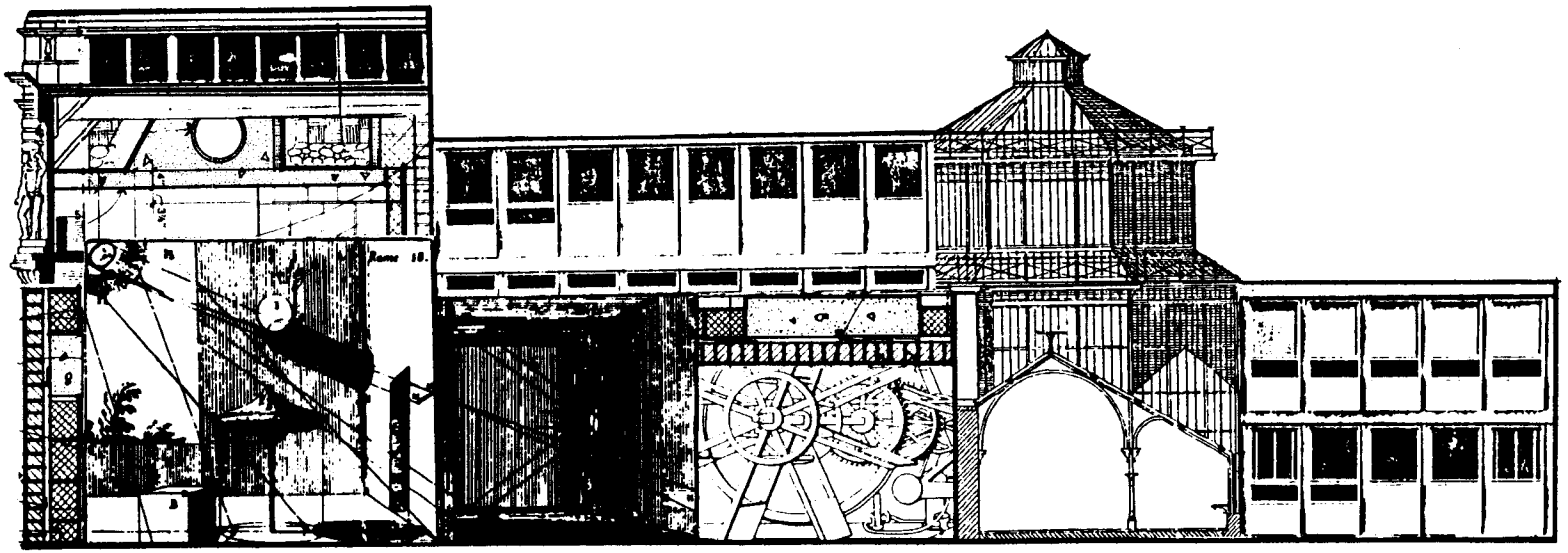
buildings in use study

technical factors



INTRODUCTION

Those responsible for building design rarely examine, in a formal and comprehensive manner, the environment they have helped create. We believe such examination is, however, the primary method through which better buildings can be created. Thus, what we learn from this study can be used, by clients and architects, in the design of future buildings.

This report is one product of the 'Buildings In Use' Study. The overall study examines architectural attributes of existing buildings (in this case 4 elementary schools) in order to determine how they have performed technically and functionally, and the relationship between the environment of the building and the behavior of its user population. This particular document addresses only the technical factors aspect of the study.

The technical factors evaluation is based on another document produced as part of this overall study: the Field Tests Manual. This report includes detailed descriptions of the tests used in the examination of the buildings. These tests are, for the most part, field test equivalents of National Bureau of Standards,

A.S.T.M., and Federal Specification Laboratory Tests and procedures.

There has been very little research performed in the comprehensive and formal evaluation of technical performance, much less of functional and behavioral factors, in existing buildings. The most notable work in this area is that of the Building Performance Research Unit at the University of Stratchclyde and the Pilkington Research Unit, University of Liverpool, both of whose efforts and reports were the precursors of the present 'Buildings In Use' Study.

In this 'hard' area of technical factors evaluation (in contrast to the 'softer' area of functional factors, and the even softer behavioral factors) we have adopted a formal and methodological approach. The procedural framework used in the Field Tests Manual is followed and test results are rated numerically wherever possible.

