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Criteria for Compliance Assurance Agencies for Manufactured Building

One and Two Family Dwelling Systems and Components

J. O. Bryson, A. A. Camacho, B. M. Vogel

Project LEAP
Office of Building Standards and Codes Services
Center for Building Technology, IAT
National Bureau of Standards
Washington, D. C. 20234

April 1973

Preliminary Report

Prepared for
National Conference of States on Building Codes and Standards

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Prepared for
National Conference of States on Building Codes and Standards

U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

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ABSTRACT

Criteria are proposed by which participating institutions may be judged for their capability to perform the Compliance Assurance Function in the evaluation and regulation of manufactured one and two family dwellings and components, including mobile homes. The criteria are intended as guidelines for objective examination of applicant, public or private, institutions who desire to serve as designees of a state government to conduct and supervise the Compliance Assurance Program for manufactured building units or components. Based on a study of the state-of-the-art and current model enabling legislation, a description of the required compliance assurance activities is provided as a basis for proposing a level of capability acceptable to the states. Appendices describe proposed institutional mechanisms and provide supporting information and forms. Adoption of the proposed criteria, in a national standard developed by the ASTM E32 Committee, could provide the states with a basis for informal reciprocity of institutional accreditations and of building-evaluation findings.

PART 1 INTRODUCTION

CONTENTS

1.1 GENERAL

1.2 DESCRIPTION OF STUDY APPROACH

1.3 STUDY OF CURRENT COMPLIANCE ASSURANCE FUNCTIONS

1.4 GLOSSARY OF TERMS

1.1 GENERAL

Building technology is changing rapidly; one manifestation of this is the increased industrialized production of a wide range of complex construction components and assemblies. Factory produced building systems often involve innovative processes not specifically described in the applicable building code and for which traditional field experience provides little guidance for the building official. Moreover, they may also be fabricated beyond the legal jurisdiction of the installation site. As a result, the local building official's technical evaluation of manufactured buildings for code compliance may be difficult, and may entail trips to distant factories for prototype examination and periodic production line inspections.

The National Conference of States on Building Codes and Standards (NCSBCS), formed in 1967 to consider problems of building regulation, has suggested that the states may utilize the services and facilities of qualified public or private institutions to provide building analyses, testing and inspections. To aid the several states in implementing such a process, a Department of Commerce Special Working Group[1], initiated by the Office of Building Standards and Codes Services, CBT, developed model legislation under the title of Model Manufactured Building Act and the related (but separate) Rules and Regulations.

[1]DOC Special Working Group No. 1 was composed of representatives from National Conference of States on Building Codes and Standards, National Association of Building Manufacturers, Building Officials and Code Administrators International, Inc., International Conference of Building Officials, Southern Building Code Congress, U.S. Department of Commerce, and U.S. Department of Housing and Urban Development.

To facilitate an appropriate degree of intra - and inter-state reciprocity regarding building system evaluations made through use of either public or private institutions, the states may wish to utilize an accreditation program for such institutions. For the purpose of this accreditation, the National Bureau of Standards (NBS) was asked by NCSBCS to develop criteria by which participating institutions may be judged for their capability to perform identified building-evaluation functions, and further, to develop procedures for an examining agency to use in determining if the criteria are met. To this end, NBS instituted a research project identified as the Laboratory Evaluation and Accreditation Program (LEAP). The American Society for Testing and Materials (ASTM) has been asked by NCSBCS to develop consensus standards for examining such institutions based on the Project LEAP findings.

For accreditation purposes, Project LEAP has divided the building-evaluation services, that may be performed by accredited agencies, into three distinct functions; analysis, testing and compliance assurance. These functional terms are defined below. Additionally, for the purposes of this report, the term Agency designates the accredited or approved status of a public or private institution to act as an agent of the state in the regulation of manufactured building. (e.g. Compliance Assurance Agency performs the Compliance Assurance Function for the state.)

(1) Analysis is the process that includes analytical examination and review of design and test documents using professional judgment and experience, to determine whether a proposed manufactured building or component conforms to applicable codes and standards.

The Analysis Function is the same as the Evaluation function defined in the Model Manufactured Building Act, and has also been referred to by ASTM E32 as Engineering Analysis and Systems Analysis.

(2) Testing is the process whereby the engineering properties claimed for manufactured buildings or components are validated by using appropriate standard test methods or other approved physical simulations based on recognized engineering principles.

(3) Compliance Assurance is the process of evaluation of the manufacturer's compliance control program in conjunction with full-time or periodic monitoring, surveillance or audit implemented to provide objective evidence that manufactured buildings or components conform to the approved design drawings and specifications.

Compliance Assurance relates to the Inspection Agency function as defined in the Model Manufactured Building Act, and has also been variously referred to as Quality Analysis and Quality Control. A Compliance Assurance Manual is prepared and the program is implemented through the Compliance Assurance function and approved under the Analysis Function of the Act.

The Compliance Control Program is a manufacturer's system, including directly related quality and process controls, for assuring compliance with applicable codes

and standards. A Compliance Control Document is prepared and the program implemented by the manufacturer and reviewed under the Compliance Assurance Function. The Compliance Control Document is incorporated into the Compliance Assurance Manual.

