8.3	9.3
Quality of finishes, interior finishes and material	32	12.1	13.6
Quality of fixtures and hardware	51	19.2	21.6
Quality and location of utility connections	31	11.7	13.1
Quality of views from the dwelling unit	83	31.3	35.2
Room sizes	129	48.7	54.7
Screens	3	1.1	1.3
Signage	1	.4	.4
Size of building	1	.4	.4
Size of unit, apartment	6	2.3	2.5
Smell	3	1.1	1.3
Smoke doors	1	.4	.4
Soundproofing	3	1.1	1.3
Source of light	5	1.9	2.1
Spaciousness	1	.4	.4
Special design features, amenities for elderly	2	.8	.8
Storage	96	36.2	40.7
Structural soundness	16	6.0	6.8

Internal, Spatial, Physical, Functional,
and Living Environment Related Attributes
of Housing (Continued)

Style of fixtures and hardware symbolism	1	.4	.4
Table top space	1	.4	.4
Temperature and humidity	8	3.0	3.4
Thickness of doors	1	.4	.4
Type of construction, material used	3	1.1	1.3
Types of rooms	10	3.8	4.2
26 dimensions of physical space	1	.4	.4
Ventilation	16	6.0	6.8
Walls	2	.8	.8
Windows, directions	1	.4	.4
<hr/>			
No. of POEs in the category	236	89	-
<hr/>			

MAINTENANCE

Subcategories

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Maintenance N = 83
Control and maintenance of open space	15	5.7	18.1
External, outside, maintenance	2	.8	2.4
Maintenance and custodial problems	46	17.4	55.4
Maintenance services, general maintenance, upkeep	23	8.7	27.7
Provision of maintenance as a factor in purchase decision	1	.4	1.2
Roach Control	4	1.5	4.8
Yard maintenance	11	4.2	13.3
No. of POEs in the category	83	31 .	-

MANAGEMENT, POLICY, AND ADMINISTRATION
RELATED ATTRIBUTES

Subcategories

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Manage- ment, Policy, and Administration Re- lated Attributes N=23
Administration	1	.4	4.3
Gatekeeping function of management in mobile home parks	3	1.1	13.0
Management	8	3.0	34.8
Management practices	5	1.9	21.7
Management - tenant relations	7	2.6	30.4
Policy decision by University about student housing	1	.4	4.3
Resident Association	1	.4	4.3
Suitability of housing management to students	1	.4	4.3
No. of POEs in the category	23	9	-

SAFETY AND SECURITY
Subcategories

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Safety and Security N=92
Accidents, their location	9	3.4	9.8
Auto security	1	.4	1.1
Crime, safety from crime	18	6.8	19.6
Feeling of security for belongings	5	1.9	5.4
Fire prevention, escape and warning system	32	12.1	34.8
Lock and security system	57	21.5	62.0
Safety	6	2.3	6.5
Safety features in bathrooms	2	.8	2.2
Security	4	1.5	4.3
Security and safety of children	6	2.3	6.5
Security threats, their location	8	3.0	8.7
Slip and minor accident affectors	35	13.2	38.0
Surveillance	1	.4	1.1
Vandalism	2	.8	2.2
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No. of POEs in the category	92	35	-

TE, LOCATIONAL, COMMUNAL, COMMUNITY,
D NEIGHBORHOOD RELATED ATTRIBUTES

Subcategories

N
Proportion of
Fact Sheets
N = 265

Proportion of
Fact Sheets
Studying Site,
Locational, Communal,
Community, and Neigh-
borhod Related Attrib-
utes N = 189

Subcategories	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Site, Locational, Communal, Community, and Neigh- borhod Related Attrib- utes N = 189
Accessibility	3	1.1	1.6
Availability and accessibility of site amenities	150	56.6	79.4
Central common storage areas	2	.8	1.1
Communal facilities	4	1.5	2.1
Communal rooms	6	2.3	3.2
Community building, design	2	.8	1.1
Community within and without	1	.4	.5
Condition of project grounds	2	.75	1.1
Configuration of project grounds	2	.75	1.1
Descriptive words for various parts of the project	1	.4	.5
General community and neighborhood design	123	46.4	65.1
Home range	1	.4	.5
List of larger areas	0	0	0
Layout of apartment block	15	5.7	7.9
Location of manager's dwelling	1	.4	.5
Location of mobile home parks	3	1.1	1.6
Location of the project complex	5	1.9	2.6
Location of unit	3	1.1	1.6
Mode of transportation from services and amenities	3	1.1	1.6
Nearness to shopping, shopping	5	1.9	2.6