CRITERIA

Criteria used in judging technical performance were based on the premise that each subsystem of the building should perform as unobtrusively and reliably as possible. These subsystems, we feel, comprise the 'background' environment which should allow, but neither hinder nor stimulate, natural and typical activities to occur.

Highly reliable subsystems performance is expected, given routine maintenance and accounting for typical wear and tear. School administrators, teachers and students should be concerned with learning and not with building associated problems and repairs.

The following scale is used to indicate performance levels based on the stated assumptions:

○ 95% performance level, implying very satisfactory performance;

⊙ 85% performance level, implying minor performance problems which do not affect the activities within, or the image of, the building. Correctable by routine maintenance and/or repair;

Unacceptable is a:

● 75% performance level, implying major problems having some detrimental effects on the activities within, or the image of, the building. Correctable only by means of major repair or replacement procedures.

CONTEXT OF TECHNICAL FACTORS

Technical factors comprise the background environment which contains the very basic attributes: protection from the elements; suitable interior surfaces for the use of furnishings and equipment; thermal comfort and satisfactory auditory and visual conditions. They do not directly support activities, such as a blackboard, for instance, does. Flexibility, manipulation of environment (e.g. windowshades), storage and equipment are classified as direct activity support and are treated in another aspect of our study (functional factors).

Today's state of the art in design and construction produces a sound building with one or two or three major problems (below the 75% performance level) during its useful life. The elementary schools studied are not inconsistent with this performance. Though expected, major problems are unnecessary, unwanted and costly to resolve. Such problems also can be the basis for legal actions against the architect and/or contractor.

From the architect's viewpoint as a professional, the decisions he makes should have predictable and appropriate consequences in terms of performance, notwithstanding whether this desired performance is in the realm of technical factors, behavioral factors, perception or imagery. As a professional and a businessman, he must inform his client when client decisions, such as budget, will compromise appropriate performance. This 'service' to the client and the eventual user can protect the architect from future recrimination and legal action. Furthermore, the architect should, when given supervisory responsibility, not allow appropriate performance to be compromised through the construction process, notwithstanding the 'give and take' in that process.

To the architectural profession, many of whose members are wondering where their next project is coming from, such concepts as performance, technical analysis of existing buildings, much less behavioral studies, may not be particularly relevant. This type of study, however, seems to bridge the gap between research and practice. The results can be immediately applied as additional useful input into technical design decisions as well as providing a useful base and direction for continuing research. We believe that technical evaluation adequately documented and disseminated, serves both the needs of the professional today and is part of a new tradition in the practice of architecture.

COMMENT ON THE TECHNICAL DATA AND FINDINGS

1) Wherever possible information on the existing building is based on the original working drawings and specifications. The reader should note that changes in design and construction are often made subsequent to these original documents. Since 'as built' drawings are not available and changes have occurred, it is possible that some of our findings, especially in the area of 'probable cause' may be erroneous.

2) Many potential causal factors and combinations of such factors effect the problem situations noted in this report. We have drawn on as many sources to help aid in our analysis of each performance characteristic. In some cases a number of probable causes are mentioned because of the complexity of the situation. However, we do not in any way guarantee our findings or the performance of the buildings or their subsystems in the future.

3) The severity of the findings is documented for all results. The reader should be cautioned to read this carefully and retain perspective on particular items. Some lengthy discussions may, in fact, pertain to less significant defects of only academic interest. The summary of performance indicator at the beginning of each chapter quickly indicates the overall level of performance and levels for specific tests.

NOTES AND REFERENCES

- "Building Performance", Building Performance Research Unit. Applied Science Publishers, Essex, England, 1972.
- "Office Design: A Study of Environment", Pilkington Research Unit. University of Liverpool, England, May, 1965.
- "The Primary School: An Environment for Education", Pilkington Research Unit. University of Liverpool, England 1967.

These reports are by two of the pioneering groups in the building evaluation field which who include technical factors in their evaluation.

- "Economics of Carpeting and Resilient Flooring", Geo. M. Parks. Wharton School, University of Pennsylvania Press, 1966.

The 95%; 85% 75% performance criteria and methodology are based on the system developed in this important study.