EVALUATING A PROCESS MODEL OF POST-OCCUPANCY EVALUATION: A CASE STUDY OF A CHINESE CHURCH

By

JING LI

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Xian Institute of Metallurgy and Construction Engineering,
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ABSTRACT

Post-occupancy evaluation (POE) is a method that assesses buildings systematically and rigorously after they are occupied. The purpose of this study was to conduct a POE using one particular process model developed by Preiser, Rabinowitz, and White (1988), as a case study in order to (1) evaluate the quality of the information obtained from the POE, (2) examine what factors may affect the quality of the POE, and how they affect the quality of the POE, and (3) suggest refinements to the model that may help people to conduct POE effectively and successfully in the future. The Chinese Evangelical Church was selected as the building to be evaluated. A review of the literature identified several factors that might affect the quality of POEs including action of clients, research design and methods, research strategies, sampling, presentation of information, and user participation. During the POE, the ways in which these factors might affect the quality of the POE were explored in each step of the process. After the POE, four evaluating criteria developed by Zimring and Wener (1985) were used to evaluate the POE. The case study of the POE demonstrated that the action of clients, the research design and methods, and the presentation of information were factors that influenced the quality of the POE in relation to each evaluating criteria. The following suggestions were made on what evaluators could do to achieve the criteria when they conduct POEs in the future: Involve the client and respect the

client's needs and opinions as much as possible: Seek the client's support and let the client understand the whole process: Study and understand the setting, cultural context, users, activities and objectives before choosing the research design and methods: Select research design and the methods which can incorporate evaluation criteria and yield useful data: Seek the client and user's opinions about ways to present the information and make the presentation of information easy to understand, clear and meaningful for different users.

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INTRODUCTION

Post-occupancy evaluation (POE) assesses buildings systematically and rigorously after they are occupied. It is the phase of the building process that follows the sequence of planning, programming, design, construction and occupancy of a building. Preiser (1989) offered a detailed and clear definition about what POE is and what POE does. He stated that:

> POE is subsumed by the higher order type of evaluation called 'building diagnostics' which has both diagnostic and prognostic capabilities. POE evaluates buildings in use and has short, medium, and long-term implications, the latter being evolutionary, based upon feedforward of POE generated information. Furthermore, POE focuses on the requirements and performance of building occupant's needs and therefore, technical performance is only considered insofar as it affects the occupants of buildings (Preiser, 1989, p.1).

Since its emergence in mid-1960's, POE has progressed through three distinct periods --- "useful" in 1960's, "usable" in 1970's, and "used" in 1980's (Rabinowitz, 1989, p.8). During 1960's and 1970's, POE research focused primarily on the processes and methods of evaluation, as well as exploring the relationships between the design of the physical environment, behavior, and building performance. The

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orientation of POE research during these decades was largely academically-based. With the development of POE methods and technology, POE has become a more wide-spread activity since 1980. It has been accepted by a broad range of clients and practitioners. The orientation of much POE research has shifted from academically-based to applied. POE is used routinely by many government agencies in many countries, and many private sector companies are increasing their use of POE as a standard activity. In view of the increased use of POE, insuring the quality of POE is important for both research and practice.

Zimring (1988, p.276) states that "the quality of POE research can be assessed on the basis of two general categories: utility and validity. These are interrelated but separable". Utility is concerned with the fit between the goals and objectives of the POE, the results of the POE, and the needs of information users of the POE. According to the different goals of research, validity can be classified into three categories: contextual realism, generality, and precision. Contextual realism requires to make the study as applicable as possible to a given setting. Generality requires to make the study as generalizable as possible to different settings, users, and times. Precision requires to make the statement of POE results as clear and exclusive as possible (Zimring, 1988).

In order to conduct POEs effectively and to increase their

quality, researchers explored various methods and strategies. For example, White (1989) studied concerns, questions, problems, and opportunities of POEs from the client's point of view. Since serving the client is becoming more important in POE, White believed that the planning of POEs should not only satisfy professional criteria such as reliability and integrity, but also should be sensitive to the client's personal, organizational and political context. Becker (1989) thought that POE should be integrated as closely as possible into facility planning and management and design practice in order to improve design practice, increase the quality of the built environment, and improve individual and organizational effectiveness. Zeisel (1989) developed six areas of agreement to increase the quality of POEs and to help them become an accepted and standard part of research and design practice. These areas include building purpose, critical performance criteria, established methods, optional depth of investigation, pre-designed data management, and pre-established database structure.

The purpose of this study was to conduct a POE using one particular model of POEs as a case study to (1) evaluate the quality of the information obtained from the POE, (2) examine what factors may affect the quality of the POE, and how those influences occur, and (3) suggest refinements to the model that may help people to conduct POEs effectively and successfully in the future.

The Process Model proposed by Preiser, Rabinowitz, and White (1988) was used to conduct the POE. The level of the effort for the POE was investigative, Functional, technical and behavioral performance of the building were evaluated. Using a multi-method approach, the evaluator carried out the case study for the Chinese Evangelical Church building located in Towaco, New Jersey. Issues that might influence the quality of POEs were examined during the process of the evaluation in order to document their effects. These issues included the action of clients, research design and methods, sample selection, and the presentation of information in the POE.

REVIEW OF THE LITERATURE

The POE Process Model

The POE Process Model, developed by Preiser, Rabinowitz, and White (1988), is one of many models that can be used to conduct POEs. This model can be applied to any type or scale of building. It evolved over a period of five years and reflects the authors' cumulative experience in having conducted numerous POEs, both in the academic realm and as commercial architectural research consultants (Preiser, Rabinowitz, and White, 1988).

The POE Process Model has two primary dimensions: the levels of effort at which a POE may be done and the major phases and steps for doing a POE (see Figure 1 and 2). The three levels of effort for POE are indicative, investigative, and diagnostic levels. Each level is composed of three phases: planning, conducting, and applying the POE. As the level of effort increases from indicative to diagnostic, time, cost, and other operational variables also increase. The level of the POE is selected as part of the first step in the planning phase.

An indicative POE provides an indication of major failures and successes of a building's performance. The time for conducting this kind of POE is very short, ranging from two or three hours to one or two days. The data-gathering methods in the indicative POE generally include archival and document

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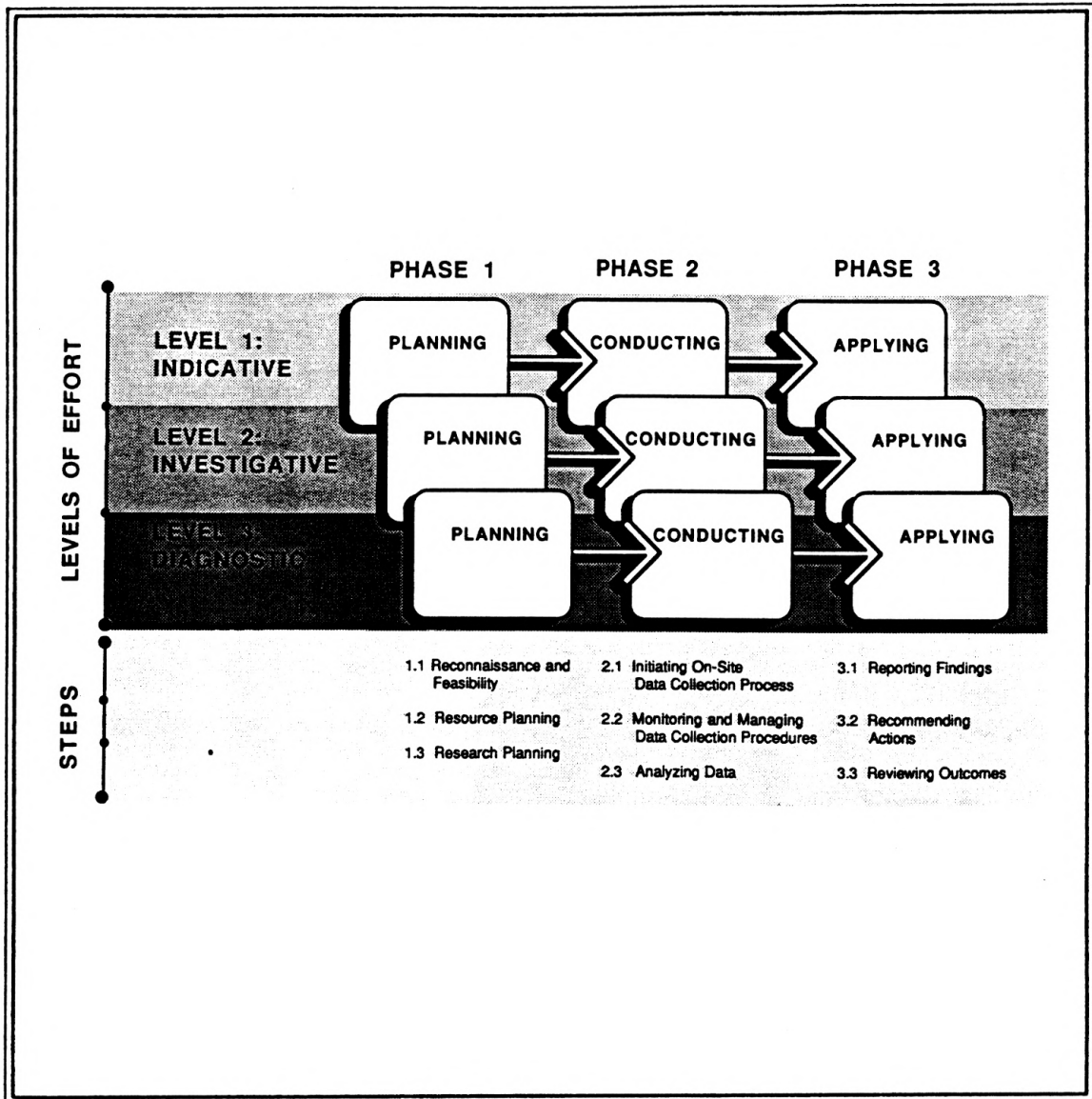
Figure 1. The Post-occupancy evaluation process model.

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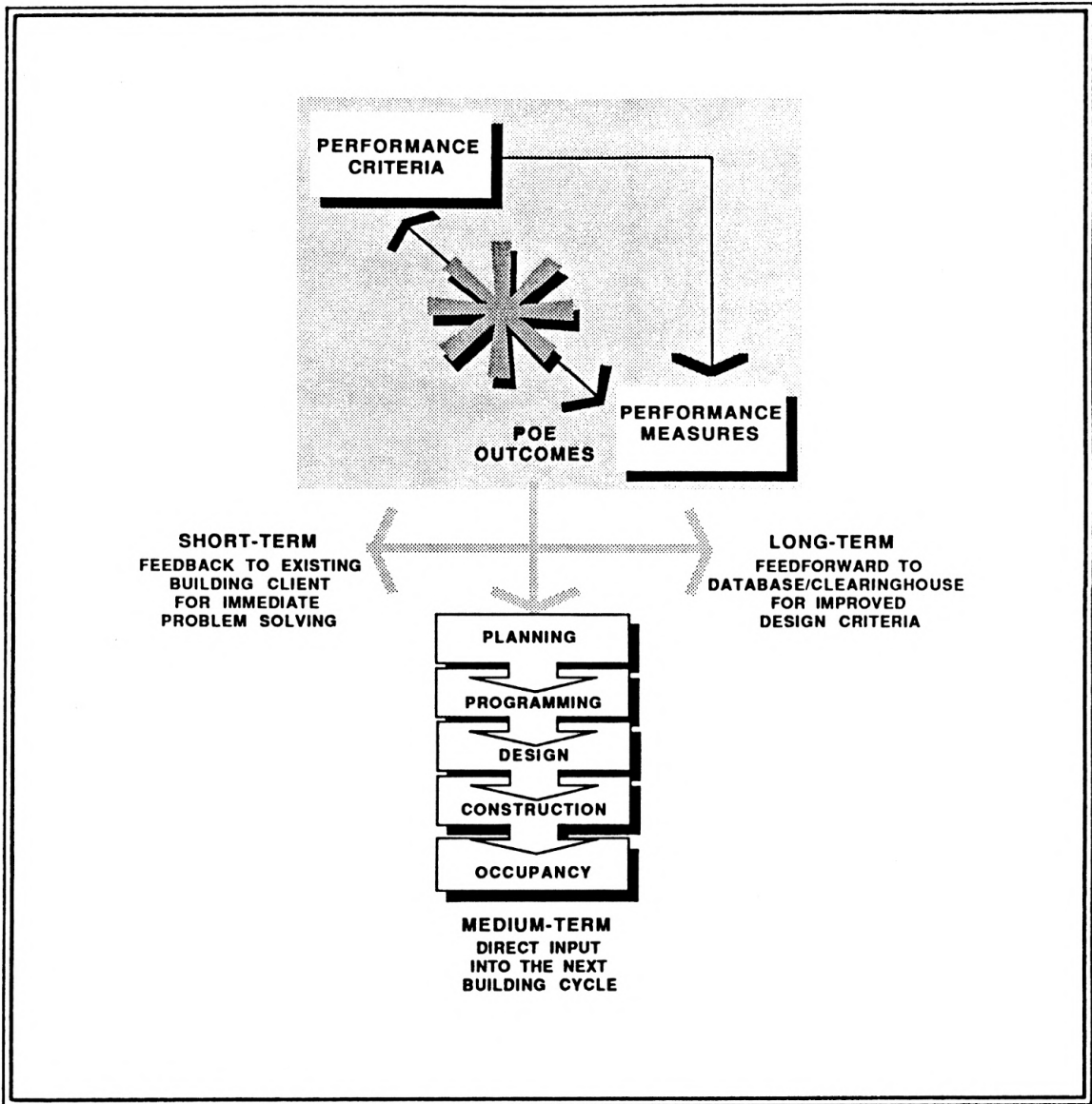
Figure 2. The performance concept in the building process. Note. From Post-Occupancy Evaluation (p. 38) by Preiser, Rabinowitz, and White, 1988, New York: Van Nostrand Reinhold. Copyright 1988 by Van Nostrand Reinhold.

evaluation, walk-through evaluation and interviews. The evaluator for this kind of POE must be familiar with all the information associated with the building, such as the building type, users, and functions, and be experienced in conducting POEs.

In an investigative POE, the major steps are the same as in an indicative POE, but it requires more time, and more complicated information and data collection and analysis methods. Another difference is the source of building performance criteria. In an indicative POE, the performance criteria used in the evaluation are based mainly on the evaluator's experience of the building, while the performance criteria in an investigative POE are objectively and explicitly stated before the building is evaluated.

An diagnostic POE is usually a large-scale project, which uses a multi-method strategy to evaluate many important aspects of building performance. The methods used are similar to those used in traditional scientific research. The results of a diagnostic POE not only provide information to improve particular facilities, but also add to the state-of-the art knowledge for a given building type through improvements in design criteria and guidelines (Preiser, Rabinowitz, and White, 1988).

Evaluation Criteria for POEs

POEs are evaluations of physical environments, which range from a small single building or environment to a large building or a group of buildings or environments. They may be conducted by social science consultants, designers, untrained building tenants, academicians and others. The methods used in POEs are varied, without a unified standard. The costs of POEs range from a few thousand dollars to millions of dollars. Because of the complexity in evaluated buildings and environments, evaluators, evaluating methods and evaluating cost, it is difficult to judge the success of a POE by a single criterion. However, Zimring and Wener (1985) suggested that there are at least two levels at which to consider the quality of a POE. First, does the POE meet its own goals? Second, does it meet some universal set of standards? Furthermore, they (1985) proposed an overall framework for evaluating POEs which included the following criteria:

* The degree to which researchers fulfilled original intentions
* The degree to which the results are useful
* The degree to which researchers' conclusions are justified by the power of the research methods
* The degree to which the study took advantage of the best possible design, given situational limits, to produce the most useful data
* The degree to which it provided the best possible

information, given the constraints of money, time and other resources. (p. 115)

In this case study, all the above criteria except the first were used to evaluate the POE.

Approaches That Improve the Quality of POEs

White (1989) stated that the recent advances in building evaluation had led to a gradual shift in the definition of POE from the "evaluation of buildings" to "service to the client" (p.19) in a more holistic sense. Service to the client has meant expanding the list of possible POE goals to accommodate client context and concerns and expanding criteria for judging POE success. The planning of POEs must not only satisfy professional criteria such as reliability and integrity, but also respond to the client's personal, organizational and political context (such as client concerns of avoiding embarrassment, defending results, and obtaining maximum public relations benefit from the POE study). White provided examples of client's contextual influences upon POE planning decisions in the following areas: purpose of the POE study, building to be evaluated, building performance aspects to be measured, level of rigor, evaluation tools and techniques, POE timing and scheduling, project participants, POE cost, and methods for reporting POE findings. White stated that if evaluators neglect the client's contextual concerns, the POE results may satisfy professional criteria, but may be useless and even

counterproductive for the client's organization. In order to effectively deal with POE goals and criteria from the client's perspective, he (1989) identified three new skills for evaluators:

* The ability to uncover client contextual issues in the early stages of POE project planning

* The skill and commitment to allow these contextual issues to affect POE planning decisions and to integrate client concerns with technical competence considerations in the POE work plan

* The capacity to reconcile where a response to client contextual factors in the POE work planning threatens the technical integrity of the study or where the satisfaction of technical POE criteria reduces the value of the POE from the client's perspective. (p.34)

Becker (1989) suggested that POE should be distinct from more formalized environment-behavior research or sophisticated evaluation studies. POE should be a relatively simple, practitioner-driven management technique so that it could gain credence within an organization, where it was most likely to be used on a regular basis and have some direct influence on the quality of the built environment. He also stated that since facility planning and management has become more responsible for coordinating all aspects of building planning, design and operation in the organization, POE should be

integrated as closely as possible into facility planning and management and design practice. This integration could improve design practice, enhance the quality of the built environment, and improve individual and organizational effectiveness.

Zeisel (1989) stated that it is not necessary to reinvent methods employed in POEs each time a study is carried out. By applying standard procedures and approaches, the results of POEs can be more reliable and useful. In order to increase the quality of POEs, and to make them an accepted and standard part of research and design practice, Zeisel (1989) developed six areas of agreement: building purpose, critical performance criteria, established methods, optional depth of investigation, pre-designed data management, and pre-established database structure. Building purpose can serve as a vehicle for organizing POE data gathering and analysis. Critical performance criteria can be derived from the building purpose for particular building types. Established methods enable all POEs to be compared to one another, and thus can be used to build a shared body of knowledge. Pre-designed data management can connect and serve to structure data gathering methods, statistical data analysis and databases. Pre-established database structures can be more efficient and powerful for making decisions.

Zimring argued (1989, p.113) that " POE can effectively advance environmental design research and support decisions by attending to the implicit theories guiding evaluations, such

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as the assumed role of evaluators and the assumed ways organizations make decisions and learn". He identified three distinct roles that are common for evaluators to choose: the inquirers, the performer and the changer. The inquirer is concerned about issues and questions that are defined by personal interest or professional socialization, or by the academic community. The performer provides answers to questions raised by some specific group such as client, and often tries to produce "action-oriented" studies that can affect the decision-making of clients (p.118). The changer tries to use the POE to bring about what he or she thinks ought to be. Zimring (1989) stated that the choice of role is very important because it makes subsequent decision-making easier. For example, the choice of the performer role not only establishes the overall goal of the POE, but also determines how to distribute study resources.

Vischer (1989) identified some of the reasons why POE has not been popular. These reasons included mistrust of surveys, changing use, professional insecurity, a sense of futility, immediate pay-off and cost-effectiveness. She proposed a "building-in-use-assessment system" which provided alternative ways to evaluate office buildings. In the future, the "building-in-use-assessment system can also be expanded to other building types. These examples suggest how some researchers have tried to explore ways to improve the quality of POEs. These efforts must continue in order to enhance the

usefulness of POE in the future.

Issues that Influence the Quality of POEs

From the literature review, six factors that may affect the
quality of POEs were identified. These factors were the action
of clients, research design and methods, research strategies,
sample selection, presentation of information and user
participation. Using the church building of the Chinese
Evangelical Church as a case study, each of these six factors
was monitored as a part of the evaluation process. Research
questions operationalizing each of the six factors were linked
to the steps of the process model for which they were most
appropriate (see Appendix A).

Action of Clients

Generally, the client plays an important role in the POE
process. At the beginning of a POE, the initial contacts with
the client can dramatically affect the subsequent ease of
doing the evaluation, the validity of results, and the
likelihood of recommendations being implemented. Any
organization has several kinds of decision-makers who can
either support or disrupt the POE, and who may use the results
of the POE. So, it is important for evaluators to understand
the client's needs and perspectives (Zimring, 1987). If the
client can take part in the POE and the evaluator can respond
to the client's needs, the utility of the POE will increase,

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and findings may be integrated successfully into future plans (Wener, 1988). However, the client may introduce bias into the study by influencing the research design or the study participants (Zimring, 1988).

Joseph O'Reilly, Joyce Shettle-Neuber and Joanne Vining (1981) found that the client management style affected the utilization of POE results in their post-occupancy evaluations at the Aviary exhibit at the Arizona-Sonora Desert Museum, Tucson, Arizona. In their study, they found that client management style could greatly influence the way in which POE results should be presented to the client. During their first study periods, for example, the management style was characterized by decentralization and a laissez-faire attitude. The authors suggested that under this situation, the evaluator should be aware of the desires and needs of the few individuals who had decision-making power. In order to produce usable and objectively valid results, the evaluator should be aware of the potential bias and preconceptions of these individuals' needs which could affect the use and design of the research.