Site, Locational, Communal, Community,
and Neighborhood Related Attributes
(Continued)

Neighborhood	1	.4	.5
Neighborhood deterioration, perception of it	1	.4	.5
Orientation of the apartment block	15	5.7	7.9
Pedestrian circulation	1	.4	.5
Previous area of residence	1	.4	.5
Public facilities	4	1.5	2.1
Road layout	1	.4	.5
Sewage disposal	5	1.9	2.6
Site design	2	.75	1.1
Size of development, settlement, no. of units in a cluster, no. of units in a given land, suggestions	13	4.9	6.9
Social status and class position of neighborhood	4	1.5	2.1
Source of water, water supply	6	2.3	3.2
Traffic patterns	1	.4	.5
Transportation, adequacy	7	2.6	3.7
Urban and rural location	4	1.5	2.1
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no. of POEs in the category	189	71	-
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SOCIAL, BEHAVIORAL, SERVICE, AND HUMAN ASPECTS

N Proportion of Fact Sheets N = 265 Proportion of Fact Sheets Studying Social, Behavioral, Service and Human Aspects N = 207

Subcategories

Subcategories	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Social, Behavioral, Service and Human Aspects N = 207
Ability to personalize the interior	63	23.8	30.4
Accommodating neighbors, preferences	6	2.3	2.9
Acculturation	4	1.5	1.9
Activities, location	1	.4	.5
Adaptability	18	6.8	8.7
Age integration and segregation	23	8.7	11.1
Change in types of occupants	1	.4	.5
Children's play	6	2.3	2.9
Children's play, its location, play behavior	5	1.9	2.4
Circulation inside the house	1	.4	.5
Communication	2	.8	1.0
Community services	1	.4	.5
Conformity	1	.4	.5
Control of yards	2	.8	1.0
Control over environment	1	.4	.5
Convenience	20	7.5	9.7
Counseling and treatment facilities	3	1.1	1.4
Cultural patterns	9	3.4	4.3
Decision making process leading to purchase decision	3	1.1	1.4
Demographic features	35	13.2	16.9
Density, crowding, persons per room	19	7.2	9.2

Economic integration, income integration	19	7.2	9.2
Embellishment and defacement	1	.4	.5
Emergency service, availability, fire, ambulance	1	.4	.5
Environmental cognition	1	.4	.5
Excursions, travels	1	.4	.5
Exterior space use	1	.4	.5
Feeling of community	8	3.0	3.9
Feeling of privacy	1	.4	.5
Freedom	1	.4	.5
Friendship patterns, vacant homes, and friendship patterns	2	.8	1.0
Group life, social life	1	.4	.5
Group privacy	4	1.5	1.9
Happiness	15	5.7	7.2
Home ownership patterns	1	.4	.5
Homogeneity	1	.4	.5
Homogeneity of population, forces toward	3	1.1	1.4
Identity	2	.8	1.0
Independence	15	5.7	7.2
Individuality	1	.4	.5
Isolation	4	1.5	1.9
Kinship	4	1.5	1.9
Learning to build housing	1	.4	.5
Leisure	1	.4	.5

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 Social, Behavioral, Service, and Human
 Aspects (Continued)

Length of occupancy	1	.4	.5
Likes and dislikes	9	3.4	4.3
Loneliness	1	.4	.5
Mail delivery, getting the mail	3	1.1	1.4
Meaning and use of home	6	2.3	2.9
Medical services and facilities	15	5.7	7.2
Mobility	1	.4	.5
Morale	17	6.4	8.2
Morbidity	0	0	0
Neighboring, interaction with neighbors	9	3.4	4.3
Occupancy ratio	1	.4	.5
Path finding	1	.4	.5
Perceived responsibility of residents for maintenance	2	.8	1.0
Politics	1	.4	.5
Preference for house or apartment	5	1.9	2.4
Preferred area to be relocated in	1	.4	.5
Problems of child raising in high rise	3	1.1	1.4
Racial integration	19	7.2	9.2
Reasons for area selection	1	.4	.5
Reasons for moving into this building	3	1.1	1.4
Recreation, leisure activities	41	15.5	19.8
Relaxation	1	.4	.5
Satisfaction and dissatisfaction with the unit	18	6.8	8.7

