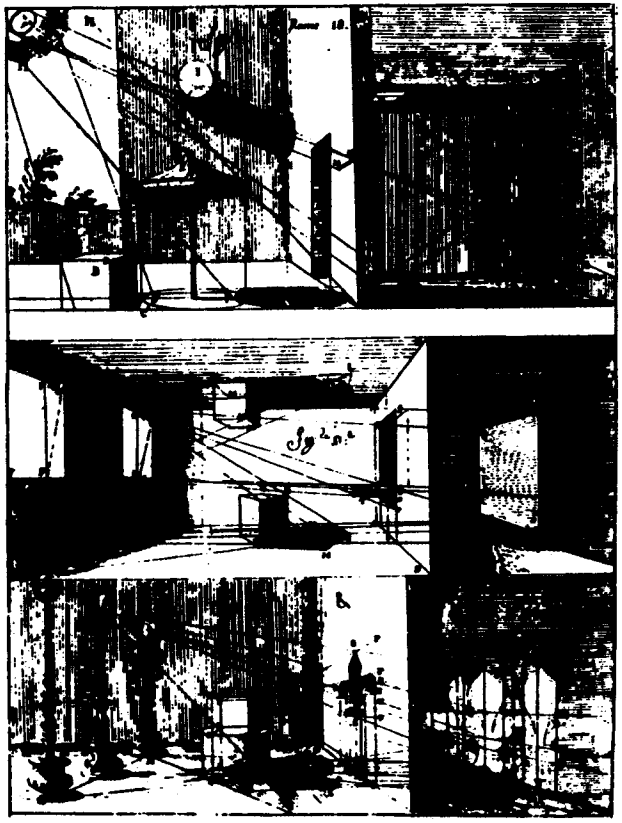
buildings in use study



field tests manual

INTRODUCTION

Those responsible for building design rarely examine, in a formal and comprehensive manner, the environment they have helped create. We believe that 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 characteristics of existing buildings 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 working document specifically addresses the technical aspect of the study. Later reports will include the other aspects.

TESTING AND MEASURING IN THE FIELD

Technical studies of buildings in use have been rare. Little information exists in this field and therefore, this manual should be of real use. It is truly meant to be a "working" document and suggested modifications will be welcomed - we are already making changes for the next 'edition'.

Although many laboratory tests exist for specific materials, there is a lack of field equivalents of laboratory tests which measure specific performance attributes of assembled components. Our field tests, derived primarily from existing A.S.T.M. and N.B.S. laboratory procedures, attempt to fill this need.

Laboratory procedures provide extreme accuracy by controlling test conditions through the use of apparatus which simulate real usage and actual building conditions. For instance, a standard abrading machine provides a simulation of the abrasion caused by the actions of shoes on a floor surface and the wear on this surface can be measured after a certain exposure to such a machine. Our tests, however, provide no such control and accuracy. For instance, in our field tests, the abrasion of floor surfaces has been provided by non-standard children wearing non-standard shoes carrying all sorts of grit, plus teaching and custodial staffs, over periods of time varying from two to twelve years, and the results must be reported in that context. What we lose in control of the agents of wear, we make up for in the very real nature of our testing situations.

EVALUATING TECHNICAL PERFORMANCE

Properly evaluating and reporting the results of many field tests is as critical as the effort involved in developing the tests.

After trying various methods, including detailed narrative, ratings, weightings, etc., we have developed a method which links the performance to the nature of the building. There are two assumptions which are the basis of this method.

> ...one generally cannot discuss an entire building, or even a subsystem, in such a technical investigation. There are too many performance characteristics in even the simplest situation. Each must be discussed separately.
>
> ...in terms of technical factors, the building must provide a satisfactory 'background' supportive of the activities in the building. A quite high performance standard for building subsystems is therefore expected so that technical factors will not at all hinder activities in the building.

The method of technical evaluation shown in the final chapter of this report presents many performance characteristics for each subsystem. Each characteristic is evaluated in the following way:

95% Performance Level: very satisfactory performance
85% Performance Level: minor performance problems which do not affect the activities within, or the image of, the building
75% Performance Level: major problems having some detrimental effects on the activities within, or on the iamge of, the building. These are correctable only by means of major repair or replacement procedures.

CRITERIA FOR EVALUATING PERFORMANCE

This manual does not contain criteria for evaluating the results of the field tests. Many factors outside the realm of this manual will affect the criteria used in individual cases of technical evaluation. Building type, age and the owner's own standards can alter the criteria for each subsystem. Our own study of elementary schools does contain

criteria and an evaluation based on these tests but they are specific to our study, and some criteria even vary between the various school buildings.

USING THE FIELD TEST MANUAL

The tests in this manual exclude factors concerned with structure, fire safety and certain mechanical subsystems such as plumbing, electricity, etc. These were excluded because the standards in these areas are either so well defined in design, code, manufacture and installation and/or the measurement of these characteristics is beyond the scope of this study.

Interviews and discussions with maintenance personnel are invaluable in determining past performance and critical areas of performance for all subsystems. A careful examination of the working drawings and specifications can help determine areas of the building to be studied in detail and to clarify the reasons for the actual performance characteristics of certain subystems.

This manual should be used as a guide to testing. Good judgement should be used in modifying the tests to conform to the specific conditions encountered in different buildings. Although the manual is written generically, it certainly does not apply to many of the myriad of products and techniques available in construction.

Follow-up procedures for many of the tests can be very useful. The 'USE' part of each test has been performed, as mentioned earlier, by the actual users in uncontrolled circumstances. Because of this anonymous test, it is useful to use follow-up procedures in cases where findings indicate problems. The results of the follow-up tests should reveal a more exact level at which specific characteristics have failed.

The cause of problems revealed in the course of technical testing is also not a part of this manual because of the numerous circumstances which can affect performance. The technical evaluation aspect of our study will deal specifically with causal factors.

PREVIOUS STUDIES

Though a 'Field Test Manual', per se, was not found in our literature search, some significant examples of technical factors' evaluations were found.

A Study of the Performance of Buildings, K.W. Jaeggin and A.E. Brass, National Research Council of Canada 9352, May 1967.
An excellent outline for technical evaluation, very impressive and useful.

The studies of the Pilkington Research Unit of the Department of Building Science, University of Liverpool, on school, office buildings and factories. Significant research though criteria used are below U.S. levels.

Building Performance, Building Performance Research Unit, Applied Science Publishers, London, England 1972.

In addition:

ASTM Standards in Building Codes 9th Edition, 1971.
American Society of Testing and Materials, Phila., Pa..
Contains a large number of laboratory test methods.

"Methodology for Development of Requirements for the Physical Elements of a Dwelling", H. Berger, National Bureau of Standards Report 10575. April, 1971.
Contains comprehensive lists of tests which are applicable to various activities.

Other documents which are specifically related to each subsystem are mentioned at the end of each chapter.