In approaching this study, it was necessary to establish the criteria for the Compliance Assurance Function in relationship to the expected services to be performed, as identified by a study of the state-of-the-art and by the Model Manufactured Building Act and its related Rules and Regulations. Therefore, a comprehensive description of the services to be rendered by a model Compliance Assurance Agency is included in the report as a basis for defining an acceptable level of performance. The report is presented in four parts:

1. Introduction
2. Compliance Assurance Function
3. Requirements and Criteria for the Compliance Assurance Agency
4. Identification of Further Research

Part I serves as an introduction supplying background for the document. Part 2 identifies the activities and functions of a Compliance Assurance Agency. Based on the identified activities and functions, Part 3 details the requirements and criteria for applicants proposing to serve as Compliance Assurance Agencies. Part 4 identifies those areas that need further study.

An overview of a proposed institutional mechanism for accreditations and for reciprocity of building-evaluations is presented in Appendix B, "This is LEAP". Other appendices provide suggested inspector checklist and the typical compliance control activities of a manufacturer.

This report on the Compliance Assurance Function is one of a series prepared for NCSBCS by Project LEAP, Center for Building Technology, Institute for Applied Technology, NBS. The report is based partly on a study performed for NBS by John C. Dunlap under NBS contract No. 2-35941. The conclusions and recommendations included here are not necessarily those of the contractor.

1.2 DESCRIPTION OF STUDY APPROACH

The objective of this report, prepared for the National Conference of States on Building Codes and Standards (NCSBCS) by the Center for Building Technology, National Bureau of Standards, is to develop the criteria for determining an organization's capability to perform the ompliance ssurance Function in the regulation of manufactured building. The Compliance Assurance Function, in general terms, is the activity that monitors the manufacturer's Compliance Control Program so as to assure that the manufactured building has been manufactured in accordance with the previously approved plans and specifications by the Analysis Agency, and therefore, is in compliance with those codes and standards.

To identify the requirements and develop the criteria for determining the characteristics of an organization to carry out any activity, that activity itself must first be analyzed and understood. From such an

understanding, it becomes possible to derive the organization's necessary characteristics. The study approach utilized in the development of this document included:

(1) A study of current Compliance Assurance Function activities

(2) Identification of appropriate activities, requirements and criteria of the Compliance Assurance Agency.

1.3 STUDY OF CURRENT COMPLIANCE ASSURANCE FUNCTIONS

A study of industrialized housing producers, NBS contract No. 2-35491[2], revealed that the type of inspection and construction control program most widely in use contains two levels of inspection effort: that provided by the employees of the manufacturer on a continual basis, and that provided by an agency independent of the manufacturer. The stated objective of these two levels of inspection is the production of manufactured buildings that are in accordance with applicable codes and standards.

While the manufacturer is responsible for controlling the product quality, for offering for acceptance only those units that conform to applicable codes and standards, and for providing and maintaining substantiating evidence of this conformance, it is the responsibility of the Compliance Assurance Agency, to provide surveillance or monitoring of the manufacturer's Compliance Control Program in order

[2]Report by John C. Dunlap titled, "Inspection and Construction Control of Industrialized Housing."

to obtain objective evidence of the mode of construction utilized in order to determine whether or not that construction is in accordance with the approved plans.

1.4 GLOSSARY OF TERMS

The following terms wherever used or referred to in this document shall have the following meanings, unless a different meaning is clearly indicated by the context.

ACCEPTANCE INSPECTION - An inspection to ascertain that a particular building component or material conforms to the drawings and specifications or specified visual and performance requirements.

ADMINISTRATIVE AGENCY - "Administrative Agency" means _____(Name of Agency)_____, which is charged with the administration of a State Manufactured Building Act.

AGENCY - Designates the accredited or approved status of an institution to act as an agent of the state in the regulation of manufactured building. (e.g. Compliance Assurance Agency performs the Compliance Assurance Function.)

ANALYSIS - Is the approval process which includes analytical examination and review of design and test documents using professional judgment and experience, to determine whether a proposed manufactured building or component is in conformity with applicable codes and standards.

Note: Analysis relates to the Evaluation Agency Function as

defined in the Model Manufactured Building Act, and has also been variously referred to as Engineering Analysis and Systems Analysis.

COMPLIANCE ASSURANCE - Is the process of evaluation of the manufacturer's Compliance Control Program, in conjunction with monitoring, surveillance or audit, implemented to provide objective evidence that manufactured buidlings or components conform to the approved design drawings and specifications.

Note: 1. Compliance Assurance relates to the Inspection Agency function as defined in the Model Manufactured Building Act, and has also been variously referred to as Quality Analysis and Quality Control. The Compliance Assurance Document (Manual) is prepared and the program implemented by the Compliance Assurance Function and approved by the Analysis Function under the Model Manufactured Building Act.

2. Compliance Control Program is the manufacturer's system including directly related quality and process controls, for assuring compliance with applicable codes and standards. After the Compliance Control Manual is prepared and the program implemented by the manufacturer, and approved under the Compliance Assurance Function.

3. Agency designates the accredited or approved status of an institution to act as an agent of the state in the regulation of manufactured building. (e.g. Compliance Assurance Agency performs the Compliance Assurance Function.)

CRITERIA - Limits establishing the minimum satisfactory embodiment of requirements.