All the literature discussed above indicates that the evaluator may encounter a lack of independence in conducting POEs, must be aware of the client's influence in the whole POE process, and try to solve any problems associated with client's influence in order to increase the quality of the POE.

Research Design and Methods

Choosing appropriate data-gathering and data-analytic methods can increase both the utility and validity of a POE. Bechtel and Srivastava (1978) identified data-collection methods commonly used in POEs, which included (1) open-ended and structured interviews, (2) cognitive maps, (3) behavioral maps, (4) diaries, (5) direct observation, (6) participant observation, (7) time-lapse photography, (8) motion-picture photography, (9) questionnaires, (10) psychological tests, (11) adjective checklists, (12) archival data, and (13) demographic data. The methods most frequently used in POEs are questionnaires, interviews, and photography or some other type of physical survey (Zimring, 1987).

In order to achieve validity for the POE, Zimring (1986) stated that evaluators must examine their POE plan and goals to see whether the methods they chose can incorporate the evaluation criteria and address the goals for use of the information. He (1988) also pointed out that:

> Methods where the evaluator controls categories for participants and responses (such as a standardized questionnaire with fixed choices) tend to support 'precision' goals; other methods such as touring interviews tend to better support 'contextual realism' goals. However, ... no single method is perfect or even adequate; most evaluators use multiple methods to gain 'convergent validity' where the strengths of one

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technique compensate for the weaknesses of others.
(p.280)

The pre-testing of data-collection methods is also a critical step in controlling the quality of a POE. If evaluators pretest the data-collection methods, they can identify problems in the methods that might yield incomplete, or useless data.

Zimring (1987) stated that data analysis is one of the weakest aspects of many POEs. Because many evaluators lack sufficient knowledge about statistical analysis, they often don't address the central questions in the evaluation. Alternately the evaluator may consult a statistician who does not really understand the problem and suggests an unsuitable analytic technique which will lead to the misinterpretation of results. "This problem is exacerbated by the realities of doing research in real settings, which often involves small sample size, nonrandom selection, and other potential threats to validity." (Zimring, 1987, p.281). If either of these two problems occurs, the results of the POE will not be as useful as the evaluator and the client expected, and the validity of the POE will be reduced.

The quality of data collection procedures also is a very important aspect. Agnew and Pyke (1987) pointed out that "the most carefully constructed questionnaire or interview schedule, combined with the most sophisticated sampling strategy, may still fail to produce accurate results if the

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administrative procedures are faulty" (p.96). For example, the interviewer's sex, social class, age, race and attitudes in the interview process may affect interviewees' answers. Questionnaire responses can be affected by the content and tone of subject instructions (Agnew and Pyke, 1987). The following case studies illustrate how the use of research design and methods can affect the quality of POEs.

In a post-occupancy evaluation of a retirement home, Arvid Osterberg (1981) used a multi-method approach to study user response to the building. He stated that "the multi-method approach used in the research offered the primary advantage of providing a broad data base for analysis. Each method provided a data set which could be used to validate information obtained from another method when overlaps occurred." (Osterberg, 1981, P.301). The methods he used included interviewing, observation, and consulting records, and all the methods were pre-tested before being used. For example, he found that the information he obtained from surveys only reflected part of the story, so he used observations and photographs to complement the survey data he needed. He also used the method of interviewing and re-interviewing users over a period of weeks and months in the evaluation process. He found that this method was especially beneficial in documenting changes which users made in an effort to adapt to a new building environment, or the seasonal variations and the continual modification of a building by

users, which were important factors that would influence user responses.

In a case study of post-occupancy evaluation of a federal office building in Ann Arbor, Michigan, Marans and Sprecklmeyer (1981) stated that because there was a lapse in time between the gathering of evaluative data and the collection of objective environmental measures, the environmental conditions in their data set were not always reflective of the questionnaire responses they had obtained earlier. Furthermore, they collected the two kinds of data only during the winter but not during other seasons when ambient conditions and people's responses to them might have been quite different. So, they suggested that " it is important to consider such matters when contemplating future evaluation studies. At the same time, serious efforts should be made concurrently to obtain the various kinds of data that are intended to be examined in relation to each other."(Marans, & Sprecklmeyer, 1981, p.156).

In their study, these authors also noticed that various characteristics of individuals would influence responses to environment conditions. They suggested that when conducting research on person-environment relations, including evaluation studies, researchers should identify those characteristics that may act as a mediating influence on people's responses, such as the status and the attitudes of individuals.

The other problem they found in their study was the

difficulty for some people in interpreting the drawings in the questionnaire. Because drawings with questionnaires can be useful in conveying ideas, especially those dealing with the physical environment, they thought that more basic research was needed on the appropriateness of graphics in eliciting valid responses of people occupying environments. Their findings showed that the drawings which people can understand easily in the questionnaires are essential for validity, while confusing drawings may cause misinterpretation of the responses.

Research Strategies

It is important to select a proper research strategy in a POE in order to ensure the quality of the POE. The basic research strategies include field experiments, field studies, computer simulations, formal theory sample surveys, judgment tasks, laboratory experiments and experimental simulations (Zimring, 1987). Generally, most POEs use field studies. Sometimes they also use the other strategies according to the objectives of the POEs. Some of these strategies, such as laboratory experiments and experimental simulations, have high internal validity and low external validity, while others have high external validity and low internal validity, such as field studies. Some strategies can achieve a balance between internal and external validity. Researchers should choose appropriate strategies in their study according to different

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goals in POEs. For example, if the goals of a POE are to provide information to improve the settings evaluated, the evaluator can use field studies; however, if the goals of a POE are to obtain information which can be widely used in different settings and different situation, the evaluator must use those strategies that have high internal as well as external validity.

<u>Sample Selection</u>

Zimring (1987, p.276) stated that "sampling of participants, sites, and times seriously affects the kinds of arguments that can be made in a POE. In addition to affecting the generalizability that can be expected from an evaluation, sampling helps reject (or create) alternative explanations of the results". In order to obtain high quality in a POE, the samples must be appropriate for the target population, sites, and times.

There are two kinds of sampling: probability sampling and nonprobability sampling. The types of probability sampling include simple random sampling, stratified sampling, and cluster sampling. What kind of probability sampling is used in the research will depend on the quality of sampling frame, the study objectives, the precision of estimates that would be acceptable, and the time and financial resources available to perform the work. In nonprobability sampling, the reliance on human judgement is its most distinguishing feature. The

researcher is unable to determine the precision of the estimates, but the method can be used appropriately in surveys where the population is extremely small, where issues are being explored in a preliminary manner, or where there is no need to generalize or estimate the precision of the findings (Marans, 1987).

The Presentation of Information

The way that information is presented has an important impact on whether it is used. Because different disciplines and individuals are accustomed to different ways of presenting materials, Reizenstein (1980) suggested that evaluators should generally present information in multiple ways. The information presented must be easy to understand, clear and meaningful. For example, evaluators might present data to social scientists primarily in written reports, and to designers in visual presentations.

Joseph O'Reilly, Joyce Shettel-Neuber and Joanne Vining (1981) found that the manner of presentation and communication of research results affected the utilization of POE results in their evaluations at the Aviary exhibit at the Arizona-Sonora Desert Museum, Tucson, Arizona. During their second study period, an outside consulting firm was hired to produce a master plan for the museum. This decision resulted in the transfer of some of the power previously held by individuals to the consultants and the master plan. In order to ensure

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that the information could be understood by both staff members and design professionals, the evaluators pointed out that a flexible, multi-level method of presenting data could be used so that the results should be presented in a nontechnical manner for staff members and in a more detailed manner useful to design professionals. They also suggested that researchers must present data in an understandable and useful manner so that important findings might not be misinterpreted or ignored. In addition, since clients may focus on those results which confirm their preconceptions, researchers also must be aware of the needs and biases of the client when presenting data. The authors further pointed out that it was important to help clients in making an informed decision about how to communicate and use the POE results. Evaluators can do this in two ways: inviting the designer to take part in the POE project, or presenting the data in a manner that is easy for clients to use and understand. No matter how effectively results are communicated, factors outside researchers's control may be the most important influence on whether or not recommendations are implemented.

The post-occupancy evaluation of a federal office building in Ann Arbor also affirmed the importance of communication and utilization. The evaluators (Marans and Sprecklmeyer,1981) found that their efforts to disseminate preliminary finds met with little interest. They suggested that care should be taken in planning the content and process of the feedback of

valuative data. They also suggested that evaluators should use the results of evaluations in developing patterns of environmental attributes that in turn could be used by designers in their planning activities (Marans, & Sprecklmeyer, 1981). The examples of these case studies indicate that the manner of the presentation and communication of the POE results can deeply influence the utility and validity of the POE.

User Participation

After evaluating several successful environment research and design projects, Wener (1988) concluded that user participation was related to the successful implementation of environment-behavior research and design. User participation can reduce user opposition and increase acceptance of final results, and enhance satisfaction with the environment. Zimring, Wineman, and Carpman (1988) also stated that:

> Participation by decision-makers and others helps to ensure that their greatest concerns are addressed in the POE and assists evaluators in checking their preliminary conclusions with people who are familiar with the setting to be evaluated. Such participation serves both as input and output from the project and leads the client to feel a real sense of involvement in the process. (P.277)

For example, one method is to organize an appointed group of

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persons with a vested interest in the evaluation being conducted, including members of the client organization, the architect or design team, and building occupants, and hold a series of workshops with the group to identify and clarify their particular needs with respect to the evaluation. This group of people can serve an advisory role throughout the project, providing structured feedbacks to the evaluation team at key points in the process (Zimring, Wineman, and Carpman, 1988).

The case study of a New Zealand residential school for boys (Gray, Watson, Daish, and Kernohan, 1985) supported the benefit of using participatory methods in POEs. In the study, the researchers used participatory methods of a touring interview and a briefing workshop which was designed as a 'game'. After completing the case study, the evaluators found that the participatory POE was successful in the following aspects: priorities were established for decision-making about what to change; the results were supported by different users; evaluators got effective information in less time than usual; the documentation they made was first-hand, accurate, speedily produced and easy for designers and managers to understand. They concluded that the participatory POE was efficient and effective: "it can be made to work, on time, with cost and with better results. It appears to give information which is naturally well organized, requiring a minimum of reorganization to be useful to the client and delivery agency"

(Gray, Watson, and Kernohan, 1985, p.285). This case study showed that participatory methods could obtain effective information, make easily used results, and produce and present the POE results in a way that was easy for designers and managers to understand. Together, these things increased the validity and utility of the POE.

The other factor that may affect the quality of POEs is environmental or personnel change. In the post-occupancy evaluation at the Aviary exhibit at the Arizona-Sonora Desert Museum (O'Reilly, Shettel-Neuber, and Vining, 1981), the researchers found that environmental change and lack of continuity of research and personnel could influence the utilization of POE data, especially in a long term project. They suggested that the evaluators must plan for change and attempt to provide continuity despite changing personnel to insure that continuity was maintained. In this way, the results could be well utilized, and support and funding could be maintained. They also found that short presentations of past research, providing on-going documentation, and having regular meetings and informal daily contact could be used in communicating information and facilitating a sense of continuity. This example illustrated that the environmental and personnel change could influence the validity of the POE. If the evaluator ignored this change, the information which was useful before the change would become useless after the change.

CONDUCTING THE CASE STUDY OF THE POE PROCESS MODEL

Building Description

The Chinese Evangelical Church is located at Towaco, NJ.
The church building to be evaluated was originally used as a
restaurant. After being purchased by the Evangelical Mission
and Seminary International Inc. in 1982, it was renovated into
a church building. Except for interior and exterior painting,
no other major architectural changes have been made since
then. In 1991, with partial modification of first floor plan,
the interior spaces of the church building were renovated. The
ceilings and walls of the sanctuary were redecorated, and the
first floor was re-tiled. In this two-story church building,
the first floor includes a sanctuary, a kitchen, a little
grocery shop, a nursery and restrooms, and the second floor
includes a conference/Sunday school room, a meeting room, four
bedroom for students of the Bible Institute and visitors,
three offices and two small kitchens. The exterior and floor
plans of the building are shown in Figure 3, Figure 4, Figure
5, and Figure 6.

The church building is a multi-function building which
provides spaces not only for routine activities of the church,
but also for the Bible Institute, the International Bible
Conference Center, and other activities. For example, the
sanctuary, which is used as a classroom for the Bible
Institute during weekdays, is the place for Sunday worship.

Figure 3. Building exterior
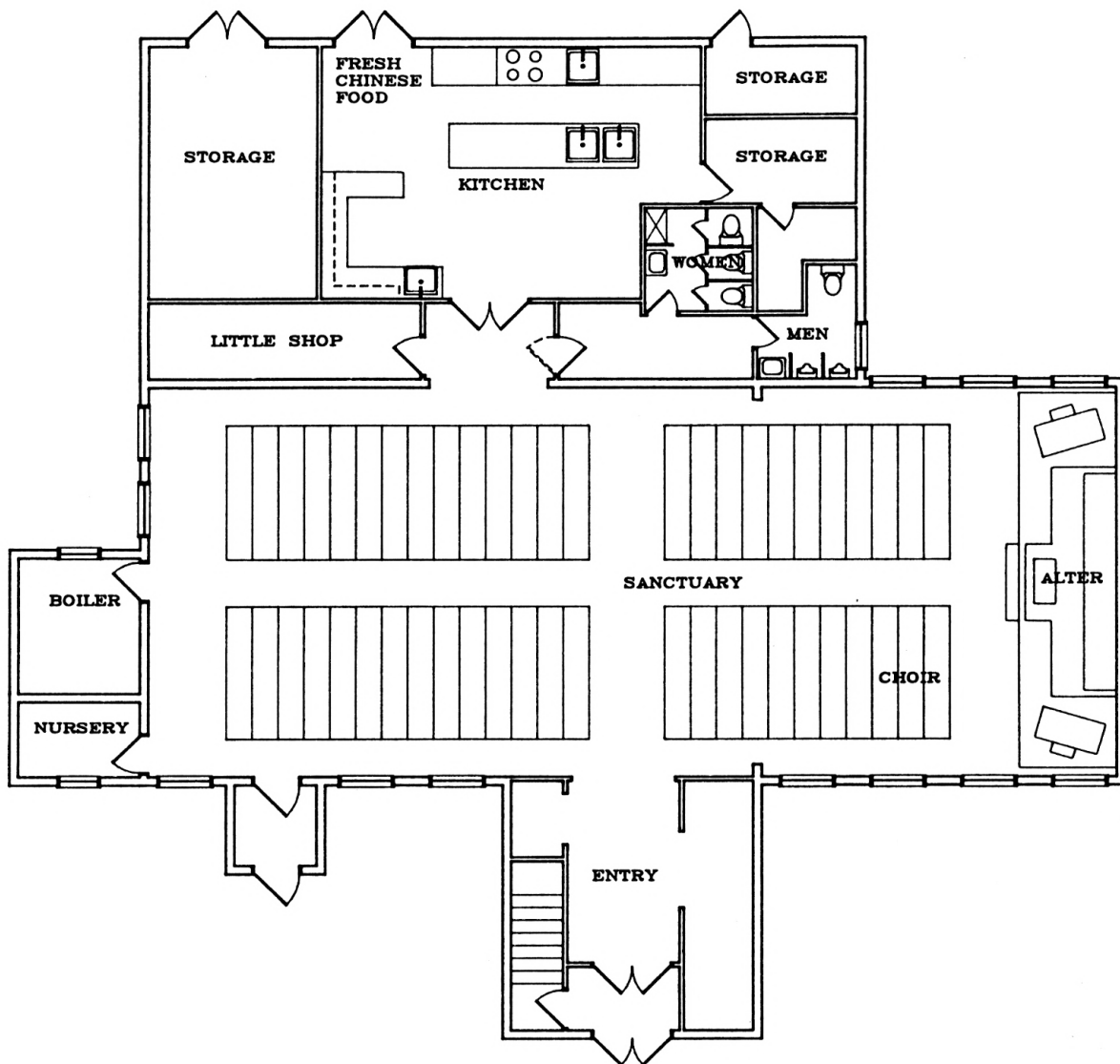
Figure 4. First floor plan
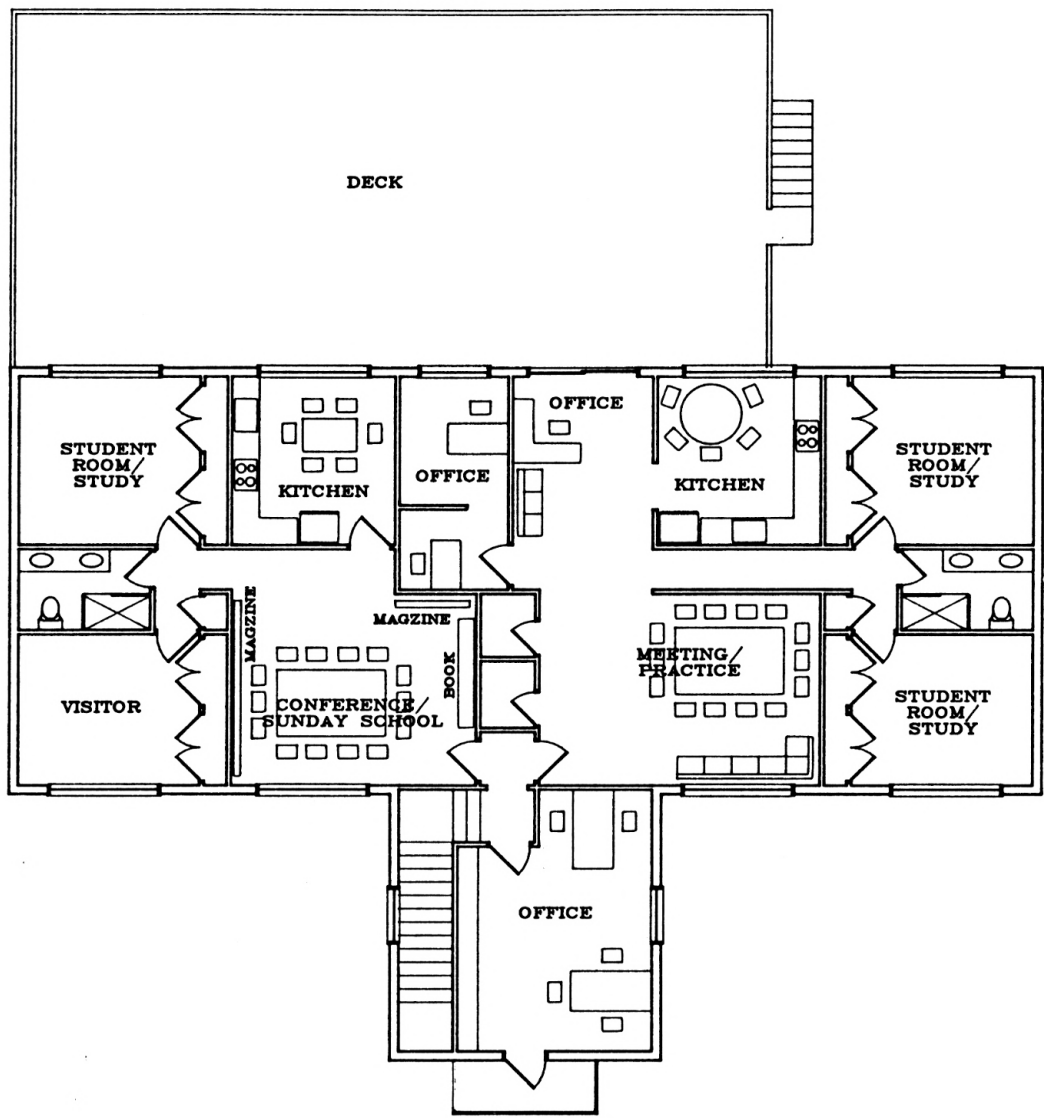
Figure 5. Second floor plan
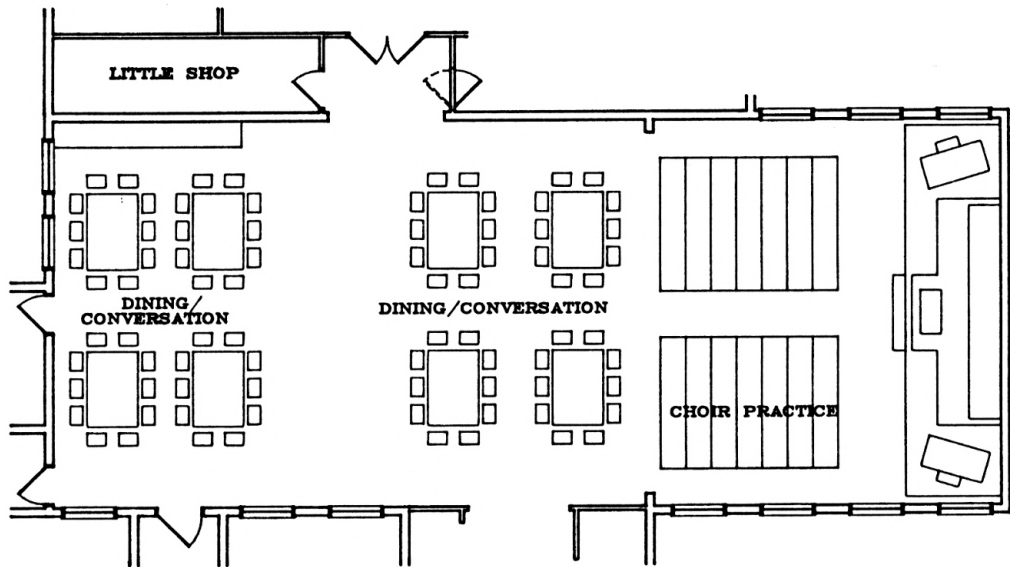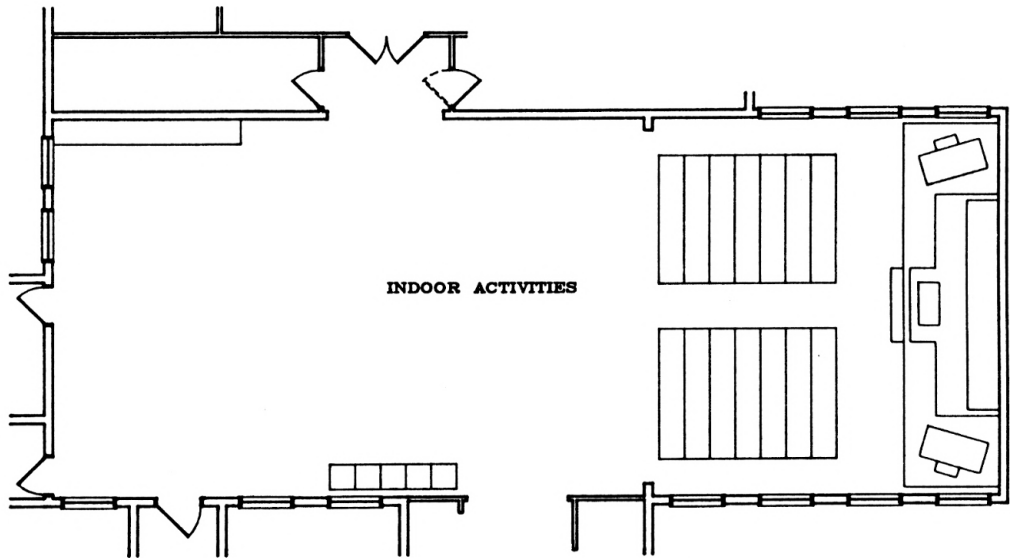
Figure 6. Alternative first floor plan

After the Sunday worship, it also provides space for lunch and conversation by moving furniture around. The major concern of the client organization was to provide a good environment for different users in limited spaces; thus, flexibility was one of the major requirements of the building. This goal was achieved by using movable furniture in the sanctuary, nursery, conference room and meeting room.