Social, Behavioral, Service, and Human
 Aspects (Continued)

Service delivery system	1	.4	.5
Services for elderly, general assets availability, location	19	7.2	9.2
Services for elderly, use	1	.4	.5
Social - cultural issues	0	0	0
Social integration	1	.4	.5
Social interaction, unit location and social interaction, its location, socialization, social behavior	42	15.8	20.3
Social organization	6	2.3	2.9
Social spaces, social environment	21	7.9	10.1
Social status	2	.8	1.0
Surveillance of activities of other residents, porch sitter	1	.4	.5
Territory, territoriality	3	1.1	1.4
Things liked best by respondents, liked and disliked about the building	0	0	0
Use of amenities and services	17	6.4	8.2
Use of space, spatial use patterns	4	1.5	1.9
Use of TV	1	.4	.5
Visiting family members in other places	4	1.5	1.9
Well being	17	6.4	8.2
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No. of POEs in the category	207	78	-
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SPECIFIC BUILDING AREAS

	N	Proportion of Fact Sheets N = 265	Proportion of Fact Sheets Studying Specific Building Areas N = 43
Balcony	5	1.9	11.6
Basement, need	7	2.6	16.3
Bath, bathing facilities, no.	2	.8	4.6
Bedroom, no.	3	1.1	7.0
Closets	0	0	0
Corridors, halls, hallways, condition	2	.8	4.6
Courtyard	1	.4	2.3
Foyer	1	.4	2.3
Gardens	4	1.5	9.3
Kitchen	4	1.5	9.3
Lounges	1	.4	2.3
Patio, porches, (no. of large ones)	13	4.9	30.2
Playground	16	6.0	37.2
Private yard, amount	0	0	0
Screened lanai	1	.4	2.3
Side yards	1	.4	2.3
Special purpose rooms, no.	2	.8	4.6
Stairwells	2	.8	4.6
Two car garage, carport	6	2.3	14.0
Utility rooms, washing machine rooms	5	1.9	11.6
Windows	3	1.1	7.0
No. of POEs in the category		43	16

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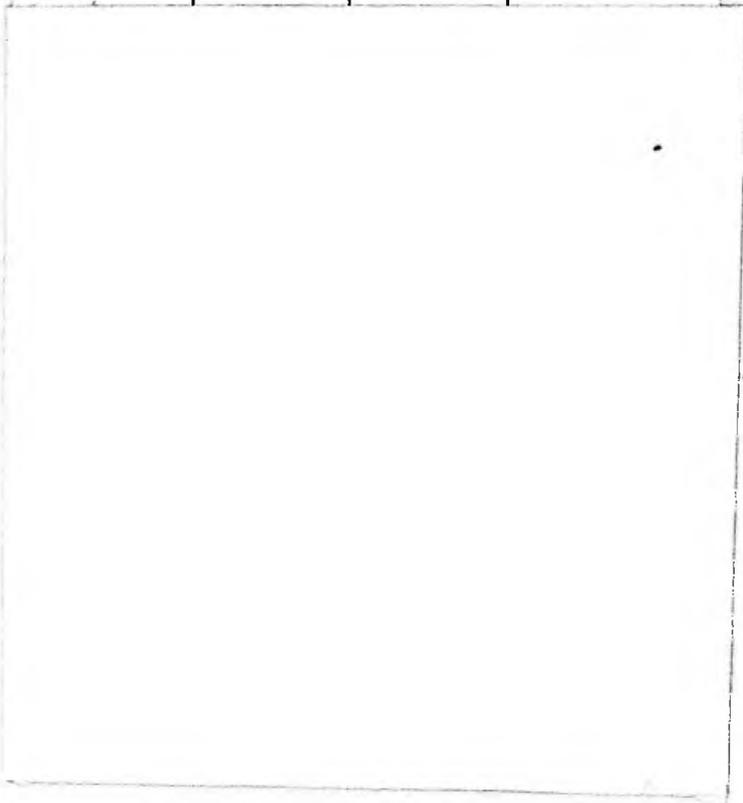
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