ENGINEER - One who has general knowledge of the basic principles, theories and practice in a given field of engineering such as may be acquired through completion of a full engineering curriculum leading to a Bachelor's degree from an accredited college or university or through training equivalent in type, scope and thoroughness.

INSPECTION - The process of measuring, examining or otherwise comparing the manufactured building or component with specified requirements.

INSTITUTION - Any candidate organization, government or private profit-making or non profit-making, for accreditation in any or all of the building evaluation functions of testing, analysis, and compliance assurance.

REQUIREMENTS - Knowledge, skill or judgment needed to perform the Compliance Assurance tasks.

TESTING - Is the process used to validate the engineering properties claimed for manufactured building or components, by using appropriate standard test methods or other approved physical simulations based on recognized engineering principles.

PART 2 THE COMPLIANCE ASSURANCE FUNCTION

CONTENTS

2.1 INTRODUCTION

2.2 BASIC FACTORS OF THE COMPLIANCE ASSURANCE PROGRAM

2.3 CHARACTERISTICS OF A COMPLIANCE ASSURANCE PROGRAM

2.3.1 ORGANIZATION

2.3.2 INSPECTION PROCEDURES

2.3.3 INSPECTION DOCUMENTS

2.3.4 INSPECTION FORMS AND REPORTS

2.3.5 DEFICIENT CONSTRUCTION

2.3.6 INSPECTION FREQUENCY

PART 2 THE COMPLIANCE ASSURANCE FUNCTION

2.1 INTRODUCTION

The Compliance Assurance Agency is responsible for the development of a compliance assurance program which, when put into affect, will assure that the manufactured buildings, as they are completed at the site of manufacture, will be in compliance with the approved building system documents. An understanding of the elements of the manufacturer's Compliance Control Program is essential for identifying the activities of the Compliance Assurance Agency. While a complete description of these elements is contained in the Appendix A, it is necessary to identify them at this point as a basis for establishing an acceptable level of criteria for the Compliance Assurance Agency.

The Compliance Control Program must provide for the following elements:

1. An organization identifying one person responsible for the overall administration and functioning of the program.
2. A method of identifying the units produced and the inspections made on each unit.
3. The development of fabrication task descriptions identifying the items to be checked at the various stages of manufacturers.
4. The development and use of material lists and descriptions to assure that only approved materials and equipment are purchased and used.

5. Development of a method for the control and storage of materials and equipment to be incorporated in the manufacture of each unit.
6. A method for controlling the use of fabrication drawings to assure that only approved drawings are used in the construction.
7. Development of methods for making product verification measurements.
8. Procedures for corrective actions for deficient construction and materials.

In order to fully understand the magnitude of the tasks and requirements that are the responsibility of the Compliance Assurance Agency it is necessary to describe the elements of a viable compliance assurance program. Once these elements are set fourth, Part 3 of this document will identify the specific requirements and criteria needed for a model candidate agency to have in order for it to have the capability to perform those identified elements of a viable compliance assurance program.

2.2 BASIC ELEMENTS OF THE COMPLIANCE ASSURANCE PROGRAM

The typical Compliance Assurance Program has two basic elements that must be considered in structuring the program. The first is that the inspection provided by the compliance assurance inspector is on a periodic basis, determined by the manufacturing rate and the demonstrated efficiency of the manufacturer's Compliance Control Program. Secondly,

the individual employed as a compliance assurance inspector is responsible for the inspection of all aspects of the construction of the industrialized housing unit, and in addition, these inspectors are not required to possess a significant degree of technical expertise. (See Section 3.2.3 for detailed requirements and criteria.)

2.3 CHARACTERISTICS OF A COMPLIANCE ASSURANCE PROGRAM

The following are the characteristics a compliance assurance program should possess to accomplish its intended purpose.

2.3.1 ORGANIZATION

The administrative element of a compliance assurance program should be structured so the decisions that the individual inspector makes are limited. This can best be done by providing detailed administrative procedures to be followed by the inspector, including inspection scheduling, the completion and submission of inspection reports and the extent of inspection to be provided under varying conditions. Inspection scheduling should be performed at the program management level, so that inspection dates for a specific producer can be varied, and at least in some instances, be on an unannounced basis. The scheduling program shall demonstrate provisions for covering the responsibilities of inspectors who become unavailable due to illness, vacation, etc. Where an agency inspects more than one manufacturing facility, inspectors maybe assigned on a relatively infrequent, but regular basis to inspect the production at a facility normally inspected by another compliance assurance inspector.

The administrative element should develop and maintain a system of reporting forms and a method for their maintenance, including a formalized method for the review and analysis of inspection reports and the compilation and comparison of inspection statistics. To facilitate the direction of inspection effort, procedures should be established whereby inspection reports shall be submitted within a specified and limited period following the inspection, and are reviewed by the program management as soon as possible following their receipt.

The administrative program should include established procedures to be followed when deficiencies are found in the operations of either the Compliance Assurance or Compliance Control Programs. These procedures shall provide for remedial and preventive action to be taken immediately when such discrepancies are found, including the correction or refinement of inspection documents, the upgrading of inspector capabilities, or the increase in inspection effort, and where necessary, preventing the movement of improperly constructed units from the production facility.