Phase 1: Planning the POE

Step 1: Reconnaissance and Feasibility

The first step in the process model of post occupancy evaluation was conducted in May, 1992. During this step, the client (the founder and paster of the church) was contacted and briefed on the nature of POEs, the type of activities involved, and the resources needed. Essential data concerning the church building were obtained, which included floor plans, space assignments and schedules, the client organizational chart and staffing, and building-related accidents, maintenance, and repair records. The church building was observed under working conditions. Observations were conducted during not only daily routine but also the days with special events. The time schedule for observation was as follows: 8:30 am to 5:00 pm and 7:30 pm to 9:00 pm on Friday, and 9:00 am to 4:00 pm on Sunday. Field notes were recorded during the observations, and these data were used to developed questions and interpret data from the interviews and surveys. An example

of the observational data is provided in Appendix B.

The key personal were identified and interviewed. The checklist of useful documents for POE and the building evaluation questions provided by Preiser, Rabinowitz and Write (1988) were used to collect information from the key personnel of the church (see Figure 7 and Figure 8). The floor plans were used as reference during these interviews. After initial observations, interviews with the key personal of the church and a review of the essential data concerning the church building, it was found that most of the technical aspects of the building such as security provisions, heating/cooling, and pluming/electrical were good, but the behavioral and functional aspects were not satisfactory. The major problems in all building areas were overcrowded spaces, inadequacy of activity space, spatial relationships and circulation. The other problems were inadequacy of overall design concept and site design, and unattractiveness of the exterior and interior as a church building. It was found that the client organization already tried to solve some of these problems, but the effects were not satisfactory. They thought that they needed a more comprehensive understanding of the building performance and the church users' reaction to the building's performance in order to effectively solve the existing problems and to provide information for the future building design and use of the building. All the above activities helped to determine the objectives, the scope and level of

CLIENT-RELATED INFORMATION

(1)   Client mission statement, organizational chart, and staffing.
(2)   Initial program from building.
(3)   As-built floor plans (may require up-dating).
(4)   Space assignments and schedules.
(5)   Building-related accident reports.
(6)   Records of theft, vandalism, and security problems.
(7)   Maintenance/repair records.
(8)   Energy audits or review comments from heating/cooling plant manager.
(9)   Any other feedback concerning the building which may be on record.

Figure 7. Checklist of useful documents for POE.

Note. From Post-Occupancy Evaluation (p. 158) by Preiser, Rabinowitz, and White, 1988, New York: Van Nostrand Reinhold. Copyright 1988 by Van Nostrand Reinhold.

We would like to know how well your building performs for all those who occupy it. Successes and failures (if any) are considered insofar as they affect occupant health, safety, efficient functioning, and psychological well-being. Your answers will help improve the design of future, similar buildings.

Below please identify successes and failures in the building by responding to the following broad information categories and by referring to documented evidence or specific building areas wherever possible:

1. Adequacy of Overall Design Concept.
2. Adequacy of Site Design.
3. Adequacy of Health/Safety Provisions.
4. Adequacy of Security Provisions.
5. Attractiveness of Exterior Appearance.
6. Attractiveness of Interior Appearance.
7. Adequacy of Activity Spaces.
8. Adequacy of Spatial Relationships.
9. Adequacy of Circulation Area, e.g., lobby, hallways, stairs, etc.
10. Adequacy of Heating/Cooling and Ventilation.
11. Adequacy of Lighting and Acoustics.
12. Adequacy of Plumbing/Electrical.
13. Adequacy of Surface Materials, e.g., floors, walls, ceilings, etc.
14. Underutilized or Overcrowded Spaces.
15. Other, please specify: (e.g., needed facilities currently lacking).

Figure 8. Building evaluation questions.

effort of the POE, following the process model developed by Preiser, Robinowitz, and White.

The client's objectives for the POE were to identify and solve the problems in the church building that would improve space utilization and feedback on the building performance, and to provide information for the future building design and the usage of the church building.

After the initial reconnaissance of the building and discussions with the client, the information that could be obtained using an indicative POE was considered insufficient because an indicative POE can only provide an indication of major failures and successes of a building's performance. By contrast, a diagnostic POE is a comprehensive and in-depth investigation. Its results and recommendations are long-term, aiming to improve not only a particular facility, but also the state of the art in a given building type. Since the church building being evaluated was a specialized building, most of the findings and recommendations of the POE can only be applied to that church building. Thus, a diagnostic POE was not suitable for the POE of this building, and an investigative POE was selected.

Step 2:Resource Planning

Based on the observation and interviews, it was decided to assess technical, functional and behavioral factors. Functional and behavioral factors were to be emphasized. The

management plan of the POE, which included workplan and schedule, was developed and presented to the client organization. With help from key personnel, the evaluator obtained the full cooperation and support of staff and users of the building. The evaluator also was given access all building spaces, allowed to interview and survey building users, and to photograph and measure all aspects of the building and its use.

The POE team consisted of four persons: the project director, the building development manager of the client organization (key personnel), and two church building users as volunteers. The project director was responsible for overall coordination, project planning, training of volunteers in collecting data, analyzing data, and preparing the final report. The manager's responsibility was to support and coordinate the POE during the evaluation process. The project schedule is shown in Figure 9.

Step 3: Research Planning

In order to obtain complete and reliable data, a multi-method approach was planned for data collection, which included:

* Interviews with selected users of the church building
   (including five adult males (ages 25 to 60), five adult
   females, two older persons (ages over 60), two male
   youths (ages 18 to 25), two female youths, and a member

PROJECT SCHEDULE

Weeks After Start

	1	2	3	4	5	6	7	8	9	10
PHASE 1: PLANNING										
1.1 Reconnaisance And Feasibility	▨									
1.2 Resource Planning	▨	▨								
1.3 Research Planning	▨	▨								
PHASE 2: CONDUCTING										
2.1 Initiating On—Site Data Collection Procedures			▨	▨						
2.2 Monitoring and Managing Data Collection Procedures			▨	▨						
2.3 Analyzing Data					▨	▨				
PHASE 3: APPLYING										
3.1 Reporting Findings							▨			
3.2 Recommending Actions							▨	▨		
3.3 Reviewing Outcomes								▨	▨	
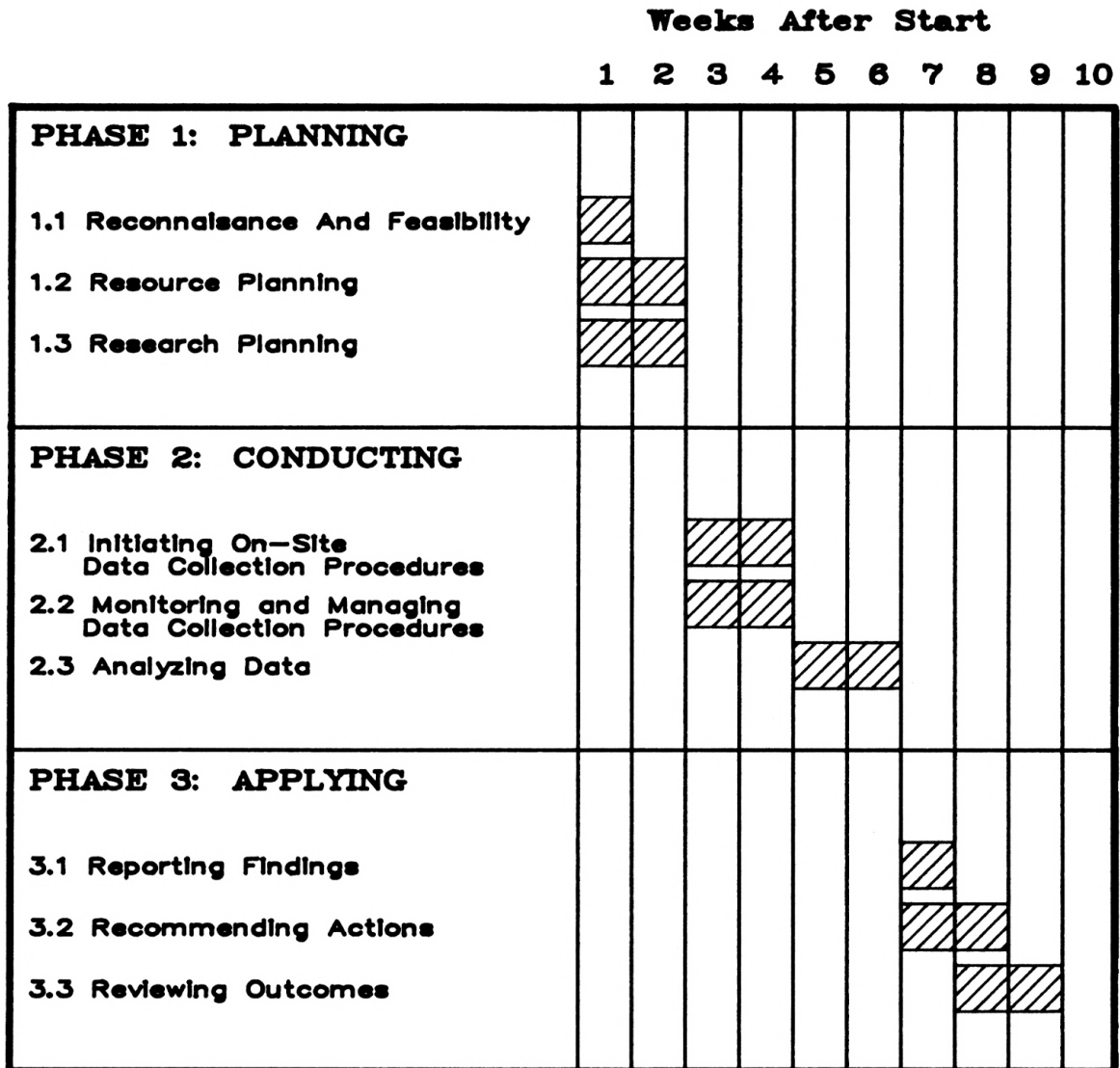
Figure 9. Project schedule of the POE

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of the church staff)

* Document and archival research

* Walk-through and inspections with the key personnel of
  the church

* Direct observation

* A questionnaire surveying of all users

* Detailed follow-up interviews with the client,the
  manager, and selected users (the same group described
  above)

Since no existing evaluation criteria could be found, the
evaluation criteria for the church building were developed
from goals and objectives of the client and the design
guidelines of typical church buildings (e.g., <u>Time Saver
Standards for Building Types</u>, 1990) (see Appendix C).

Phase 2:Conducting the POE

<u>Step 1:Initiating the On-site Data-collection Process</u>

Prior to the data-collection process, necessary instruments
for data-collection were prepared. Surveys were provided in
both English and Chinese. The survey form was pretested and
sent to the client for final approval. The survey form
developed from the "Occupant Survey" (Preiser, Rabinowitz and
White, 1988 p.160) was pretested in the church building with
six randomly selected people including an adult male, an adult
female, an older person, a young male, a young female, and a
member of the church staff. The questions included on the

survey are shown in Figure 12 (which is also the formal survey form). Since no problems were found during the pre-test, no changes were made. The strategy of distributing the survey form was discussed. It was decided that the client would distribute the survey form for the evaluator in the church building. The formal survey forms were prepared for distribution (see Figure 12). The time schedule for the walk-through evaluation and interviews concerning the POE process was made. Interview questions used before the survey were the same as the questions on the survey. Interview questions used after the survey and the POE are shown in Figures 10 and 11. The interviewers were instructed to begin each interview with the same introductory comments, to ask the questions in the same order and wording, and to establish and maintain a pleasant relationship with the interviewee.

Step 2: Monitoring and Managing Data-collection Procedures

At this stage, 120 survey forms were distributed to the building users. The client helped to distribute the forms and insure that all age groups using the building received the survey form and responded to the questionnaires. The church has about 200 members. The average number of people who attend Sunday worship in the church is about 150. About 100 of them are adult and the other 50 are children. A total of 84 out of 120 survey forms were returned. Three interviews were conducted during the POE process: first, interviews before the

```
Interview Questions After The Survey

    A few weeks ago, we conducted a occupant survey about the
building performance of the church building. After the survey was
completed, we analyzed the survey answers and got the results. We
wish that you could help us confirm whether these results
reflected the true situation or not, And we also want to know
your opinion about the survey.

A. the following are the results of the survey, please tell us
whether you agree or not agree the results, why?
(Summaries of each question results of the survey were explained
to interviewees.)

B. please give your opinion about the survey on the following
aspects:

1. Generally speaking, whether the survey is useful or not, why?

2. Are all the questions in the survey easy to understand? If
not, which are (is) not easy to understand?

3. Are the meaning of the words used in the survey easy to
understand? If not, which are (is) not easy to understand?

4. Do you think whether there are too much questions or not
enough questions in the survey form?

5. Do you think whether question #9 and #10 are important?
whether do you like to answer this two questions? If not, why?
```

Figure 10. Interview questions after the survey

Interview Questions After The POE

1. Do you think that the findings of the POEs are accurate of not?

2. Do you think that the recommendations of the POE are useful or not? If not, why?

3. Is it easy for you to understand the presentation of the findings and recommendations?

4. In the POE, the following ways were used to present the findings and recommendations. Which way or ways do you think are most easy to understand?
a. bar graphs.
b. word descriptions.
c. floor plan with simple explanations.
d. graphic illustrations.

5. Which of the following methods do you think are most useful to collect data about the performance of the church building?
a. questionnaire survey.
b. interviews.
c. observation. ,
d. questionnaire survey and interviews.
e. questionnaire survey and observation.
f. interviews and observation.
g. all of the above methods.

Figure 11. Interview questions after the POE

OCCUPANT SURVEY

We wish to conduct a post-occupancy evaluation of your building. The purpose of this evaluation is to assess how well the building performs for those who occupy it in terms of health, safety, security, functionality, and psychological comfort. The benefits of a post-occupancy evaluation include: identification of good and bad performance aspects of the building, better building utilization, and feedback on how to improve future, similar buildings.

Please respond only to those questions of the following survey that are applicable to you. Indicate your answers by marking the appropriate blanks with an "X".

1. In an average   week, how many hours do you
   spend in the following types of spaces (specify):

Space A: Sanctuary
Space B: Kitchen
Space C: Conference/Sunday School
          (Second Floor)
Space D: Meeting / Practice
          (Second Floor)
Space E: Nursery

HOURS	A	B	C	D	E
0 - 5	( )	( )	( )	( )	( )
6 - 10	( )	( )	( )	( )	( )
11 - 15	( )	( )	( )	( )	( )
16 - 20	( )	( )	( )	( )	( )
21 - 25	( )	( )	( )	( )	( )
26 - 30	( )	( )	( )	( )	( )
31 - 35	( )	( )	( )	( )	( )
35 - 40	( )	( )	( )	( )	( )
40 +	( )	( )	( )	( )	( )

2. Please rate the overall quality of the following areas in the building:

	EX	G	F	P
a) Space Category A	( )	( )	( )	( )
b) Space Category B	( )	( )	( )	( )
c) Space Category C	( )	( )	( )	( )
d) Space Category D	( )	( )	( )	( )
e) Space Category E	( )	( )	( )	( )
f) Restroom(s)	( )	( )	( )	( )
g) Storage	( )	( )	( )	( )
h) Elevator(s)	( )	( )	( )	( )
i) Stairs/Corridors	( )	( )	( )	( )
j) Parking	( )	( )	( )	( )
k) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

KEY FOR THE FOLLOWING QUALITY RATINGS:
EX = Excellent quality
G = Good quality
F = Fair quality
P = Poor quality

3. Please rate the overall quality of Space Category A in terms of the following:

	EX	G	F	P
a) Adequacy of Space	( )	( )	( )	( )
b) Lighting	( )	( )	( )	( )
c) Acoustics	( )	( )	( )	( )
d) Temperature	( )	( )	( )	( )
e) Odor	( )	( )	( )	( )
f) Esthetic Appeal	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Flexibility of Use	( )	( )	( )	( )
i) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

4. Please rate the overall quality of Space Category B in terms of the following:

	EX	G	F	P
a) Adequacy of Space	( )	( )	( )	( )
b) Lighting	( )	( )	( )	( )
c) Acoustics	( )	( )	( )	( )
d) Temperature	( )	( )	( )	( )
e) Odor	( )	( )	( )	( )
f) Esthetic Appeal	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Flexibility of Use	( )	( )	( )	( )
i) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

5. Please rate the overall quality of Space Category C in terms of the following:

	EX	G	F	P
a) Adequacy of Space	( )	( )	( )	( )
b) Lighting	( )	( )	( )	( )
c) Acoustics	( )	( )	( )	( )
d) Temperature	( )	( )	( )	( )
e) Odor	( )	( )	( )	( )
f) Esthetic Appeal	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Flexibility of Use	( )	( )	( )	( )
i) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

Figure 12. Questionnaire survey form for the POE (in English and Chinese)

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6. Please rate the overall quality of Space Category D in terms of the following:

	EX	G	F	P
a) Adequacy of Space	( )	( )	( )	( )
b) Lighting	( )	( )	( )	( )
c) Acoustics	( )	( )	( )	( )
d) Temperature	( )	( )	( )	( )
e) Odor	( )	( )	( )	( )
f) Esthetic Appeal	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Flexibility of Use	( )	( )	( )	( )
i) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

7. Please rate the overall quality of Space Category E in terms of the following:

	EX	G	F	P
a) Adequacy of Space	( )	( )	( )	( )
b) Lighting	( )	( )	( )	( )
c) Acoustics	( )	( )	( )	( )
d) Temperature	( )	( )	( )	( )
e) Odor	( )	( )	( )	( )
f) Esthetic Appeal	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Flexibility of Use	( )	( )	( )	( )
i) Other, specify_____	( )	( )	( )	( )
_____	( )	( )	( )	( )

8. Please rate the overall quality of design in this building:

	EX	G	F	P
a) Esthetic quality of exterior	( )	( )	( )	( )
b) Esthetic quality of interior	( )	( )	( )	( )
c) Amount of space	( )	( )	( )	( )
d) Environmental quality (lighting, acoustics, temperature, etc.)	( )	( )	( )	( )
e) Proximity to views	( )	( )	( )	( )
f) Adaptability to changing uses	( )	( )	( )	( )
g) Security	( )	( )	( )	( )
h) Maintenance	( )	( )	( )	( )
i) Relationship of spaces/layout	( )	( )	( )	( )
j) Quality of building materials				
(1) Floors	( )	( )	( )	( )
(2) Walls	( )	( )	( )	( )
(3) Ceilings	( )	( )	( )	( )
k) Other, specify..._____	( )	( )	( )	( )
_____	( )	( )	( )	( )

9. Please select and rank in order of importance facilities which are currently lacking in your building:

10. Please make any other suggestion you wish for physical or managerial improvements in your building:

11. Demographic Information:

Your Age: _____

Your Sex: _____

# of years with the present organization: _____

Figure 12. Continued

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■使用者調查■

我們希望對您們的建築做一個使用後的評價, 此評價的目的是評價建築在健康, 安全, 保安, 功能及精神對過方面給使用者提供怎樣的服務. 此評價的益處包括; 評價建築的表現以便更好的使用建築, 并且對將來类似建築的改退提供資料.

請您只回答以下與您有關的問題, 在適當的空格里打'X'作為您的回答.