The Compliance Assurance Program should include a person responsible for the immediate supervision of the compliance assurance inspectors. The specific requirements and criteria for the inspector supervisor are detailed in Part 3 of this document. In summary, this person should possess a high level of technical expertise with regard to the types of construction involved, including knowledge of the governing codes and standards pertinent to construction materials, equipment and methods.

He should be fully knowledgable regarding the documents pertaining to each type of unit inspected by the people he supervises, the production testing procedures, and the program administrative procedures. The activities of the inspector supervisor are discussed in subsequent sections.

2.3.2 INSPECTION PROCEDURES

The inspection procedures should be structured to provide the inspector with detailed directions regarding the performance of the inspection functions, and to specifically establish the extent of inspection effort to be applied. The inspection documents prepared by the Compliance Assurance Agency's inspector supervisor should include an inspection checklist* detailing the items to be inspected at each step in the fabrication process. This list should be keyed to the sources of the information the inspector is to follow in determining whether the construction complies with the approved documents. With respect to the degree of inspection, the procedures should establish the number of items to be inspected to determine that a particular system in an individual unit is properly constructed. Both the detail and degree of inspection shall be reflected by the inspection report forms.

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*See Appendix C for a typical checklist.

Because the Compliance Assurance Program does not necessarily include the inspection of each unit produced, one of the primary functions of the compliance assurance inspections is to ensure that the Compliance Control Program operated by the manufacturer's employees is effective. To accomplish this end, as part of his regular inspection activities, the inspection procedures should require the inspector to sample inspect systems previously signed-off by the manufacturer's employees under the procedures of the Compliance Control Program as being properly constructed. He should also observe the production verification measurements as performed by the employees responsible for that function.

The activities of the inspectors should be monitored on a regular basis by the compliance assurance inspection supervisor. This inspection should include an independent verification inspection by the supervisor of items previously checked by the inspector, utilizing the inspection forms and procedures used by that inspector. The completed forms should be forwarded to Compliance Assurance Agency headquarters for review and assessment by the management, which should also review the operation and records produced by the Compliance Control Program.

The review of the manufacturer's Compliance Control Program by both the compliance assurance inspector, and the inspector supervisor during the monitoring inspection, should include the review of the compliance control records to determine that such records are being kept for each unit produced by checking them against the listing of serial

numbers of the units produced since his last inspection, and a summation of the deficiencies found through the compliance control procedures as reflected by the inspection records, and the remedial actions taken. The compliance control review should include the checking of the control and review of fabrication or shop drawings, the use and correctness of the fabrication task descriptions, and should verify that the compliance control records are being completed as the unit systems are being constructed and tested rather than after the actual fact and based on opinion rather than observation.

The engineers employed or retained by the Compliance Assurance Agency should monitor the construction control programs in at least a representative number of production facilities. The extent of this review should be sufficient to determine both the structure of the Compliance Control and that the Compliance Assurance Program provides for the production of manufactured building units in compliance with the governing laws.

2.3.3 INSPECTION DOCUMENTS

The documents furnished the compliance assurance inspector are of two basic types: those that have been approved by the Analysis Agency and delineate the construction as it should be accomplished (approval documents), and those that serve to direct the activities of the inspector in determining that the actual construction complies with the approved drawings. These latter documents are also a part of the approval documents.

The approval documents typically include the plans and specifications, and the Compliance Assurance Documents (Manual). In the preparation and evaluation of these documents, full cognizance must be taken of the capabilities and knowledge of the inspector. The information as presented by such documents as typically prepared for on-site construction is not sufficient. This is particularly true with respect to information contained in the governing codes or standards that pertains to installation procedures or tolerances, and is not repeated on the drawings or in the specifications. The volume of such information is not great with respect to a specific building system, and the cost of its inclusion in these documents is more than offset by the reduced inspection costs that result from the use of one individual to inspect all aspects of the construction.

The compliance assurance inspector should not utilize the shop drawings prepared by the manufacturer as a source of information to determine the correctness of the construction since inspections should be made on the basis of the information contained in the approval documents.

A key element in the Compliance Assurance Program is the inspection checklist. This document should be organized with a section for each station in the manufacturing process, with a listing of each specific item to be inspected at that station. The listing of inspection items shall be keyed, as specifically as practicable, to the information in the approval documents that depicts the construction of that item. The inspection checklist should treat the storage and

control of materials prior to their incorporation into the construction, in this same detail. The inspection checklist, in conjunction with the inspection procedures, should serve to control both the detail and degree of the compliance assurance activities.

2.3.4 INSPECTION FORMS AND REPORTS

Inspection forms utilized by the compliance assurance inspector should contain an entry of the manufacturer's serial number for the building unit that incorporated the element or system being inspected, the date of inspection, and a reference as to whether the element had been signed-off through the Compliance Control Program prior to his inspection. The inspection form should follow the organization of the inspection checklist and be keyed to it. The format of this form should be such that improperly constructed items or deficient materials or components may be succinctly and clearly identified. The use of a numbering system for inspection items in structuring the inspection list, and the coordinated us of this system in identifying discrepancies can facilitate both the inspector's activities and the treatment and use of this information in compiling data useful in directing the inspection effort. The inspection form should be the control in the inspection process. Units should not be permitted to be removed from the manufacturer's plant until this form has been completed and indicated the unit is properly constructed. The original inspection form, and the description of the actions taken to correct all discrepancies noted on the form should remain as permanent records, with copies retained by both the manufacturer and the Compliance Assurance Agency.