1. 在平均一週里您有多少時在以下的空間里:

空間A:　主日崇拜大廳
空間B:　廚房
空間C:　主日學/資料室(二楝)
空間D:　會議/活動室(二楝)
空間E:　嬰兒室

小時	A	B	C	D	E
0-5	( )	( )	( )	( )	( )
6-10	( )	( )	( )	( )	( )
11-15	( )	( )	( )	( )	( )
16-20	( )	( )	( )	( )	( )
21-25	( )	( )	( )	( )	( )
26-30	( )	( )	( )	( )	( )
31-35	( )	( )	( )	( )	( )
36-40	( )	( )	( )	( )	( )
40+	( )	( )	( )	( )	( )

2. 請對下例建築區域的總體質量作一評價:

	很好	好	一般	差
a. 空間 A	( )	( )	( )	( )
b. 空間 B	( )	( )	( )	( )
c. 空間 C	( )	( )	( )	( )
d. 空間 D	( )	( )	( )	( )
e. 空間 E	( )	( )	( )	( )
f. 洗手間	( )	( )	( )	( )
g. 貯藏室	( )	( )	( )	( )
h. 樓場/走廊	( )	( )	( )	( )
i. 停車場	( )	( )	( )	( )
j. 其他(請說明)	( )	( )	( )	( )

3. 請對空間A作以下幾方面的總體評價:

	很好	好	一般	差
a. 充足的空間	( )	( )	( )	( )
b. 照明	( )	( )	( )	( )
c. 聽覺效果	( )	( )	( )	( )
d. 溫度	( )	( )	( )	( )
e. 氣味	( )	( )	( )	( )
f. 美感	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 靈活使用性	( )	( )	( )	( )
i. 其他(請說明)				

4. 請對空間B作以下幾方面的總體評價:

	很好	好	一般	差
a. 充足的空間	( )	( )	( )	( )
b. 照明	( )	( )	( )	( )
c. 聽覺效果	( )	( )	( )	( )
d. 溫度	( )	( )	( )	( )
e. 氣味	( )	( )	( )	( )
f. 美感	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 靈活使用性	( )	( )	( )	( )
i. 其他(請說明)	( )	( )	( )	( )

5. 請對空間C作以下幾方面的總體評價:

	很好	好	一般	差
a. 充足的空間	( )	( )	( )	( )
b. 照明	( )	( )	( )	( )
c. 聽覺效果	( )	( )	( )	( )
d. 溫度	( )	( )	( )	( )
e. 氣味	( )	( )	( )	( )
f. 美感	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 靈活使用性	( )	( )	( )	( )
i. 其他(請說明)	( )	( )	( )	( )

(反面)

Figure 12. Continued

6.請對空間D作以下幾方面的總體評價:

	很好	好	一般	差
a. 充足的空間	( )	( )	( )	( )
b. 照明	( )	( )	( )	( )
c. 聽覺效果	( )	( )	( )	( )
d. 溫度	( )	( )	( )	( )
e. 氣味	( )	( )	( )	( )
f. 美感	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 靈活使用性	( )	( )	( )	( )
i. 其他(請說明)	( )	( )	( )	( )

7.請對空間E作以下幾方面的總體評價:

	很好	好	一般	差
a. 充足的空間	( )	( )	( )	( )
b. 照明	( )	( )	( )	( )
c. 聽覺效果	( )	( )	( )	( )
d. 溫度	( )	( )	( )	( )
e. 氣味	( )	( )	( )	( )
f. 美感	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 靈活使用性	( )	( )	( )	( )
i. 其他(請說明)	( )	( )	( )	( )

8.請對此建築的設計作一總體評價:

	很好	好	一般	差
a. 外表的美觀	( )	( )	( )	( )
b. 室內的美觀	( )	( )	( )	( )
c. 足夠的空間	( )	( )	( )	( )
d. 環境的質量(照明,聽覺,溫度等)	( )	( )	( )	( )
e. 觀景效果	( )	( )	( )	( )
f. 改變使用的適應性	( )	( )	( )	( )
g. 安全性	( )	( )	( )	( )
h. 維修	( )	( )	( )	( )
i. 空間之間的關係	( )	( )	( )	( )
j. 建築材料的質量				
(1)地面	( )	( )	( )	( )
(2)牆面	( )	( )	( )	( )
(3)天花板	( )	( )	( )	( )
k. 其他(請說明)	( )	( )	( )	( )

9.請選擇并按其重要性的次序例出您認為目前建築所缺乏的設施

10.請您提出其他您希望對建築本身及建築管理上如何改進的建議

11.統計資料:

您的年齡:

您的性別:

在此教會的年數:

Figure 12. Continued

questionnaire survey, second, interviews after the survey, and the last, interviews after the POE. The purpose of the first interview was to provide data that can reinforce the information obtained from walk-through, observation and the survey. The purpose of second interview was to confirm the data gathered from the survey and to obtain opinions about the quality of the survey design. The purpose of last interview was to obtain information about the quality of the POE. Selected interviewees for each interview were identified in Step 3: Research Planning of Phase 1.

Walk-through evaluation with the manager of the church was conducted after the worship service on a Sunday. The interior and exterior areas of the building were inspected in order to locate the building problems that deserved particular attention and to obtain information about the technical performance of the building. Floor plans and a checklist of technical factors provided by Preiser, Rabinowitz and White (P.163) were used to record the results during the walkthrough evaluation.

Step 3: Analyzing Data

The data collected from occupant surveys, interviews, observations and the walkthrough evaluation were analyzed. Survey data were analyzed using frequencies and means (n=84 respondents). The results of the data analyses were presented and interpreted as bar graphs with simple captions so that it

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was easy for the client and users to understand (see Figure 13). Interview data were categorized and analyzed for frequency and content (see Figure 14). The results from these data were used to confirm the survey data. The data obtained from observations and the walkthrough were tabulated and categorized according to space type of the building, and annotated floor plans were used to summarized the data from observations and walkthrough evaluation (see Figure 17).

Phase 3: Applying The POE

Step 1: Reporting Findings

The findings of the POE were organized and reported according to the following categories: overall building performance, sanctuary, kitchen, conference/Sunday school, meeting/practice, nursery, restrooms, parking, landscaping, and security. Since the report was presented to both the client and the users, the formats of the report were designed to be easy to understand. After discussions with the client, it was decided that the format of the report should include verbal explanations, bar graphs, annotated plans and sketches. For example, when reporting the findings regarding the sanctuary, the problems were described both in writing and annotated floor plans (see Figure 17). The findings from the survey were presented in bar graphs. Some sketches were used to support the findings and to make the presentation more clear.

3. SANCTUARY:

	1	2	3	4	
a) Adequacy of Space					3.12
b) Lighting					3.18
c) Acoustics					3.00
d) Temperature					2.81
e) Odor					2.69
f) Esthetic Appeal					2.62
g) Security					2.92
h) Flexibility of Use					2.88
	Poor	**Fair**	**Good**	**Excellent**	

The overall quality of the Sanctuary was rated as "Good" With the exception of Adequacy of Space and Lighting which were rated as "Excellent". The Esthetic Appeal recleved the lowest rating.

Figure 13. Example of data summaries

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A. the survey results

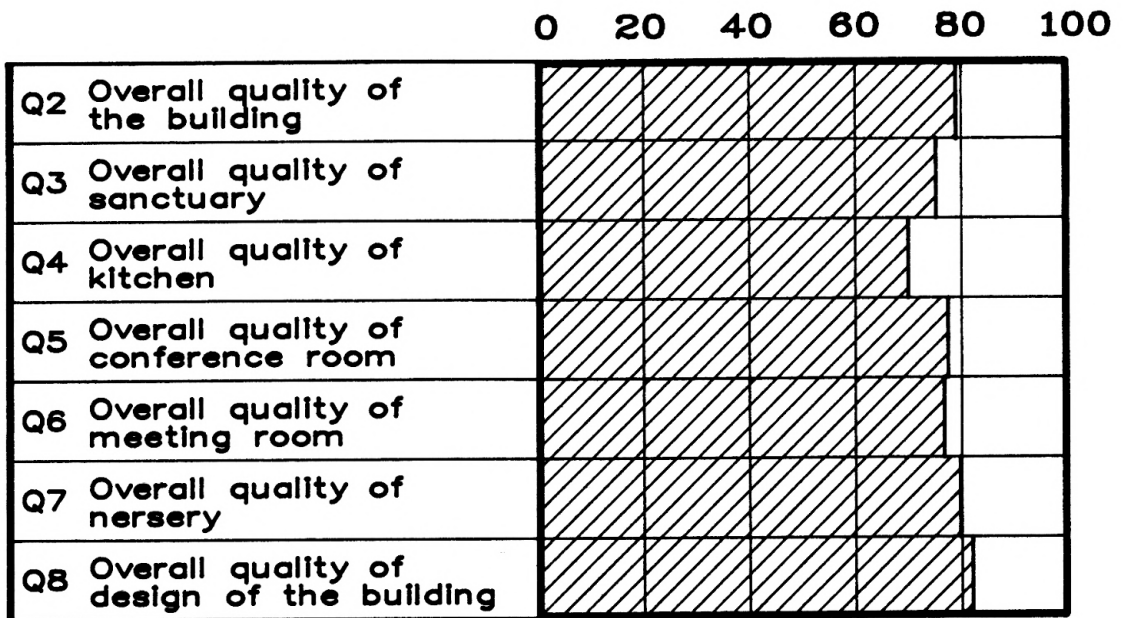|		0	20	40	60	80	100
Q2	Overall quality of the building						
Q3	Overall quality of sanctuary						
Q4	Overall quality of kitchen						
Q5	Overall quality of conference room						
Q6	Overall quality of meeting room						
Q7	Overall quality of nersery						
Q8	Overall quality of design of the building						

Figure 14. Example of interview results after the survey

Step 2: Recommending Actions

Recommendations developed in the POE included short-term and medium-term suggestions. Short-term recommendations were organized using the categories of the findings of the POE. Medium-term recommendations were reported according to the overall development plan of the church. Where appropriate, annotated floor plans (see Figure 19) and perspectives such as perspective of nursery (see Figure 27) were used to describe the details of the recommendations in order to make the recommendations more understandable. Since renovations and additions are funded from the donations of the users, a report was designed not only to help collect funds for the improvement of the building through short and medium term goals, but also to provide information for the client organization (see next chapter for the report).

The REPORT Of THE POST-OCCUPANCY EVALUATION OF CHINESE EVANGELICAL CHURCH

Findings, recommendations and shot-term plans
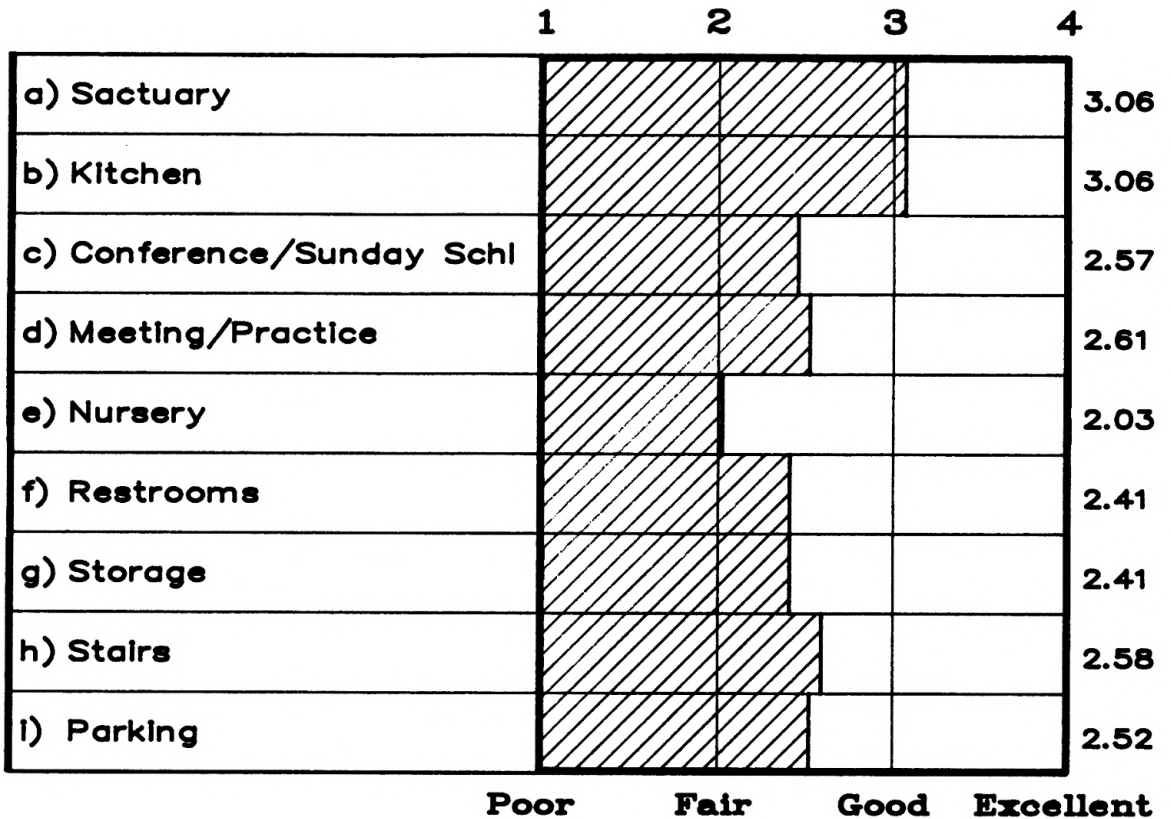
1. Overall building performance

Findings

After the evaluation, the overall building performance was considered as good. The results of the occupant survey showed that the overall quality of the sanctuary and the kitchen were better than "good", while the nursery performed the worst. The overall quality of other building areas was rated better than "fair" but worse than "good" (see Figure 15 and Figure 16). It was found that the major problem related to poor building performance was inadequate space. The detailed findings for every building area are discussed in the following items.

Recommendations

Since increasing spaces within the building is difficult, it is recommended that the methods for improving the building performance should be emphasized on aspects of management of the building, flexibility, aesthetic appeal. The priorities for improvement should be given to the (1) nursery, (2) restrooms, (3) storage, and (4) parking. The detailed recommendations for every area are discussed in the following items.

2. THE OVERALL QUALITY OF THE FOLLOWING AREAS IN BUILDING:

	1	2	3	4	
a) Sactuary					3.06
b) Kitchen					3.06
c) Conference/Sunday Schl					2.57
d) Meeting/Practice					2.61
e) Nursery					2.03
f) Restrooms					2.41
g) Storage					2.41
h) Stairs					2.58
i) Parking					2.52

Poor   Fair   Good   Excellent

Overall, the building areas were rated as "Good". The Sanctuary and kitchen were rated as "Excellent". The nursery was "Fair".

Figure 15. Results of questionnaire: the overall quality of the building areas

8. THE OVERALL QUALITY OF DESIGN IN THE BUILDING:

	1	2	3	4	
a) Esthetic quality of exterior					2.68
b) Esthetic quality of interior					2.74
c) Amount of space					2.72
d) Environmental quality (lighting, acoustics, temperature, etc.)					2.75
e) Proximity to views					2.82
f) Adaptability to changing uses					2.68
g) Security					2.83
h) Maintenance					2.63
i) Relationship of spaces/layout					2.65
j) Quality of building materials					
1) Floors					2.99
2) Walls					2.76
3) Ceilings					2.83
	Poor	Fair	Good	Excellent	

The overall quality of design in the building was rated as" Good".
The rates of Esthetic quality of exterior, Adaptability to Changing
uses, Maintenance and Relationship of space/layouts were
somewhat lower than the rates of others.

Figure 16. Results of questionnaire: the overall quality of

design of the building

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2. Sanctuary

Findings

The overall quality of the sanctuary was good, especially
when the number of people was under 150. Some existing
problems were identified through the evaluation. One of the
problems was the unsatisfactory sight lines and acoustic
quality for the people seating far away from the altar,
especially when the pastor moved away from the microphone.
Another problem was the lack of dinner tables for serving
lunch. It was also found that the area between the kitchen,
restrooms and little grocery was extremely crowded at the time
that the worship finished and the serving of lunch began. The
door at the entrance of the restrooms was improperly located,
potentially causing injury if suddenly pushed by the people
from inside or outside (see Figure 17). The occupant survey
showed that the quality of odor and aesthetic appeal received
lowest ratings (see Figure 21). The odors of the food from the
kitchen could be detected in the sanctuary during the worship,
which might affect people's concentration. The poor aesthetic
appeal of the sanctuary was attributed to the lack of
religious decoration in the room. A final problem noted was
the conversations among the people sometimes disturbed the
practice of the choir after lunch.

Recommendations
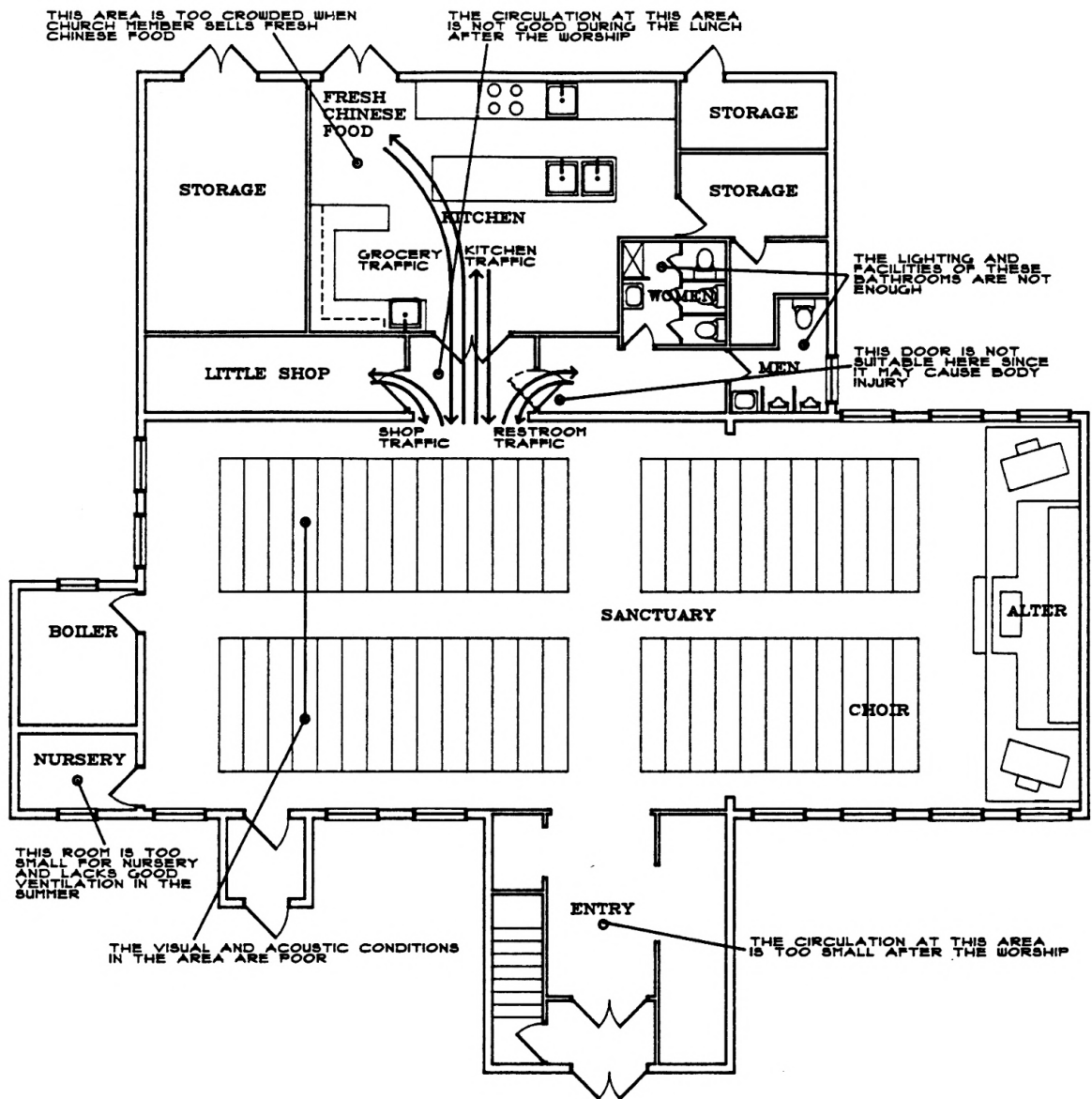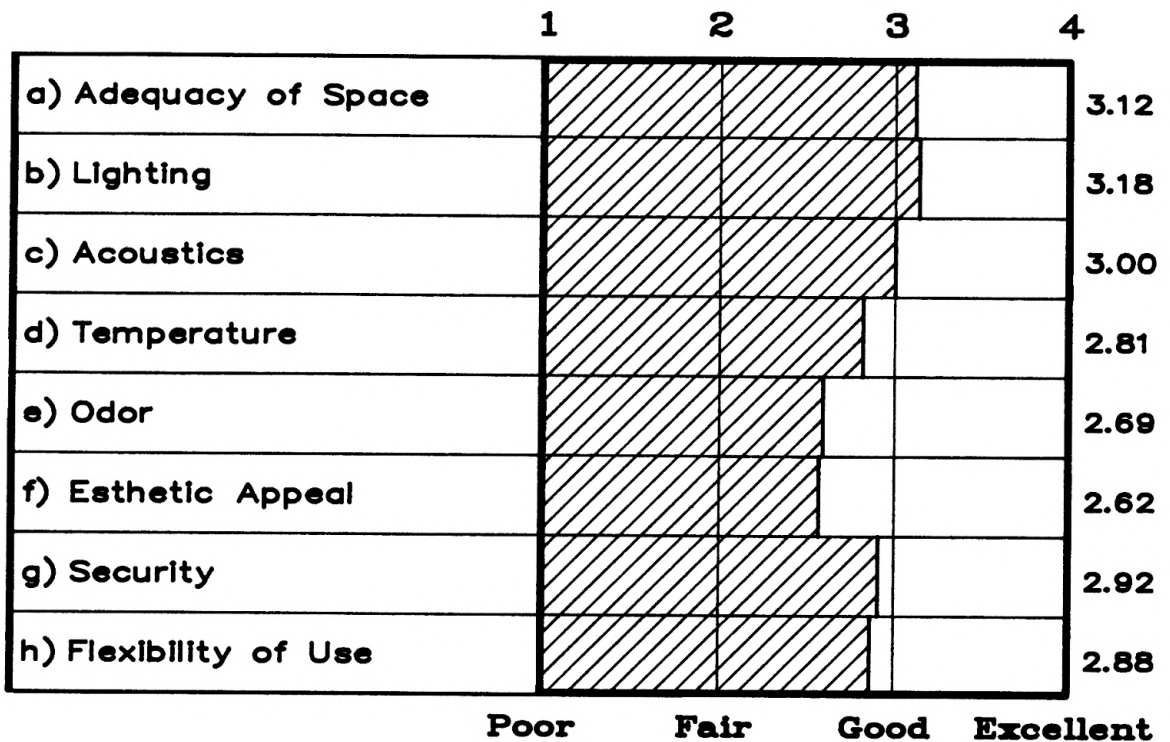
A acoustic control room (see Figure 19) should be installed

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THIS AREA IS TOO CROWDED WHEN
CHURCH MEMBER SELLS FRESH
CHINESE FOOD

THE CIRCULATION AT THIS AREA
IS NOT GOOD DURING THE LUNCH
AFTER THE WORSHIP

FRESH
CHINESE
FOOD

STORAGE

STORAGE

STORAGE

STORAGE

KITCHEN

GROCERY
TRAFFIC

KITCHEN
TRAFFIC

THE LIGHTING AND
FACILITIES OF THESE
BATHROOMS ARE NOT
ENOUGH

WOMEN

LITTLE SHOP

MEN

THIS DOOR IS NOT
SUITABLE HERE SINCE
IT MAY CAUSE BODY
INJURY

SHOP
TRAFFIC

RESTROOM
TRAFFIC

BOILER

SANCTUARY

ALTER

CHOIR

NURSERY

THIS ROOM IS TOO
SMALL FOR NURSERY
AND LACKS GOOD
VENTILATION IN THE
SUMMER

ENTRY

THE VISUAL AND ACOUSTIC CONDITIONS
IN THE AREA ARE POOR

THE CIRCULATION AT THIS AREA
IS TOO SMALL AFTER THE WORSHIP

Figure 17. Annotated floor plan of the sanctuary

3. SANCTUARY:

	1	2	3	4	
a) Adequacy of Space					3.12
b) Lighting					3.18
c) Acoustics					3.00
d) Temperature					2.81
e) Odor					2.69
f) Esthetic Appeal					2.62
g) Security					2.92
h) Flexibility of Use					2.88

Poor   Fair   Good   Excellent

The overall quality of the Sanctuary was rated as "Good" With the exception of Adequacy of Space and Lighting which were rated as "Excellent". The Esthetic Appeal recieved the lowest rating.

Figure 18. Results of the questionnaire: sanctuary

for improving the acoustic quality. A moveable microphone may be used in order to retain acoustic quality while the pastor is moving around the altar. Two doors should be installed at the entryway to the kitchen, restrooms and little grocery to avoid the odor. It is suggested that these two doors should be kept opened while serving the lunch. The door at the restroom entrance should be removed to improve the circulation. A folding partition may be used to separate the front area of the Sanctuary for the choir's practice (see Figure 19). More folding tables should be added for serving lunch. To improve the quality of the interior space, lighting should be re-designed to enhance the atmosphere of worship, emphasizing the altar area (see Figure 20) and also be flexible for other use with lighting control.

3. Kitchen

Findings

Overall, the kitchen functioned well. It was found that the ventilation of the kitchen was the main problem which needed improvement. The occupant survey indicated that the quality of the temperature and odor yielded the poorest rating except for the aesthetic appeal of the kitchen (see Figure 21). The limited storage space and poor design were the reasons for the low aesthetic appeal of the kitchen. Inadequate ventilation system caused the poor rating for temperature and odor. Although adequacy of space was rated as good in the survey,
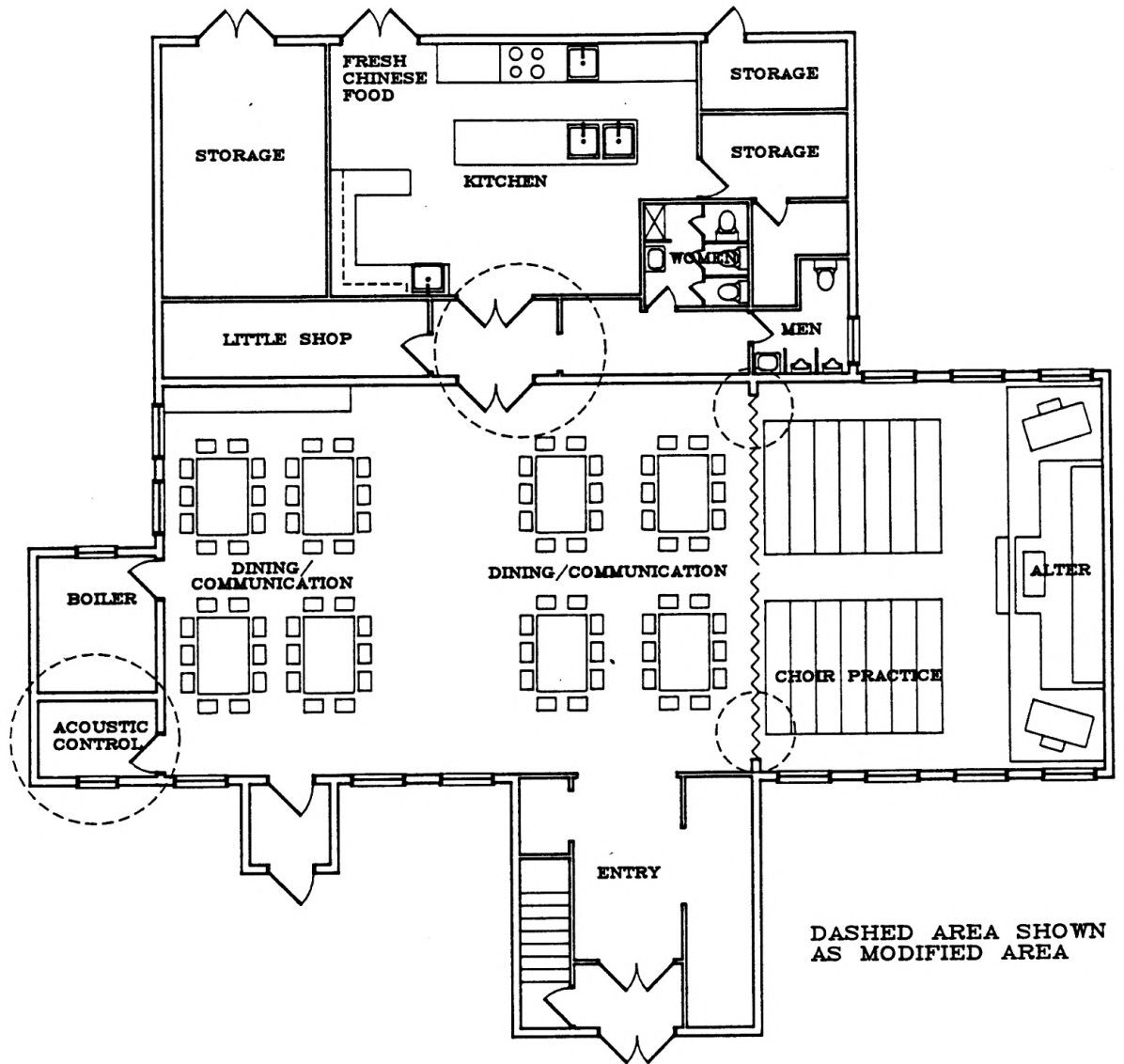
Figure 19. Recommended floor modification for the sanctuary
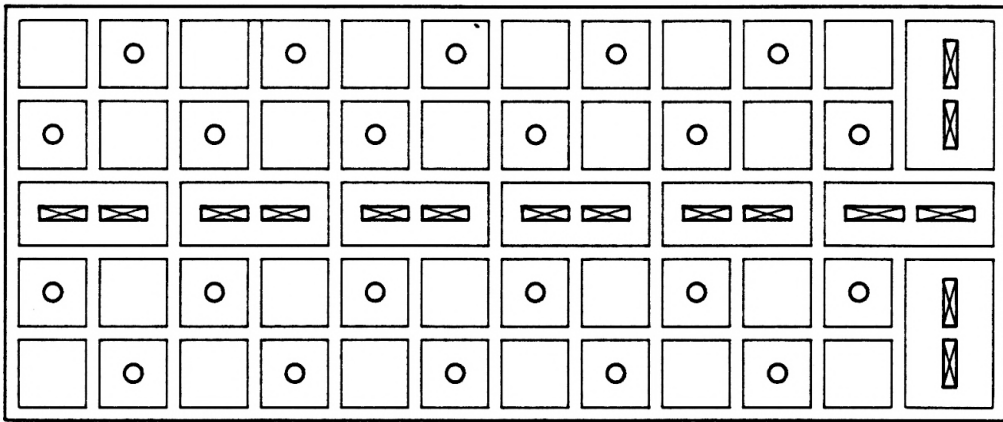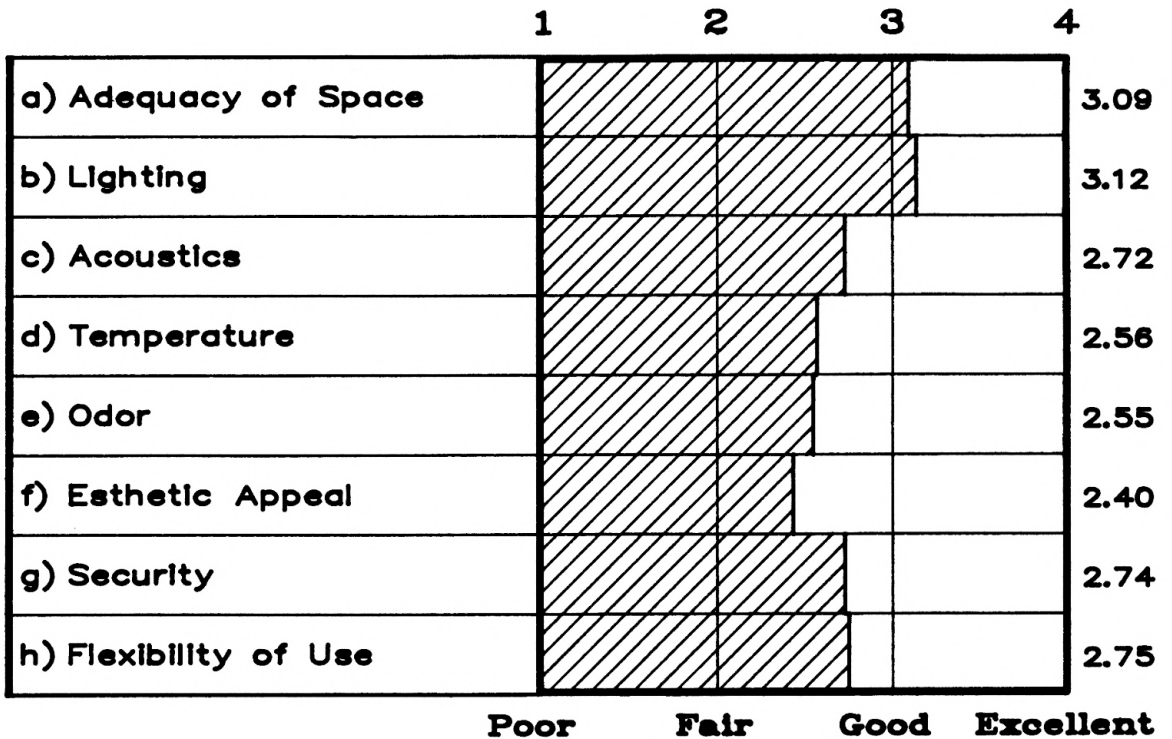(see Figure 4 for existing plan)

Figure 20. Recommended lighting layout of the sanctuary

4. KITCHEN

	1	2	3	4	
a) Adequacy of Space					3.09
b) Lighting					3.12
c) Acoustics					2.72
d) Temperature					2.56
e) Odor					2.55
f) Esthetic Appeal					2.40
g) Security					2.74
h) Flexibility of Use					2.75
	Poor	Fair	Good	Excellent	

On the average, the quality of the Kitchen was rated as "Good", while the Adequacy of Space and Lighting of the Kitchen were rated as "Excellent". The Esthetic Appeal received the lowest rating.

Figure 21. Results of the questionnaire: kitchen

it was found that at the beginning of the lunch, the kitchen was extremely crowded. The problem was created by selling fresh chinese food and serving lunch at the same time, leading to multiple paths and crowding.

Recommendations

As a part of midterm development plan for the church, the kitchen will no longer be used as a lunch facility on Sunday, so no major changes are recommended. The following are some suggestions that may provide temporary solutions for the existing problems. In order to improve the quality of ventilation of the kitchen, two more ventilation fans should be installed on the windows. More counters with storage cabinets may be added at locations shown Figure 22. The wall in the kitchen should be repainted to unify the aesthetic style as well as the furniture. The area for selling fresh chinese food should have a counter and the time schedule for selling should be change to fifteen minutes after the beginning of lunch.

4. Conference/ Sunday school room

Findings

The major problem in this room was inadequate space. Especially on Sunday, the children don't have enough space for various activities, and it is impossible to arrange more classes for the different age groups of the children. These
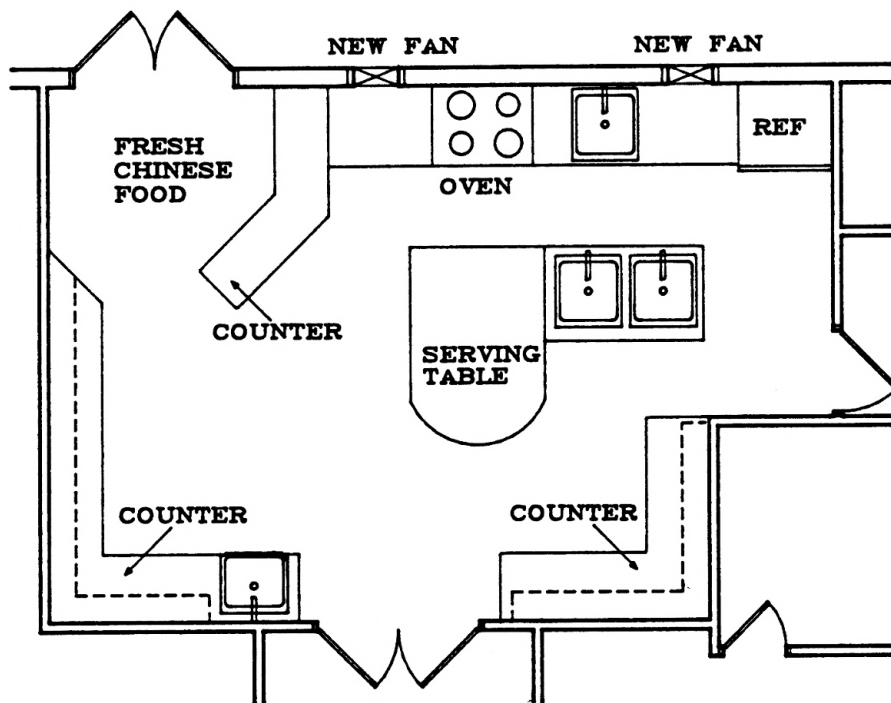
Figure 22. Recommended kitchen cabinet design and layout

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findings were supported by the occupant survey, which indicated that the adequacy of space and flexibility of use of this room had the lowest rating except for aesthetic appeal (see Figure 23).
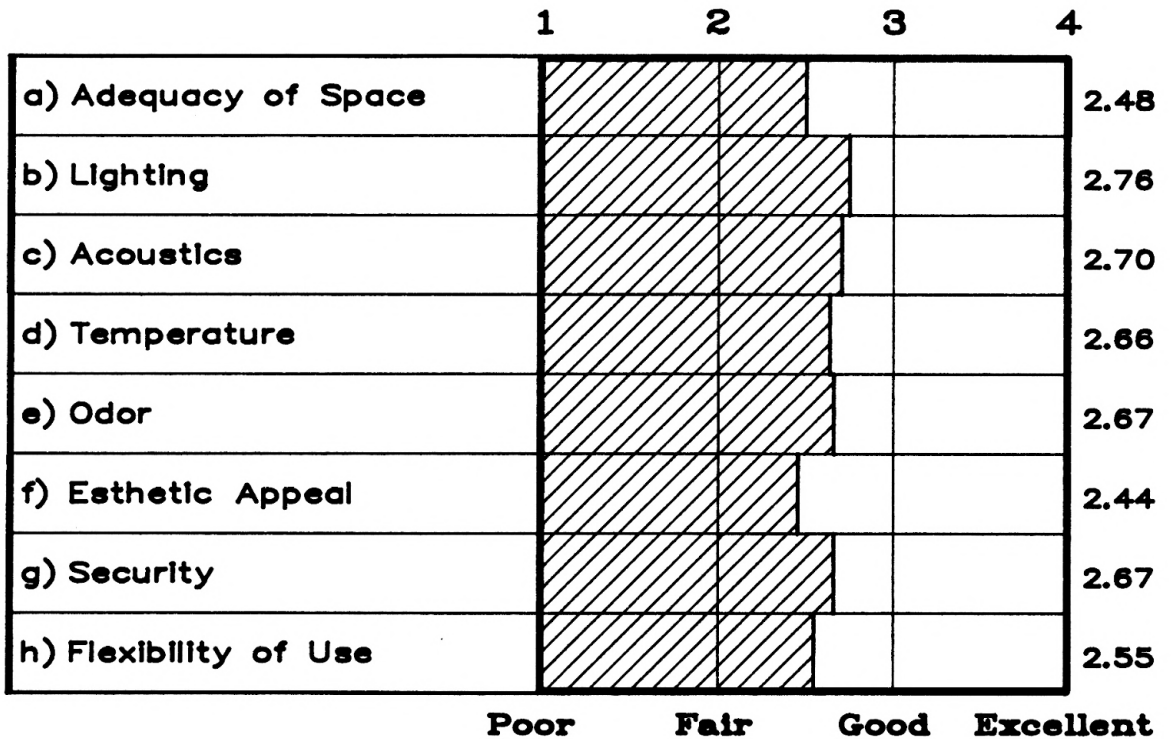
Recommendations

It is recommended that the conference/Sunday school room should be used as the meeting/practice room and the meeting/practice room should become the conference/Sunday school room. The furniture of the conference room should be re-arranged and removable folding tables and chairs should be used. On weekdays, the room can serve as a conference room. On weekends, the table and chairs may be removed so that the children can play on the carpet. This flexible space also allows the small children's furniture such as chairs to be arranged in various patterns (see Figure 24). A hanging fan should be installed on the ceiling of the room to improve the ventilation. More art could be added on the walls to improve the aesthetic appeal.

5. Meeting/practice room

Findings

The evaluation results of this space is similar to the findings for the conference room survey. The major problems of the meeting room were inadequate space and poor aesthetic appeal. The survey also showed that the room temperature was

5. CONFERENCE/SUNDAY SCHOOL

	1	2	3	4	
a) Adequacy of Space					2.48
b) Lighting					2.76
c) Acoustics					2.70
d) Temperature					2.66
e) Odor					2.67
f) Esthetic Appeal					2.44
g) Security					2.67
h) Flexibility of Use					2.55
	Poor	Fair	Good	Excellent	

Overall, the quality of the Conference Room was rated as "Good". The Esthetic Appeal and Adequacy of Space had the lowest rate.