The inspection system should include a method of identifying deficient construction to the fabrication personnel so that improper construction is not covered up by subsequent fabricating activities. A workable method to accomplish this is the use of colored tags that may be attached to the deficient item. (If similar tags are used in the Compliance Control Program, they should be of a different color.) These tags should be serialized so that their numbers may be entered on the inspection form coincident with the discrepancy notation. The tag should remain until the deficiency is properly corrected. In the other instances, because the compliance assurance inspector is not continually in the plant, the person responsible for signing-off the particular item under the procedures of the Compliance Control Program should be permitted to remove the tag following the approved remedial action, and should note the action on the compliance control record for that unit.

The compliance assurance inspector should file a report on his inspection as soon as practicable following the inspection. This effort can be facilitated through the use of standardized reporting procedures and forms. This report should include the individual inspection reports completed during the inspection, an accounting of the total units produced by the manufacturer in the interval between inspections and the point to which they were shipped and a report on the functioning of the Compliance Control Program.

2.3.5 DEFICIENT CONSTRUCTION

With the exception of items that may be easily replaced or repaired, procedures should be established for the treatment of deficient construction. Although it may not be possible to specifically cover all the cases that may occur, well defined guidelines should be established limiting the type of repair or rework permitted to that which will result in the production of construction as delineated by the approval documents.

The procedures to be followed with respect to deficient construction should set specific requirements, within defined limits, for the investigation of units produced prior to the discovery of the deficiency by the compliance assurance inspector. This back-tracking procedure should include reliance on such items as the certification date, and in the case of deficient material or components, material storage and control records.

These procedures should establish conditions under which the Compliance Assurance Agency management must be consulted to determine actions to be taken with respect to deficient construction. Examples of such conditions would be where rework would result in possible damage to regulated materials, or would result in alternate construction to that approved; or the deficiency involves a substantial number of building units.

2.3.6 INSPECTION FREQUENCY

As noted in Appendix A on the Compliance Control Program, this program, operated by the manufacturer, should include the review of every unit produced. But if this program can be demonstrated to be operating

effectively, it is reasonable that the inspections by the Compliance Assurance Agency be on a periodic basis.*

The practice of some agencies, which may serve as a general guide, is to require the inspector to inspect 100% of the first ten units produced by a manufacturer coming on the program. If these inspections indicate that the Compliance Control Program functions effectively, the Compliance Assurance Agency inspection frequency is reduced to 25% of the units constructed with the interval between inspections two weeks maximum. Otherwise, the inspection frequency must remain at 100% until the Compliance Control Program is demostrated to be effective. The occurrence of substantial deficiencies where the independent inspection effort has been reduced is cause for return to full inspection.**

Regardless of the reduced inspection frequency adopted for a Compliance Assurance Program, the conditions requiring the increase of the inspection effort shall be formally established. The conditions warranting such action are those where a compliance assurance inspector discovers units that have been signed-off under the Compliance Control Program and contain deficiencies that are hazards to life safety; the compliance control effort has permitted the production of a significant number of units containing lesser deficiencies, or the records required

*See Part IV for a discussion on the need for further study of inspection frequency.

**The recommendations in this paragraph reflect current state-of-the-art as reported by project consultants.

as part of the Compliance Control Program are not being properly completed or maintained.

The same general approach should be taken with respect to the monitoring inspections provided by the compliance assurance inspector supervisor. With regard to a properly functioning Compliance Assurance Program, the inspector supervisor should perform a complete monitoring inspection in at least one plant producing each type of construction inspected by an individual inspector, at least once every three months. This frequency should be increased under the same conditions cited in the previous paragraph, and in addition, for those cases where a new inspector is employed or an inspector is assigned duties pertaining to a type of construction he had not qualified for previously.

Part 3 REQUIREMENTS AND CRITERIA FOR THE COMPLIANCE ASSURANCE AGENCY

3.1 INTRODUCTION

3.2 GENERAL REQUIREMENT AND CRITERIA

3.3 PERSONNEL REQUIREMENT AND CRITERIA

3.3.1 MANAGER

3.3.2 SUPERVISOR

3.3.3 INSPECTOR

PART 3 REQUIREMENTS AND CRITERIA FOR THE COMPLIANCE ASSURANCE AGENCY

3.1 INTRODUCTION

The basic organizational structure for candidate Compliance Assurance Agencies should provide a setting whereby qualified in-plant compliance assurance inspectors are adequately supervised in their day-to-day duties and are supported by authoritative technical and administrative expertise. These organizational relationships are depicted by the chart of a typical organization (See Figure 1). The degree to which this typical structure is applicable to a particular agency, however, must be commensurated with the size and scope of operations of the agency.

The studies forming the background to this report indicate that agencies performing compliance assurance functions must have strong program management and administrative and technical procedures for the in-plant compliance assurance inspector. These procedures were described in Part 2 of this document. In this part, the requirements and criteria for the personnel involved in the optimal operation of the Compliance Assurance Program are presented.