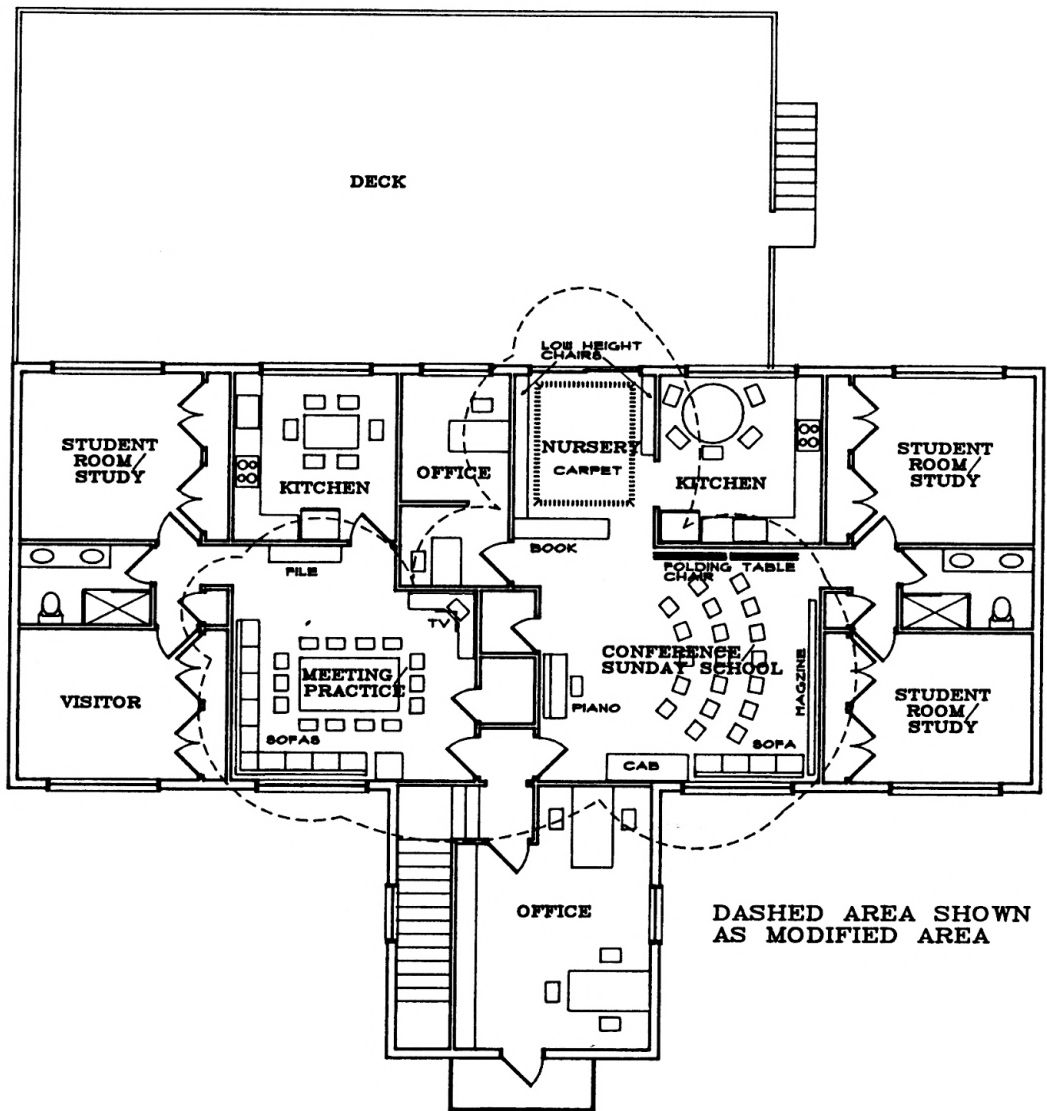Figure 23. Results of the questionnaire: conference/Sunday school

Figure 24. Recommended floor modification for the conference/Sunday school, meeting/practice, and nursery (see Figure 5. for existing plan)

unsatisfactory (see Figure 25). It was found that these problems were not as serious as those in the conference room. Although the space was not large enough, this room was not frequently used for different activities, and the most frequent activities such as meetings did not require much flexibility.
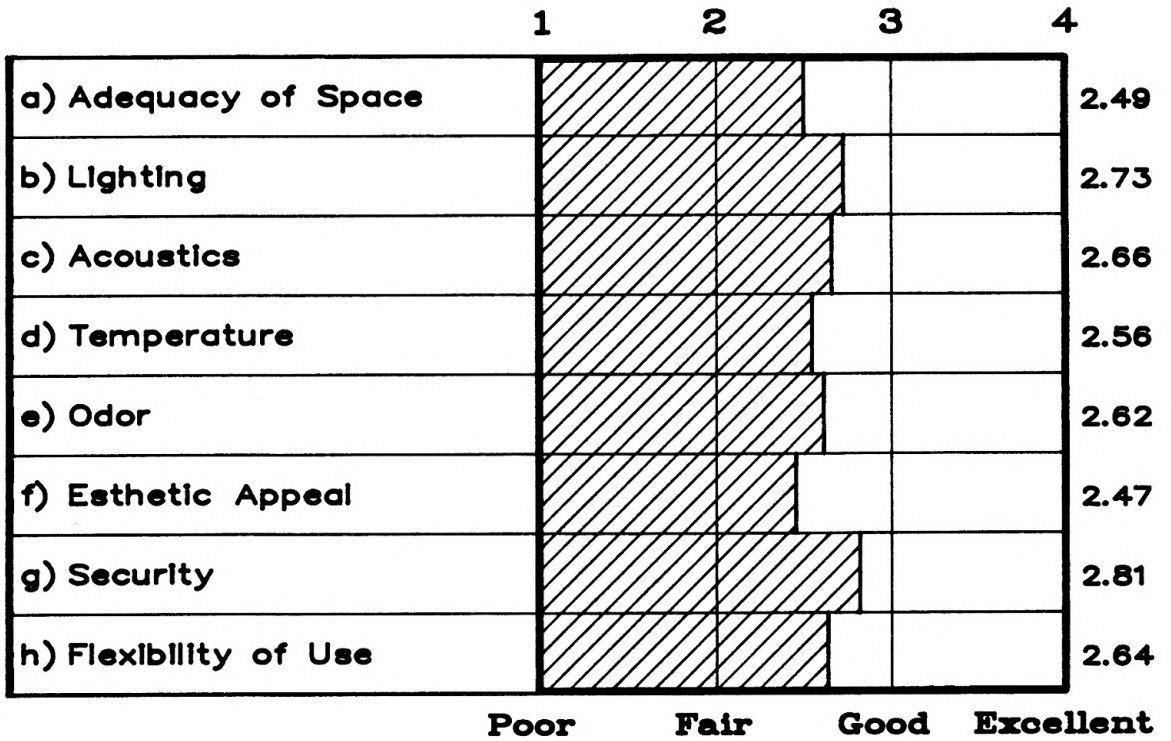
Recommendations

As suggested earlier, the conference room and the meeting room should be exchanged. Although the size of the meeting room will not be increased after the exchange, the space utilization could be increased by re-arranging the furniture. Arrangement of the furniture could also improve the aesthetic quality of the room (see Figure 24). Several religious paintings or art works could be added to improve the aesthetic appeal of the room. A ceiling fan could be installed to improve the room ventilation.

6. Nursery

Findings

It was found that the quality of the nursery room was poor in every aspect. The survey results supporting the finding are presented in Figure 26. Since the space was too small and the window was too high and too small, the quality of natural lighting, temperature and ventilation were not good. The artificial lighting was not sufficient, and the dark-colored
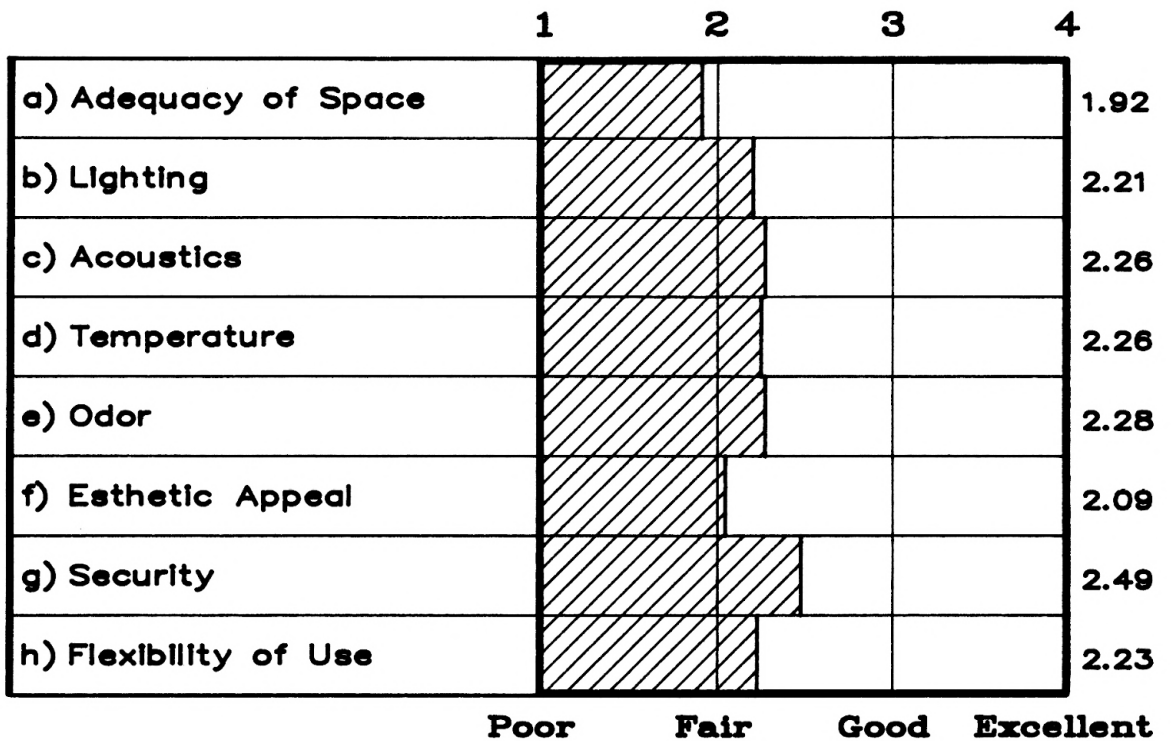
6. MEETING/PRACTICE

	1	2	3	4	
a) Adequacy of Space					2.49
b) Lighting					2.73
c) Acoustics					2.66
d) Temperature					2.56
e) Odor					2.62
f) Esthetic Appeal					2.47
g) Security					2.81
h) Flexibility of Use					2.64

Poor   Fair   Good   Excellent

The overall quality of Meeting/Practice Room was rated as "Good",
The Adequacy of Space and Esthetic Appeal had the lowest rate.

Figure 25. Results of questionnaire: meeting/practice

7. NURSERY

	1	2	3	4	
a) Adequacy of Space					1.92
b) Lighting					2.21
c) Acoustics					2.26
d) Temperature					2.26
e) Odor					2.28
f) Esthetic Appeal					2.09
g) Security					2.49
h) Flexibility of Use					2.23

Poor   Fair   Good   Excellent

On the average, the quality of the Nursery was rated as a little better than "Fair". The Adequacy of Space was rated as "Fair". The Esthetic Appeal was rated neer "Fair".

Figure 26. Results of questionnaire: nursery

wall and floor made the room appear even darker. The room was not decorated at all, and the storage space was insufficient. Instead of an open play area, furniture occupied too much space. All these problems contributed to the poor rating of the room.

Recommendations

It is recommended that the nursery should be moved to the second floor (see Figure 24). The following suggestions should be considered to improve the quality of the nursery room: carpet should be installed to improve the quality of the play space and children's height benches and storage capacity should be added to the space (see Figure 27). More lighting fixtures should be installed. The walls should be decorated with child-appropriate art to improve the aesthetic quality.

7. Other findings and recommendations

Restrooms

It was found that the restrooms were too small and the lighting was not sufficient. The toilets and lavatories were old. Since the space of the restrooms couldn't be enlarged, it was suggested that the quality of the equipment should be improved to increase the efficiency of the use. More lighting fixtures should be installed to make the rooms brighter.
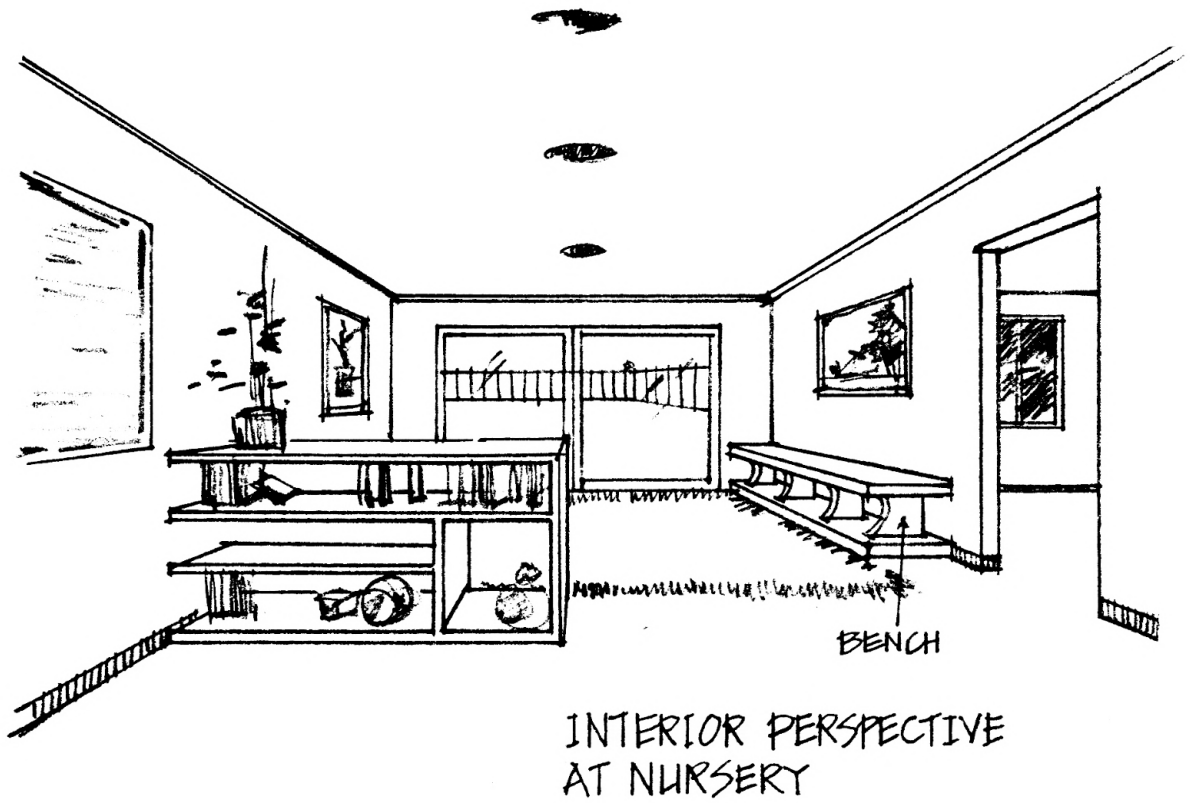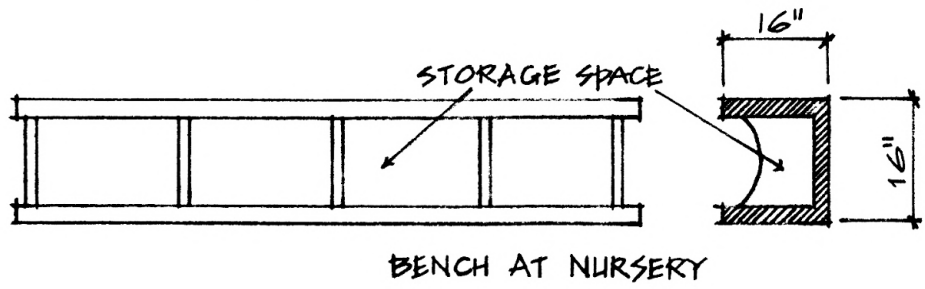
16"

STORAGE SPACE

16"

BENCH AT NURSERY

BENCH

INTERIOR PERSPECTIVE
AT NURSERY

Figure 27. Recommended bench and storage design for the nursery

Parking

Three problems were found in the parking lot. First, the inadequate parking caused some people to park their cars at the places which were not suitable. For example, some people, who can not find parking space, park their cars along the narrow road, and others park their cars on the lawn. Second, the signs indicating parking areas were not very clear. Third, the parking lot was not smooth. It was recommended that the parking lot should be leveled, the parking signs should be repainted, and clear signs should be added in the short term. In the longer term, a new parking lot could be constructed near the church building (see Figure 28).

Landscaping

Landscaping enhances the impression of the church in the community. Many people, ranging from children to adults, enjoy staying outside the building for various activities after worship service. Although some site work was done by the church, the quality of the landscaping was not satisfactory to users. Only part of the area near the church building was landscaped, while the other areas around the building had almost no landscaping at all. Many people suggested that more work should be done on the landscaping. A possible landscape design is provided here as a reference(see Figure 29). Another problem was sign: both signs for the organization at the entrance area and at the church building were not clear.
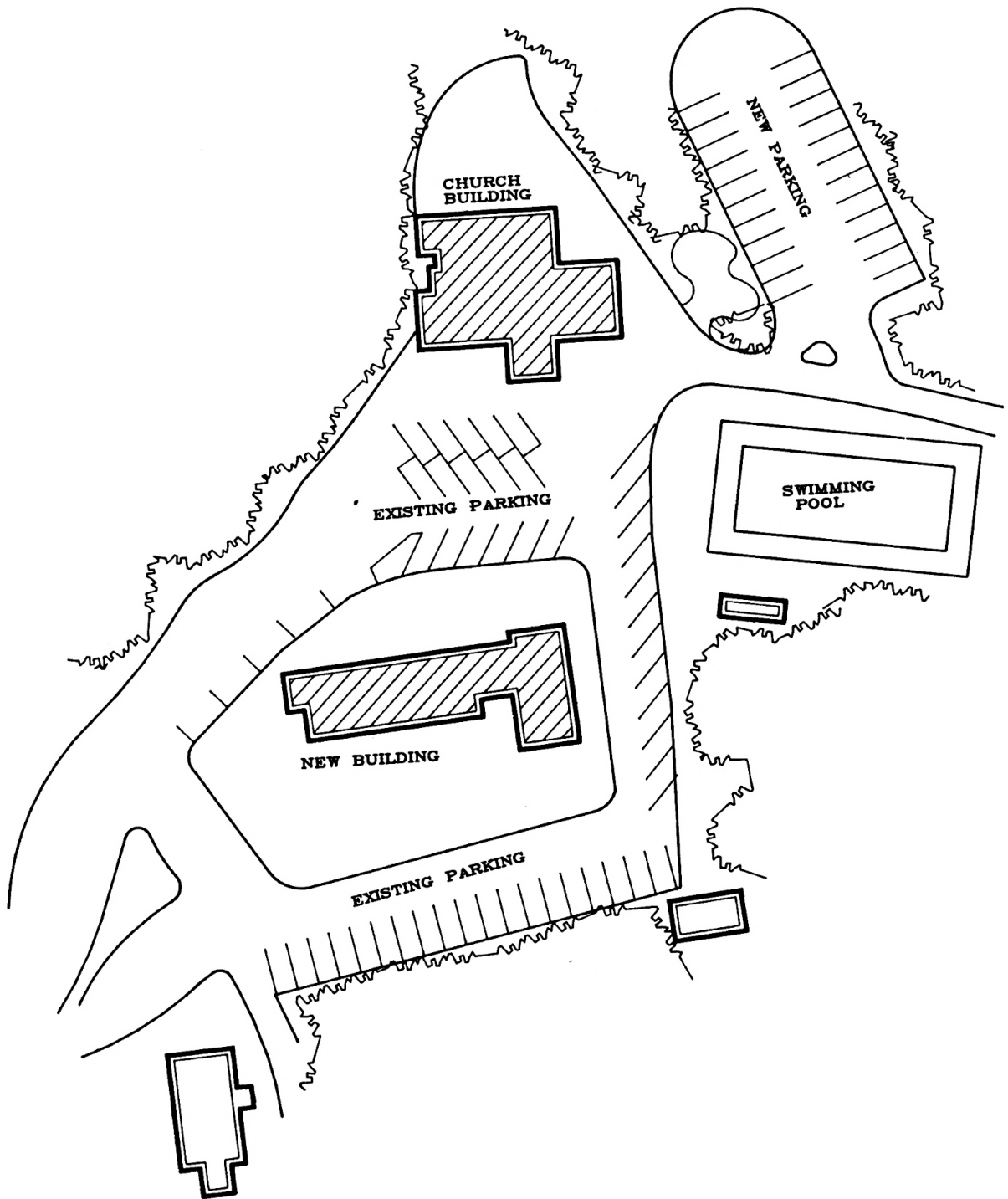
Figure 28. Recommended site plan of the new parking lot

Since it is difficult for newcomers to find their way, clear signs should be installed at both places.

Security

It was found that the major concern about security was fire safety. Although there have been no incidents of fire in the past and the building meets the fire safety requirements, many people were concerned about the fire safety of the church building. Because so many people are in the building on Sunday, it was suggested that the fire safety equipment should be checked regularly. More fire safety equipment such as fire extinguisher could be installed in the kitchen. The other security problem was insufficient outdoor lighting. People couldn't see the exterior area and parking lots clearly when they drove to the church area at night. It was recommended that more outdoor lighting should be installed along the road from the entrance of the church area to the parking lots and the church building (see Figure 30).

Medium-term Plan

Within two years, a new multi-purpose building will be completed on the church property. The new building will include following spaces: a dining/fellowship hall, a kitchen, classrooms for the Sunday school and the Bible Institute, and a dormitory for the students. Since the kitchen, bedrooms for the students, and Sunday school will be moved to the new
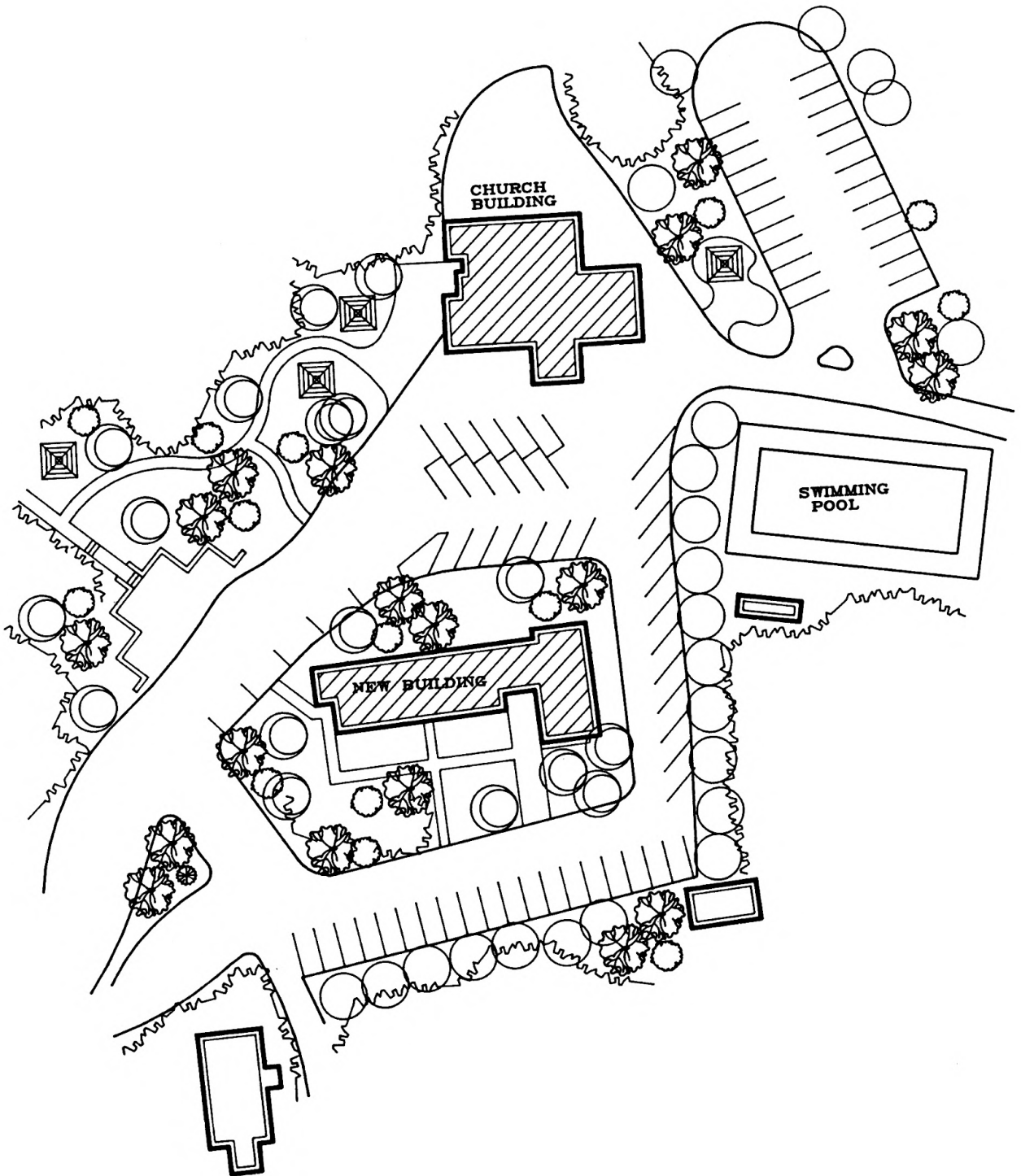
CHURCH
BUILDING

SWIMMING
POOL

NEW BUILDING

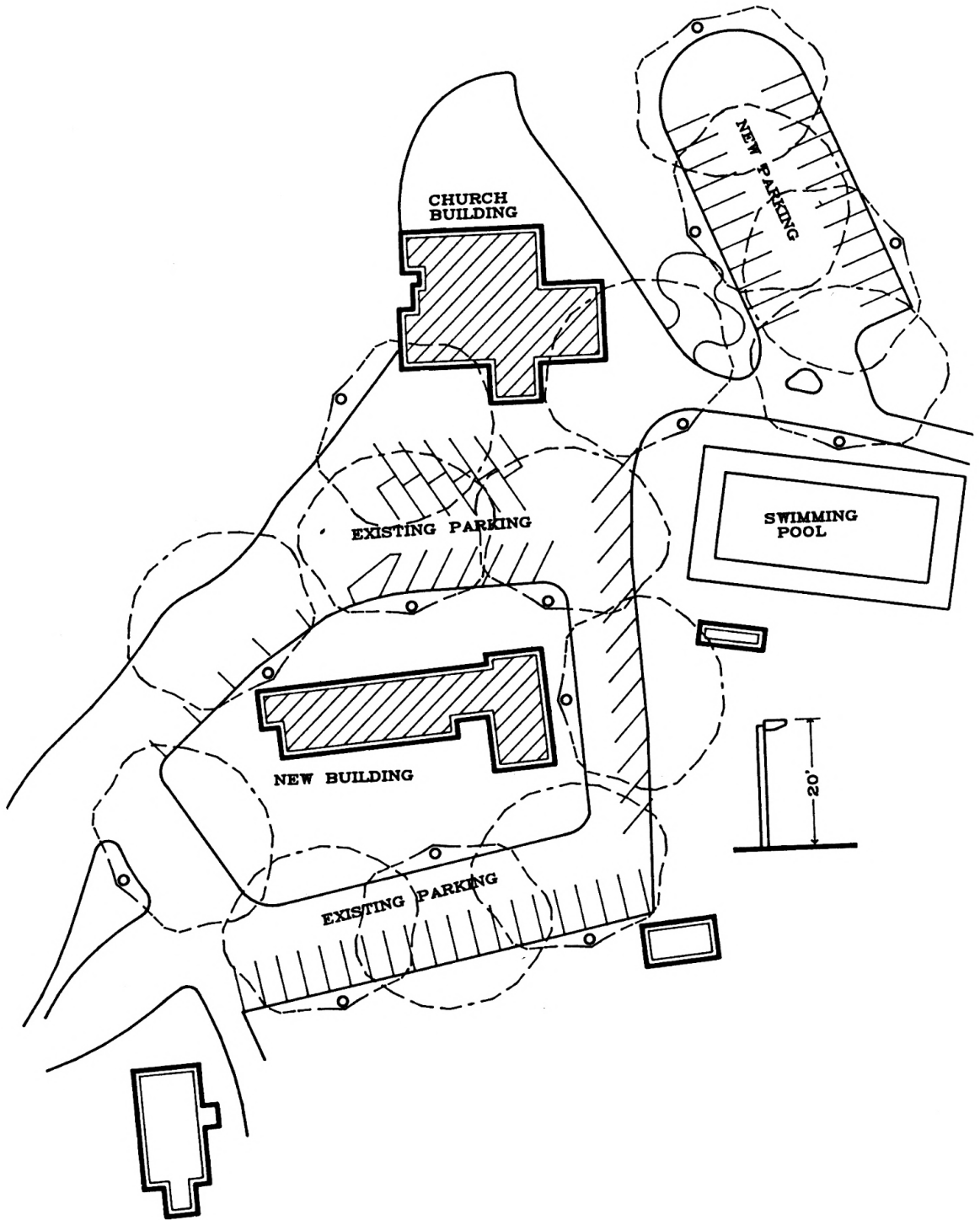Figure 29. Recommended landscape plan of the church building

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Figure 30. Recommended design of outdoor lighting layout

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building, some spaces of the church building will be available for new uses after the new multi-purpose building is constructed. Thus the medium-term plan is to modify the existing church building and further improve the quality of the building performance. The medium-term plan may start after funds are available.

Recommendations

It was recommended that the two floor plans of the church building should be modified. The suggested layouts for these two floors are shown in Figure 31 and Figure 32. On the first floor, existing restrooms as well as two storage rooms behind should be removed and new restrooms should be designed for greater capacity and handicapped access as the building code required. The existing kitchen should be remodeled to be a cafeteria serving coffee, tea and snacks in the later afternoon and evening. The area of the little shop could be enlarged, with direct linkage to storage room. On the second floor, existing kitchens and some office rooms could be removed. The plan layout was simplified in order to achieve more spaces for the conference, meeting and nursery area. The meeting room will also serve as an extension of the nursery when it is not used. The existing student room and visitor room could be converted to office spaces after minor renovation.
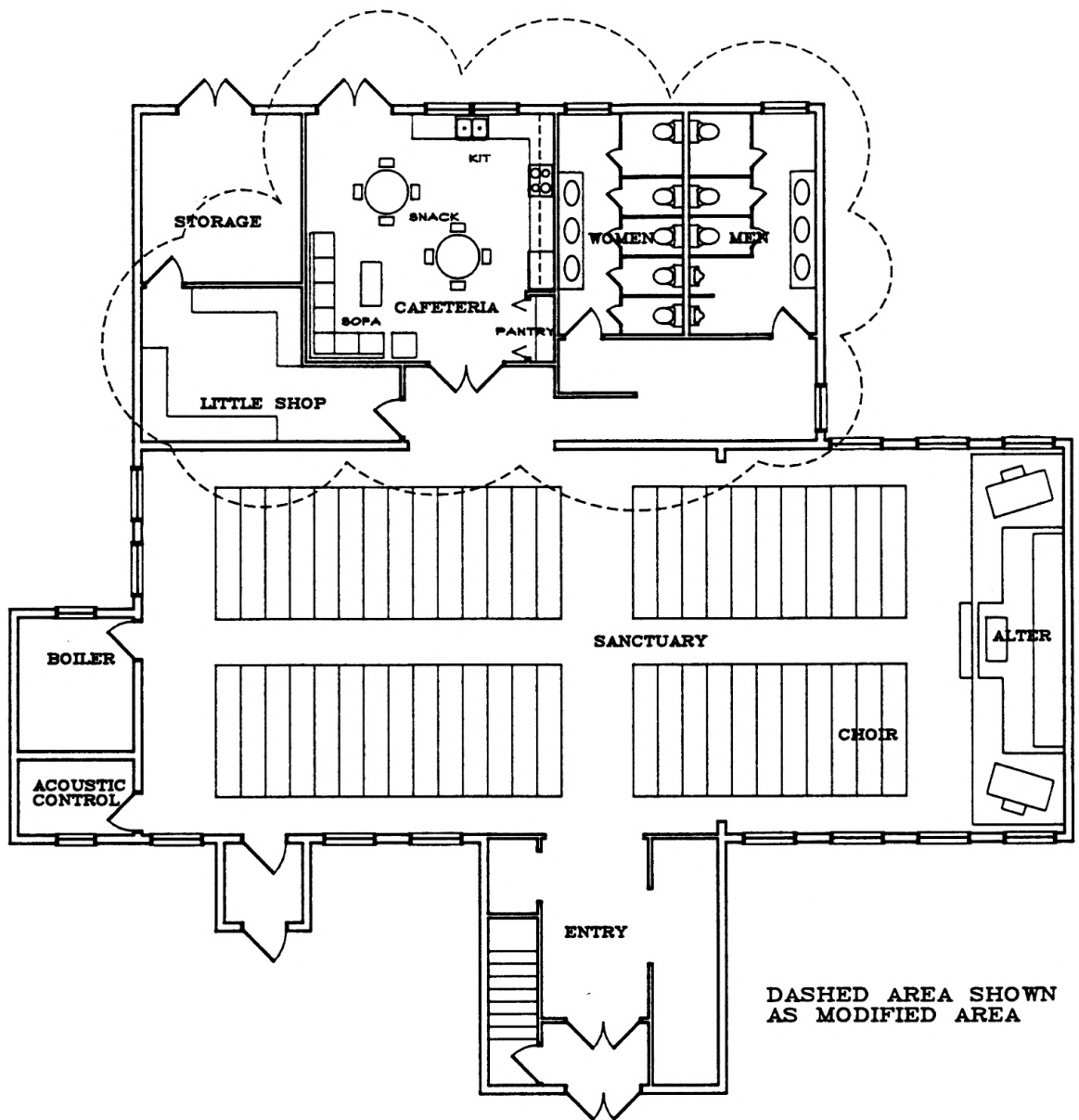
Figure 31. Recommended floor modification of the first floor
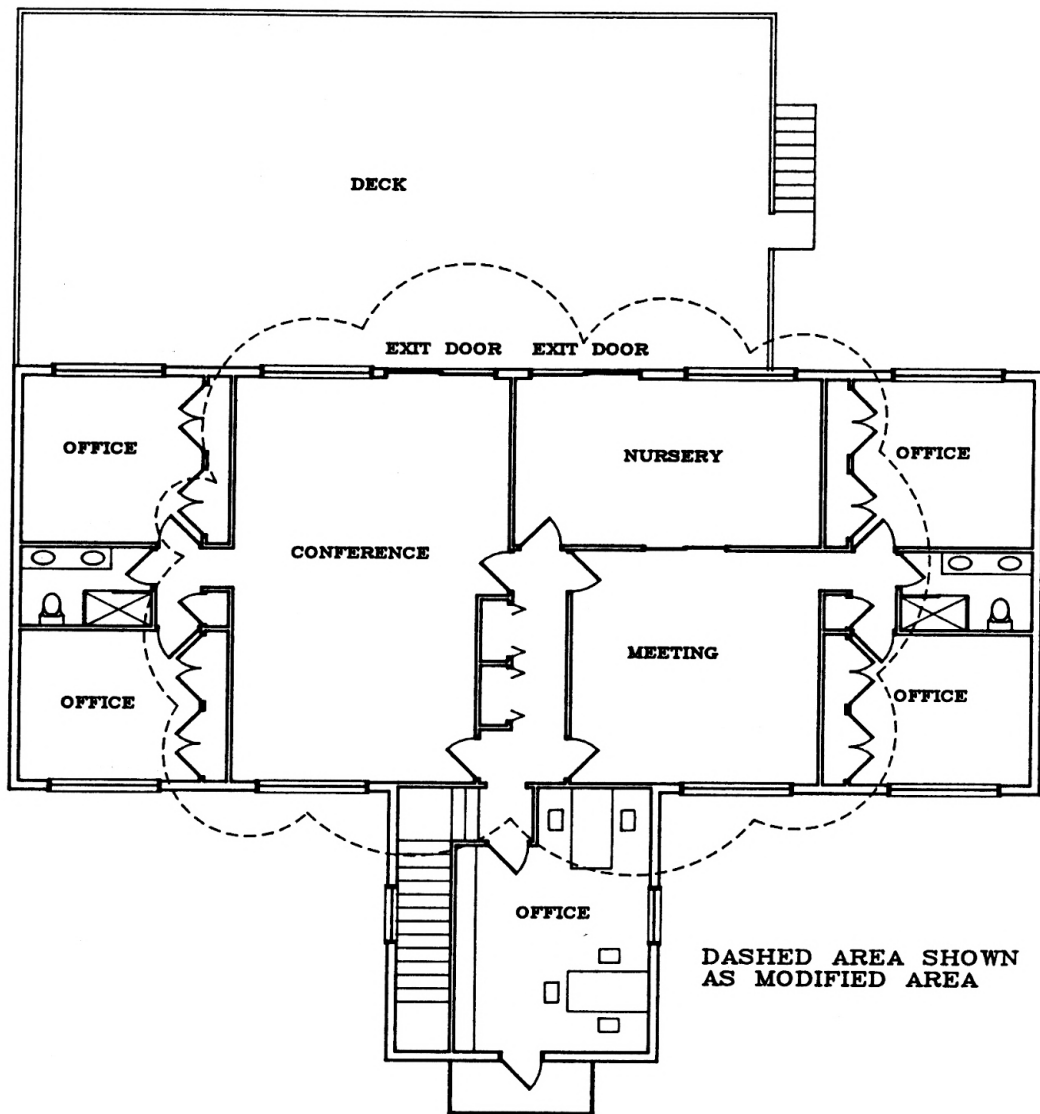plan for medium-term

DECK

OFFICE

EXIT DOOR   EXIT DOOR

NURSERY   OFFICE

CONFERENCE

OFFICE

MEETING   OFFICE

OFFICE

DASHED AREA SHOWN
AS MODIFIED AREA

Figure 32. Recommended floor modification of the second floor
plan for medium-term

REVIEWING OUTCOMES

Quality Issues in Phase 1

The client could affect the quality of the POE in almost every aspect in Phase 1. As Zimring (1987) said, initial contacts with the client could dramatically affect the subsequent ease of doing the evaluation, the validity of results, and the likelihood of recommendations being implemented. In this POE, the initial contacts with the client had an important impact on the following-up activities. After the client was briefed on the nature of POEs, the type of activities involved and the resources needed, the client had a positive attitude towards the POE. He stated that he would support the POE and help the evaluator whenever needed. With the support from the client, the evaluator could easily get useful information from key personnel and the users, and observe the building in use without any interruption. Obtaining this information helped to determine the critical space, items and building factors to be evaluated, and to determine POE priorities, methods and instruments to be used in the POE. Thus the quality of the POE was improved.

In this phase, the client's role was not only that of a decision-maker, but also that of a supporter of the POE. As a decision-maker, he made decisions with the evaluator on which space to be evaluated, which building factors and critical items to be evaluated, which criteria to be used, and what

level and scope to be used in the POE. As a supporter, he facilitated the relationship between the evaluator, key personnel and the building users to help the evaluator successfully conduct the POE activities in Phase 1.

The relationship between the client and the evaluator was one in which the evaluator respected the client and tried to meet his needs as much as possible. At the same time, the client respected the ideas and opinions that the evaluator suggested in the POE.

For choosing appropriate data-collection methods, the following aspects were considered in the POE: the incorporation of the evaluation criteria, the goals for use of the information, and the requirement for complete and reliable data in the POE. In this POE, the evaluation criteria underlie the data-collection methods. These criteria determined the information needed and the most appropriate methods for collecting the information. The goals for use of the information also affected choosing the data-collection methods. Since users have the major responsibilities for fund-raising and development for the church, they should be involved in decision-making. The chosen methods allowed the gathering of large amounts of information and involved the users in the POE activities. Multi-methods data-collection enabled the strength of one type to compensate for weaknesses in another. Thus, the following data-collection methods were chosen in this POE: a questionnaire survey, interviews of a

small group before and after administering the questionnaire, document and archival research, walk-through evaluation, and direct observations.

The data gathered through document and archival research included floor plans, space assignments, a client organization chart, building evaluation and design guidelines of typical church buildings. Walk-through evaluation, observations, and interviews before the survey helped to identify information about building-use and user's behaviors and to determine the critical items to be evaluated. The questionnaire survey was used to collect precise information about the building use from the variety of users. Interviews and observation after the survey helped to identify additional problems that were not obvious from the survey and confirm the problems found in the survey. These methods complemented each other in order to achieve a more complete evaluation of the facility. In this phase, it was found that using floor plans significantly improved the communication between the interviewers and the interviewees on building issues. By showing the floor plans during interviews, the interviewers could locate the problems identified by interviewees quickly and precisely. The interviewees could easily understand the questions asked by the interviewers when they looked the floor plans at the same time. The floor plans could also prompt the interviewees some ideas that were neither mentioned by the interviewers, and might not have come to mind without seeing the floor plans.

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The participant observation employed in the POE was effective. Because the observers were users of the church, people didn't know that they were observed, and typical behaviors and activity patterns could be observed. By using floor plan to document observations, the observers could record quickly and precisely some of the results of the observation which were difficult to describe in words. According to the POE objectives, the spaces selected for the POE were those most used in order to provide information for better utilization of the existing building and possible future building design.

Quality Issues in Phase 2

Conducting the POE included three steps: initiating the on-site data-collection process, monitoring and managing data collection procedures and analyzing data. In this POE, since the way that the client was involved in each step was different, the possibility of affecting the quality of the POE was different in each step as well.

In the step of initiating on-site data-collection process, the client's role was as a supporter. He assisted the evaluator in arranging the time schedule for the walk-through evaluation, observations and interviews so that the evaluators could collect data without interrupting the users' routine activities. The client also helped the evaluator to identify the ways to distribute and collect the questionnaire survey form to and from the users. Upon observing the use of the

church building, the evaluator initially suggested a way to manage the questionnaire survey process. The POE team distributed the survey forms at the entrance of the church building when the users came into the building for Sunday worship. Then an aldermen explained to the users about the survey and where and when they will return the survey forms at the end of the worship. But the client disagreed with this proposal. Based on the client's experience with the users, he believed that most of the users would ignore or even throw away the survey forms if they were distributed in the way that the evaluator had suggested. The client suggested that he was willing to personally distribute and collect the survey forms. In order to prevent the client from distributing the forms only to selected people, the evaluator emphasized that the forms must be distributed to all user groups including those of different ages and sexes. The client accepted the evaluator's opinion. This example indicates that it is important to seek the client's opinion during the data collection process. Because the client generally knows much more about the users than the evaluator, the client can provide useful information for the evaluator to plan successful data collection procedures.

The client distributed and collected all the survey forms for the evaluator, while the evaluator monitored the questionnaire survey process. The evaluator and the client tried two ways to administer the survey. First, the client

distributed part of the survey forms to the leaders of different activity groups such as youth fellowship and women's fellowship. The leaders of these groups were asked to distribute the survey forms to every member of their groups and to collect and return these forms to the client. The client also gave part of the survey forms to the chief alderman. The latter introduced the POE and asked the users to finish the survey by the end of the service. But the result of the first way was not satisfactory. Only a small number of the users returned the forms (37% of the total). Then the client tried another strategy, in which he introduced the POE himself at a worship service, emphasized its importance, had the survey forms distributed, and asked the users to finish the survey forms by the end of the service. This time, except for those who had responded before, most people returned the survey forms (63% of the total). Because the questionnaire survey process was more complicated than expected, the time spent on the survey was much longer. Since the client was involved in the questionnaire survey process and some users couldn't return the survey forms on time, it was difficult for the evaluator to control the length of time spent on the survey process.