REPRESENTATIVE ORGANIZATION STRUCTURE

COMPLIANCE ASSURANCE AGENCY

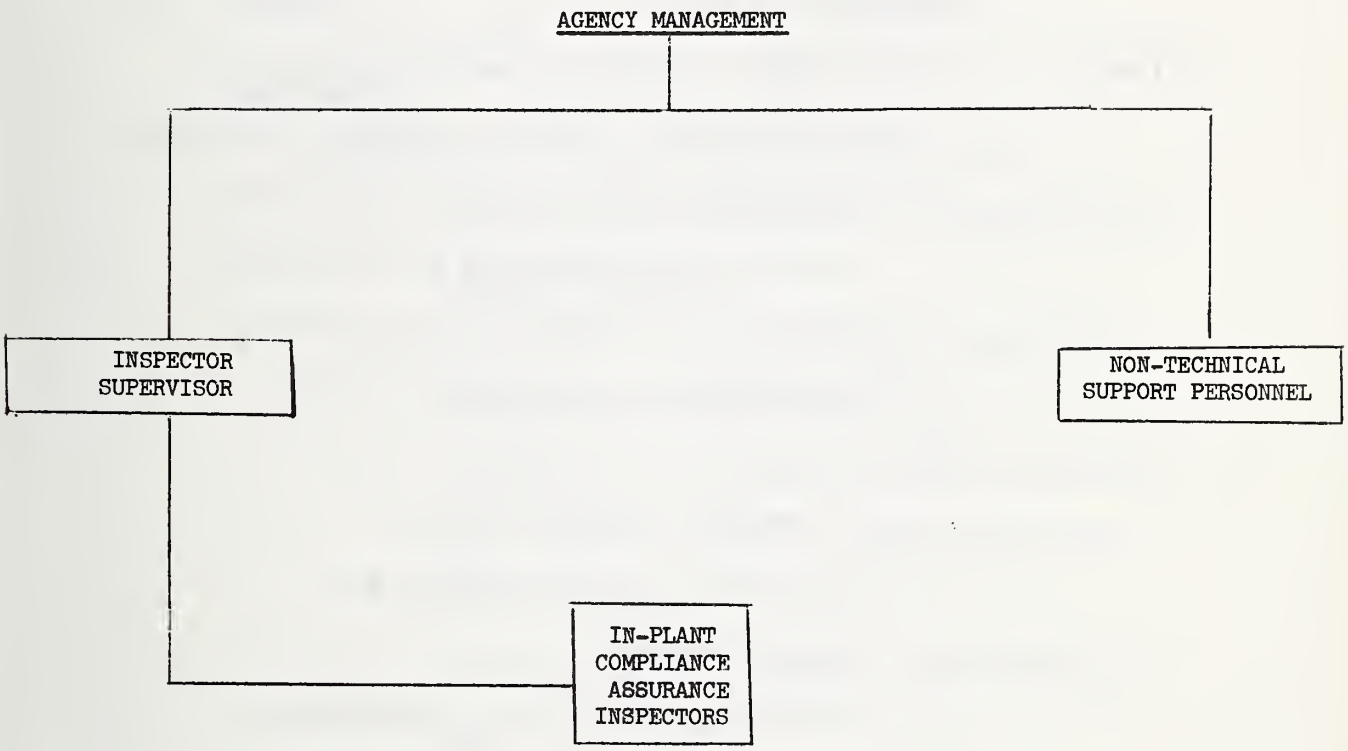

Figure 1

3.2 GENERAL REQUIREMENT AND CRITERIA

Requirement - Provide physical, administrative and financial framework for successfully managing the Compliance Assurance Function.

Criteria - A. Facilities - Provide adequate facilities to house and support technical personnel, including:

1. Conference space for use of entire evaluation team and meetings with applicants
2. Space and facilities for plan checking
3. Equipment for calculations and for checking of calculations
4. A complete technical library
5. Equipment for typing reports and correspondence
6. Storage facilities for correspondence and reports

B. Support Staff - Provide adequate secretarial, administrative and managerial staff to support the activities of technical personnel

C. Information - Provide effective methods for keeping the professional staff technologically current

D. Financial Capability - Demonstrate the availability of adequate financial resources to support the required facilities, staff and activities

E. Conflict of Interest - Provide positive evidence of a total absence of potential financial conflict of interest

3.3 PERSONNEL REQUIREMENT AND CRITERIA

3.3.1 MANAGER

Requirements

The Compliance Assurance Agency manager must:

1. Be capable of formulating and structuring the inspection program.
2. Be capable of reviewing ongoing compliance assurance activities for adequacy.
3. Be capable of identifying technical problems of most difficult nature for resolution by the Analysis Agency.
4. Be knowledgable in technical requirements of codes and standards.
5. Have knowledge of administrative procedures.
6. Have knowledge of inspection procedures.
7. Have knowledge of the Analysis Agency review procedures.
8. Have knowledge of responsibilities and functions of individual inspectors and supervisors.

Criteria

A. Education

Bachelor's degree in Engineering or equivalent in training.

Experience

1. Five years in building construction of which 2 years shall be in manufactured building and in addition
2. Two years experience in building design.

3.3.2 SUPERVISOR

Task -1. Training of inspectors.