The difficulties associated with the survey process indicate that the client can play an important role in the POE process. With his reputation and role as an authority, the client could easily organize the actions which the evaluator

required. This example also indicates that unexpected problems may happened during the data collection process. The evaluator should be aware and prepare for such situations and solve any problems efficiently if possible.

Though the client's involvement in the POE process can benefit the POE, the client may also introduce bias into the results of the study. In the data collection process of this POE, the evaluator involved the client only in the activities in which the client's bias would not influence results. For example, the evaluator found that the interviewees were always careful about what they said during interviews while the client or other people were present. So, the evaluator arranged for the interviews to be as private as possible. On the other hand, since the users weren't asked to write their name on the survey forms, they felt free to respond, and the evaluator therefore let the client be involved in order to increase the response rate.

During the process of analyzing data, the client was involved in the following activities to help ensure that the findings were useful and insightful: reviewing the results of the data analysis, helping the evaluator to interpret data, and organizing findings and results for presentation to users. With the client's help, the evaluator could directly focus on the important issues that were critical to the church building and ignore less important issues. Thus, the speed of data-analysis was increased . Finally, the client also helped the

evaluator to interpret findings in ways that would help the users to understand them more easily.

Quality Issues in Phase 3

Reporting the findings and recommending actions were two of the major activities in applying the POE. In this study, it was clear that the client and the format of presenting information were two major issues which could affect the quality of the POE in this phase. Because the findings and recommendations of the POE would be used by the client organization and the users of the church, the format of presentation had to be easy for them to understand. It was believed that if the client or the personnel who were in the position to make decisions in the church were involved in the process of reporting findings and recommending actions, the findings and recommendations of the POE would be more easily accepted and used by the organization and the users. With the client's involvement in the process of reporting findings and recommending actions, he could provide useful information about what formats were suitable, which findings were critical, and what the priorities of the recommendations should be. Since the client discussed the presentation decisions with the evaluator, he could accept the findings and recommendations more easily. In this POE, the client took part in the following activities with the evaluator in the process of reporting findings and recommending actions: discussion of

the findings, development of presentation formats, organization of report contents, formal review of findings, analysis of alternative strategies, and prioritization of recommendations. All these activities helped make the findings and recommendations more useful.

In order to make the presentation understandable and accepted by both the client and the users of the church, the evaluator also asked some users to become involved in the process of reporting findings and recommending actions. The evaluator discussed the following issues with selected users (the same people selected in interviews): what findings were important, what kinds of presentation formats they would like, and what kind of actions should be prioritized. The information from the users was very helpful to the evaluator in selecting the presentation formats.

Evaluating the case study of the POE

After the POE was completed, interviews with the client and selected users were conducted to obtain the information about the quality of the POE. The results of the interviews after the POE indicated that most people thought that the findings of the POE truly reflected the problems of the church building, the recommendations of the POE were useful, and the presentation of the findings and recommendations were easy to understand. It also indicated that graphics illustrations and floor plans with simple explanations were more easily

understood. Most people believed that questionnaire survey, interviews and observations should be applied together for collecting data on the performance of church building (Interview questions are shown in Figure 11). Using the records of the POE activities and the concerns of the later interviewees related to the quality of the POE, the evaluator evaluated the POE by using the following criteria: (1) the degree to which the results were useful; (2) the degree to which researcher's conclusions were justified by the power of the research methods; (3) the degree to which the study took advantage of the best possible design, given situational limits, to provide the most useful data; and (4) the degree to which the POE provided the best possible information, given the constrains of money, time and other resources.

Evaluation Criteria 1: The degree to which the results were useful

In this POE, the results include findings and recommendations reported to the client and the users of the church. Although only a small part of the recommendations of the POE was applied, both the client and the users considered that the findings and recommendations of the POE were useful and applicable to improve building performance. As discussed earlier, if the client is involved in all phases of the POE process, the quality of the POE may be increased. Although it is possible that the client might provide bias in

a POE, the evaluator should be able to control the process and limit the bias if it is recognized during the POE process. The result of findings was enhanced by the data-collection and sampling methods intended to obtain as complete information as possible. The recommendations also were related to the format of presenting information and the evaluator's understanding of the client and users's needs. Evaluators should understand the client and users' needs in order to enhance the acceptability of the results by the clients or users of POEs. For example, in this POE, it was understood that the client was interested in money-saving suggestions. The evaluator considered this as a major factor when making the recommendations, so that some of the proposed recommendations met the expectation of the client.

Evaluation criteria 2: The degree to which researcher's conclusions were justified by the power of the research methods

The degree to which researcher's conclusions are justified by the power of the research methods refers to validity. Zimring (1988) classified the validity of POEs to three categories according to the different goals of POEs: contextual realism, generality, and precision. Contextual realism requires to make the study as applicable as possible to a given setting. Since the goal of the POE for the client was to provide information to improve the church building,

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contextual realism was required in this POE. As stated
earlier, the results of the POE were considered by the client
and users to be useful and applicable for improving the
performance of the church building. Thus the requirement for
contextual realism was met in the POE. As mentioned earlier,
the client, the research design and methods and the
presentation of information were the factors which affect the
validity of the POE.

Evaluation criteria 3: The degree to which the study took
advantage of the best possible design, given situational
limits, to provide the most useful data

The POE not only provided useful information for the client
organization, but also for the evaluator on how to improve the
quality of POEs. The research design and methods helped to
generate useful data both for the client and the evaluator. It
is clear that evaluators should study carefully the site, the
users, and the organizations which they will evaluate prior to
planning the research design and methods. A good relationship
with the client helps the evaluator proceed with any research
goal in the POE while conducting the POE for the client. With
a good relationship, the evaluator can persuade the client to
help the evaluator achieve additional research goal as long as
the client's needs are met. To enhance good relationships with
clients, it is suggested that researchers should meet clients'
needs as much as possible, respect clients' opinion, and help

clients understand the process of POEs as much as possible.

Evaluation criteria 4: The degree to which the POE provide the best possible information, given the constrains of money, time and other resources

Being considered the scope, level, the results of the POE, and the money and other resources spent, this POE was very economical, but the time spent on the POE was too long. It was found that the client and the management of data-collection process of the POE were two factors that influenced achieving this criterion. Because of the client's support, money was spent only on the materials which were necessary for conducting the POE, such as the copies of the survey forms and the costs for photography. All the other resources were free. It is recommended that evaluators should let clients understand the benefits of POEs as much as possible, so that clients may support POEs whenever needed. With the support of clients, the expenses of money and other resources will be reduced. For example, in this POE, the client helped to find church volunteers to assist conducting the POE. Because of the problems in managing the data-collection process, the time spent on data-collection was extended, prolonging the time spent on the whole POE process. Because the evaluator did not anticipate the problems that emerged during the questionnaire survey process, the evaluator had not considered strategies for solving possible problems before they occurred. Since many

participants are involved during data-collection processes, a variety of problems could appear during this time. It is suggested that evaluators should consider carefully the problems that might be encountered and prepare for changes that might occur.

SUMMARY AND CONCLUSIONS

The case study of post-occupancy evaluation of the Chinese Evangelical Church building in Towaco, NJ demonstrated that the action of clients, the research design and methods and the presentation of information were factors that influenced the quality of the POE. The study also examined how these factors influenced the quality of the POE and explored the ways to improve the quality of the POE. The study demonstrated that the process model developed by Preiser, Rabinowitz, and White (1988) is a useful model to conduct POEs, when the primary objective of a POE is to make the study as applicable as possible to a given setting.

Action of Clients

Zimring, Wineman, and Carpman (1988) stated that "participation by the client and openness of the evaluator to the needs of the client, all things being equal, tend to increase the utility of a POE" (p.278). This study supported their statement and indicated that the client could influence the quality of the POE at every step in the process. In this case, the client's involvement significantly improved the quality of the POE. Zimring (1987) stated that at the beginning of a POE, the initial contacts with the client could dramatically affect the subsequent ease of doing the evaluation, the validity of the results, and the likelihood of

recommendations be implemented. The study supported this point completely and also indicated that the client may facilitate the evaluator's gathering useful data and provide useful results for the client organization, if the client is involved in the data-collection, analysis, and presentation process.

In order to increase the quality of a POE, it is suggested that the evaluator could do the following things related to the client:

* Involve the client in a POE whenever it is possible and at any phase in the process, if appropriate.

* Respect the client's needs and opinions as much as possible.

* Seek the client's support by letting the client understand the benefits of a POE.

* Let the client understand the whole process of a POE, so that the client can understand the POE activities and help to conduct a POE effectively.

Research Design and Methods

Zeisel stated (1989) that the multi-method methodology used in POEs has been well developed by post-occupancy evaluators. Those multi-methods include building walkthroughs, interviews, questionnaires, unobtrusive measures, behavior observation, and secondary analysis, to name the major components. The reliability and validity of these methods have been tested in comparative studies. It is important for evaluators to

explore how best to apply these methods and interpret results, but not to invent the best methods. The study supported Zeisel's point. The result of the case study indicated that all the data-collection and analysis methods used were effective and useful. An important consideration is how to select and employ a subset of these methods which are best suited to solve particular problems in a POE.

The following suggestions could be considered when selecting and using research design and methods to ensure the quality of a POE:

* Study and understand the setting, the users, the activities, and POE objectives before choosing and employing the research design and methods.

* Select the research design and methods which can incorporate the evaluation criteria of the building type and address the goals for use of the information.

* Select the research design and methods which can be combined together to produce complete and useful data.

Presentation of Information

It has demonstrated that the way of presenting information has an important impact on whether the information is used. Information must be easy to understand, clear and meaningful for different users. This study explored how to make the information understandable, clear and meaningful for users such as the client and church members. It was found that the

information could be presented in useful ways if the evaluator sought the client and users' opinion about how to present the information.

The Process Model

In the case study, the phases and steps of the Process Model were followed when conducting the POE. The purpose, justification, activities, resources and results of each step suggested in the model were used to direct the POE. The detailed instructions on how to plan, conduct and apply POEs were consulted when conducting the POE, such as how to establish performance criteria, and how to report the findings and recommendations. Some of the usable tools provided by Preiser, Rabinowitz, and White (1988), such as the survey form, were used in the POE. It was found that the phases and steps were systematic and helpful. By following the phases and steps, the evaluator could complete the POE successfully. The suggestions and instructions provided by Preiser, Rabinowitz, and White contributed to increasing the utility and validity of the POE. It was also found that the "usable tools" were useful to collect varied data in the POE process.

Specific Cultural Impact on the Quality of the POE

In this case study, specific cultural expectations and needs also were factors that influenced the quality of the POE. For example, the evaluator thought that the method of group

discussion would be very useful for obtaining information about the use of the church building, but decided not to use it in this POE because most Chinese people are very sensitive and careful about their spoken opinions. Thus, they might not like to express their real opinions in public. The evaluator decided to use private interviews instead of group discussion to encourage people to be forthcoming about their opinions.

In another example, no problems were identified through pre-testing the survey in both English and Chinese because pre-testers said that the survey form was easy to understand. However, during the formal occupant survey, it was found that some people didn't know how to fill the survey form. Two possible explanations may exist: first, by chance, these pre-testers have better reading skills than those who didn't understand the survey form; second, because of cultural factors, some pre-testers didn't admit that they couldn't understand some of the questions.

During interviews, most people liked to answer all question in the same way---"good, very good" or "excellent". This may be a response based on Chinese cultural values and expectations, no matter what the real situation is. Some of the survey questions and answers may have yielded similar responses since some people checked "excellent" or "good" on all questions. Some of the users may have believed that every aspect of the building was excellent as they answered, while others may have chosen "excellent" or "good" because they

didn't want to say anything negative about the church. These examples show the potential of cultural impacts on the quality of the POE. It is important that evaluators be sensitive to such cultural uniqueness and differences between cultures when selecting and using research designs and methods. Clearly, conducting POEs that involve people of different cultures, evaluators must be sensitive to these issues, and should be more carefully considered in future POE research and practice.

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APPENDIX A

Research Questions Based on Quality Issues

Questions Related to Action of Clients

1. In what ways could this specific client affect the quality of the POE?

2. How did the client affect the quality of the POE during the whole POE process?

3. Did the role the client took in the POE increase or decrease the quality of the POE?

4. Did any relation between the client and the evaluator improved to the quality of the POE?

5. What did the evaluator do to facilitate relationships with the client in the POE process?

6. What did the evaluator do not only to meet the client's need, but also to get the information of his/her own?

7. Did the evaluator deal with the problem of the client introducing bias into the study?

Questions Related to Research Design and Methods

8. How did selection of the research design and methods affect the quality of the POE?

9. What strategy did the evaluator use to select research design and methods that incorporated POE goals and criteria?

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10. How did the evaluator decide which and how many methods to use so that the data needed in the POE is complete?

11. When planning the data collection and analysis, how effectively did the researcher obtain the data he/she needed? Did the methods used affect the routine work? Were the methods easy for participants to understand? How might the respondents' characteristics have affected their response? was bias in their responses likely? How did the evaluator arrange the time for data collection?

12. Were all the methods pre-tested? How were these methods pre-tested?

13. When completing data-collection, were procedures designed to yield usable data? Were the content and tone of the subject instructions appropriate?

14. Were the ethical implications of the POE fully considered and was informed consent obtained when necessary?

15. Did the analysis methods directly address the issues and criteria?

16. Were the assumptions behind the methods understood? (For example, for statistical methods, what were the requirements for equal sample size? minimum sample sizes?)

17. Were the implications for the results of the methods and procedures understood and acknowledged?

Questions Related to Research Strategies

18. Did the evaluator choose the research strategies according to the POE objectives and goals?

19. When choosing a research strategies, what other factors did the evaluator consider, such as budget?

Questions Related to Sample Selection

20. Did the sampling method meet the study objectives (such as the degree of precision, the time and financial resources)?

21. How was the sample selected? Did the sample represent the target population?

22. Was the sample size suitable (not too large or too small) for the research purpose?

23. Did the site/sites or spaces selected meet the research objectives or goals?

24. Did the sampled times include all the times that the situation may be different?

Questions Related to Presentation of Information

25. Was the information presented easy and clear to understand?

26. Was the information presented in different ways to meet different disciplines and individuals?

27. Did the information presented meet the needs of the client, the designer, or the researchers?

28. Was the information presented in a useful manner for different users?

29. Could the researcher have done more to help the client to better understand and use the presented data?

30. What are the other possible factors that may have affected the use of the presented information?

Questions Related to User Participation

31. In order to address the objectives and goals of the study, did the evaluator choose suitable participatory methods in the POE?

32. Did the client and participants really understand the participatory design and the benefits of the design process?

33. What was the role of the researcher in the participatory process?

35. What tools were or could have been used to help increase the efficiency of the participatory methods?

Summaries and Comments of the Observation

Time: Sunday

Space: sanctuary

10:00---10:30 am

The volunteers prepared for the worship. They arranged the folding chairs in order and prepared the bible for distributing. People were coming for the worship.

Comment

No problems were found.

10:30---12:00 pm

This is the time for worship. People seated in the sanctuary and listened to the speech. Some people came after the worship began. They were led by the volunteers who were on duty to the available seats. About 11:30 am, the smell of the food came from the kitchen. Some people went to the restrooms for a while during the worship.

Comment

Generally, the sound system was good, but when the pastor left the platform to the blackboard to illustrate something, or to go off the platform, those people who seated back of the sanctuary couldn't hear the voice of the pastor. Those people

who came late made some noise. The smell of the food from the kitchen seemed to bother some people in the sanctuary.

12:00---1:00 pm

After 12:00 am, the worship was finished. Some people left the church, some went to the restrooms, some went to the little grocery store, some people were in line to buy lunch, some went into the kitchen to buy fresh chinese food, some stood and talked to each other in the sanctuary and at the entrance area, and some went out and talked to each other near the building. The volunteers began to arrange tables and chairs for lunch. During the lunch time, people talked to each other when eating. After lunch, some people left and some stayed and continued to talk.

Comment

From 12:00 to 12:30 pm, the whole sanctuary was in noisy disorder. Especially at the area near the kitchen, little grocery and restrooms, the circulation was bad. People who were going into and out of the kitchen disturbed and were disturbed by those people who were going into and out of the restrooms and grocery. Those people who stood at the entrance area of the building made a little traffic. Some people had to stand when eating because the tables were not enough.

1:00---4:00 pm

The choir began to practice, while some other people continued their talking. Sometimes, woman's fellowship or other groups held their meeting at the sanctuary at 1:30 pm after the choir's practice.

Comment

Those people who were talking disturbed the choir's practice.

Time: Sunday

Space: kitchen

9:00---10:30 am

The cooking volunteers began to prepare and cook food for lunch.

Comment

When they began to cook, the temperature was rising. The kitchen was hot and the ventilation was bad. Some people complained about the hot room and bad ventilation sometimes. They used a fan to try to make the ventilation better, but the condition was not improved.

Time: Sunday

Space: Conference/Sunday school room

10:30---11:00 am

The children learned to sing songs. They seated on children's chairs raw by raw.

Comment

The space was too crowed. Sometimes, some children had to stand aside. The ventilation was bad.

11:00---12:00 pm

The children were arranged to three to four groups according to their age. Different groups conducted different activities, some reading, some drawing, and some playing around. Generally, the reading group was arranged in the small kitchen near the conference room, while the other groups stay in the conference room. If weather was good, some groups went out and played in the church property.

Comment

The space was too small to be arranged to conduct different activities. Each group's activity was interrupted by the other's activities. it was noisy and crowed in the room.

Time: Sunday

Space: meeting room

10:30---12:00 pm

Some teen-ages seated and talked in the room. Generally, they left around 11:00 am and played outside.

Comment

The room was not used most of the time.

APPENDIX C

Evaluation Criteria

The evaluation criteria of the POE indicated in the following were developed from the design guideline (e.g., The Time-saver Standards For Building Type) and the goals and objectives of the client.

The Site

Design Guideline

The church building is by its very nature an important public building. It speaks to the entire community about the beliefs and aspirations of the congregation. Minimum 60 parking spaces should be provided based on one parking space for every five persons accommodated in the Sanctuary space. Ample parking areas reached by convenient driveways are functional necessities. There should be a strong entrance relationship to the parking areas and driveways.

Client's Requirement

The parking lots should be convenient for users and provide enough spaces not only for the church members but also for visitors who come for picnics or parties, sport activities or other special events in which mass people may present.

Entry

Design Guideline

The main entrance to the building should be easily accessible from the parking area, and should be designed with a drive up and canopy entrance. This permits covered access to the building during inclement weather. The minimum function of the entry area is as a vestibule from the out-of doors. However, this space must be sized in relation to the number of occupants, as it will often act as a lobby. Coat storage may be located here. Pamphlet racks, bulletin boards, and memorial plaques or books should be located here rather than in the worship space.

Client's Requirement

The storage space at entry should be large enough to provide different areas for accommodating users' coats and articles, Bibles and choir's gowns, and other stuffs that should be stored near entry area.

Sanctuary

Design Guideline

The space should have dignity and strength to carry out the spirit of worship. Factors which determine this character include lighting, spatial proportion, symbolism (for example, the cross), and attention to details. Since this faith places emphasis on the spoken word, it is important to consider the ability of the pastor to maintain eye contact with the

congregation. This can be achieved by elevating the pulpit, so that even those seated in back of the room can see the pastor.

Client's Requirement

The purpose of the space is to provide a place where people may assemble for worship, fellowship, education, and for the chinese community to carry on some of its social activities. Except for worship, it should also be a pleasant area for social interaction and meet the needs for friendly, social interaction, for discussion of day to day problems, and for common activities. The activities except worship require varied arrangements of the furniture.

Other Planning Considerations For the Sanctuary

Design Guideline

Air conditioning. The use of the church during the summer months, the hour and length of the worship service, and the anticipated size of the congregation will determine the best type of system. High background noise generated by poor equipment must be avoided.

Lighting. Natural light should be used in the space but not force the congregation to look into the sun. High light levels are not required in worship space. Thirty to fifty foot candles are adequate for most visual tasks in a church. Outdoor lighting is also important, since the church will be utilized at night and the access paths to the building must be illuminated in order to decrease the likelihood of vandalism.

Therefore out door security lighting is recommended.

Client's Requirement

Acoustics.   The speaker must be heard everywhere in the worship space.

Kitchen

Client's Requirement

The kitchen should have entry/egress that does not interfere with other activities occurring in the sanctuary space. The ventilation should both prevent odors from permeating the rest of the building and ensure comfort for the volunteer workers. Storage space should be provided for different foods and kitchen equipment.

Nursery

Design Guideline

The nursery should be large, roomy and sound-proved. The ventilation and temperature of the room must be appropriate for the comfort of young children. Adequate room is needed for the storage of toys, materials, and other equipment. Window areas should be generous. Since the children play on the floor, a sanitary flooring material must be provided which is easy to clean, warm to the touch, and colorful.

Client's Requirement

The nursery should be large, roomy and sound-proved with

appropriate ventilation and temperature.

Conference/meeting/Sunday school

Design Guideline

Classroom should not be less than 24 by 32 ft. As classroom, the space must be adaptable for program change. Adequate natural light should be provided (50 Footcandle Levels).

Client Requirement

Because both rooms are used for multiple purposes, The furniture of the room must be accommodate the different user group and be flexible for re-arrangement.

Landscaping

Design Guideline

The landscape is an integral part of the total architectural concept and should properly relate to building plans and mass. A good maintenance program should be developed. With the development of the site, the quality and extent of landscaping should steadily improve.

Client's Requirement

The landscaping should be developed in the style of Chinese Garden and provide good outdoor environment for different user groups.