2. Assess and develop checklists from the following aspects of the Manufacturer's Compliance Control Document relative to the product's code compliance:

A. Integrity of Raw Material Supply - Verification of methods for acceptance or rejection of incoming materials for damage and compliance with purchase documents.

B. Integrity of Raw Material Storage and Handling - Verification that equipment and facilities for storage and handling of raw materials has been provided for. Storage facilities should provide weatherproof space for materials that may be damaged by weather and materials whose moisture content must be controlled.

C. Assembly/Fabrication - Checking of fabrication or assembly sequence for appropriateness of inspection locations. Develop checklist for

Inspector's use, flagging items of importance, such as fabrication check, materials approved and the like (see Appendix C for example). Verification that systems are not covered prior to any required test or inspection. The system should be reviewed for the appropriate means of replacing or repairing unacceptable materials to control damage or disassembly of previously accepted portions.

D. Product Storage and Handling - The method of storage and handling accepted products prior to shipment must be reviewed for adequacy. The method of weatherproofing units to be stored outside, the means of transporting the units from the assembly area to the storage area, and the ongoing means of rechecking the product's integrity during storage must be checked.

Using:

A. Approved Design and Shop (fabrication) Drawings - The design drawings are part of the product description documents approved by the Analysis Agency.

B. Specifications and Manufacturer's Literature - Specifications other than those approved with the product description documents and other manufacturer's literature may also be used.

C. Inspection Documents - The inspection documents detail the manufacturer's inspection tasks to be performed at various assembly and subassembly points.

D. Verification Measurements - The verification measurements to be performed on various building materials and systems and their appropriateness.

E. Plant and Manufacturing Process Layout Drawings.

Requirements:

A. Understanding of Materials in Proposed System - Basic knowledge of design and construction techniques utilizing basic structural materials (i.e. wood, steel, concrete and plastics).

B. Understanding of Production Techniques Applicable to Specific Submission - Knowledge of construction assembly and fabrication.

C. Ability to Read and Interpret Drawings and Other Documents - Understanding of engineering design drawings, specification and other inspection documents. Ability to evaluate such documents and drawings for sufficiency.

D. Applicability of Production Verification Measurements - Review of production verification measurements proposed for appropriateness as well as frequency and other parameters.

E. Understanding of Quality Assurance Theory - General appreciation and understanding of quality assurance methods and concepts and an understanding of their application to the specific compliance control process proposed.

F. Ability to Anticipate Modes of Failure - The process design perception providing the evaluation with an understanding of where materials and products undergoing a process may fail, and leading to the understanding of need for preventive measures, monitoring or inspection.

Criteria:

A. **Education: a Bachelor's degree or equivalent in training in Engineering with expertise in structural, electrical, mechanical and plumbing systems for buildings.**

B. Experience:

1. Two years construction or factory production experience with the various raw materials proposed.
2. Two years of building design.

C. Ability - Adequate performance on an examination related to the requirements.

D. Training Capability: To develop and execute an effective training program so as to prepare the inspectors in the use of checklists based on basic structural material (wood, steel, concrete and plastics), and the preparation, control, and filing of reports as required in the approved Compliance Assurance documents.

3.3.3 INSPECTORS

Task - Perform the in-plant monitoring of the manufacturer's Compliance Control Program using the inspection checklist developed by the supervisor. (See Appendix C for a typical inspector checklist.)

Requirements -

1. Personal Characteristics - The inspector must possess the personal characteristics of tact and a sense of authority.
2. Technical Characteristics - The ability to follow detailed instructions and checklists that provide the criteria for construction, including both material and fabrication requirements.

Criteria -

A. Education: The inspector must possess the mathematical and communicative skills equivalent to those acquired through a high school education.

B. Experience: Two years in building construction.

C. Orientation and Training: The inspector shall undergo a period of orientation and training for each specific structural material (wood, steel, concrete and plastic) of the manufactured building units for which he performs the inspection function. This training must be under the continuous direction of a supervisor fully qualified under this criteria to perform the inspection of the types of construction and fabrication processes involved.

Part 4 IDENTIFICATION OF FURTHER RESEARCH

CONTENTS

4.1 INTRODUCTION

4.2 INSPECTION SAMPLING FREQUENCY

4.3 CORRECTING DISCREPANCIES

4.4 TRANSPORTATION AND INSTALLATION PHASE

Part 4 IDENTIFICATION OF FURTHER RESEARCH

4.1 INTRODUCTION

The current study of the Compliance Assurance Function has brought attention to areas related to the regulation of manufactured building which would benefit from further study and research or from the development of additional model rules and regulations. Some of these areas are common to other building-evaluation functions as well[1]. The following list is limited to concerns related only to compliance assurance and is not intended to be exhaustive.

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[1] See NBS LEAP document. "Criteria and Methodology for Examination of Analysis Agencies for Manufactured Building," NBS Report No. NBSIR 73-186, April 1973.

4.2 INSPECTION SAMPLING FREQUENCY

Quality control sampling plans and tables exist for statistical treatment of inspection programs for high volume production items. High reliability quality control programs also exist for low volume, high value products such as manned spacecraft. Most of these programs were developed to meet the specific needs of Department of Defense or NASA.

While the basic principles of statistical quality control are also applicable to manufactured building, the programs embodying these principles may need to be tempered by the legal responsibilities of the states and the political necessity for highly visible bases for reciprocity of compliance assurance programs. What is needed is an objective study to apply state-of-the-art knowledge of statistical quality control to the problems of assuring compliance of manufactured building, in parallel with or followed by development of model rules and regulations to provide a basis for reciprocity. Sampling plans presently required by states appear to be arbitrary, but the experiences derived from their use should provide a point of depature for work by a model rules group.

4.3 CORRECTING DISCREPANCIES

In a manufacturing process involving significant production volume or a high level time-utility value of the product, it is necessary to provide timely resolution of discrepancies that are identified

by the Compliance Control Program. In the case of the proposed manufacturer's Compliance Control Program and the states Compliance Assurance Program for regulation of manufactured building, provision should be made for timely resolution of one-time problems (production "botches") and for needed design or process changes.

One possible approach would be to adopt a modified version of the Materials Review Board (MRB) method used successfully by the Department of Defense (DOD) to assure quality while minimizing interference with production. In this approach, DOD invites the manufacturer to propose name(s) of qualified employees to serve as liaison engineers for resolution of discrepancies identified by inspection. Upon receipt, the list of name(s) is reviewed by DOD to verify proper qualifications. Approved individuals are provided a certificate or letter granting them the authority to take "MRB" action.

Such an approved MRB engineer is brought into the picture by inspection when a major discrepancy is identified which could affect the basic integrity of the structure or could adversely affect the safe performance of a subsystem which is not easily removed or repaired. The engineering drawing or sketch which he prepares to describe a remedy serves three functions: a production order, an inspection procedure, and a record of "change notices". Where a permanent design or process change is needed, a copy of the change notice also serves as a request that the design department institute the needed permanent change.

As applied to the regulation of manufactured building, MRB authority would be given to an appropriately qualified engineer who was either a full-time employee of the manufacturer, or serving the manufacturer as a contractor or consultant, based in the local area. One of the several problems that this approach could resolve is the case where a Compliance Assurance Agency inspector hangs a major discrepancy tag on the building or component. The inspector need not be technically competent to resolve the discrepancy and he probably is not present in the plant to approve the corrective action. The MRB engineer is given authority by all parties involved to take corrective action and to specify the inspection measures required to assure that the specified correction has been effected. Where permanent design or process changes of a "crisis" nature are involved, the MRB engineer would be authorized to institute the needed changes as a temporary measure, with a copy of the change notice going to the manufacturer's design department for design approval and then to the Analysis Agency for regulatory approval. Copies would also be provided to the Compliance Assurance Agency.

The proposed MRB approach or other method of timely resolution of major discrepancies needs to be developed in the form of model rules and regulations.

4.4 TRANSPORTATION AND INSTALLATION PHASE

The proposed building evaluation system developed by Project LEAP is intended to cover both manufactured buildings and components. Thus

a wide range of possibilities exist regarding the extent of responsibility of the manufacturer to design and to oversee the system for transporting and installing his product at the ultimate building site. Such responsibility is often fragmented in current marketing and distribution practice, so that effective regulating and delegating responsibilities may sometimes be difficult. Since the responsibility stops at the local jurisdiction of the building site, feedback of information by the local code enforcement officer should be sought where available. However, in many rural jurisdications there is no building inspection function at the local or county level.

In this document, the in-plant phase of the Compliance Assurance Function has been emphasized. Further work needs to be done to develop an institutional mechanism to assure compliance during the transportation and installation phase, or to clearly disclaim responsibility in specific areas, in localities where citizens have chosen not to support code enforcement activities. Where local code enforcement is in effect, it represents the best source available for information on the effectiveness of transportation packaging design and installation methods.

APPENDIX A

BASIC ELEMENTS OF THE COMPLIANCE CONTROL PROGRAM

The Compliance Control Program operated by the manufacturer must be structured so each unit produced is reviewed for compliance with the documents approved by the Analysis Agency ; the procedures and responsibilities for the repair or discarding of deficient construction are well defined and records are kept of the inspection activities performed on each unit produced. Following are the basic characteristics that the Compliance Control Program should possess in order to accomplish this.

1. ORGANIZATION. The principal responsibility for the administration and functioning of the Compliance Control Program should be assigned to a person at the management level of the manufacturer's organization, although this may not be that person's only nor primary responsibility. This will ensure that considerations pertinent to the Compliance Control Program will be communicated to the company's decision making level.

A specific employee should be assigned the responsibility for "signing-off" the construction performed at each step of the fabrication process, indicating it is in compliance. This sign-off must be accomplished prior to the incorporation of the element into the structure of the unit. The sign-off procedure should include the review of both materials and workmanship. The person assigned this responsibility should not be a person directly

involved in the fabrication process. However, in either case, it must be substantiated that this person had the knowledge and capability to determine that the inspected element is properly constructed.

2. INDENTIFICATION OF UNITS AND RECORDS KEEPING ACTIVITIES. Each unit produced should be assigned an individual serial number and this number should be permanently attached to the unit in a uniform, accessable location at the early stages of construction.

Inspection forms should be developed to provide for the signing-off of the separate elements by the people assigned this responsibility. These forms should bear the serial number of the unit inspected and the date of inspection, and should travel with it throughout the fabrication process. The required detail of the form will vary with the complexity of the type of construction involved. In general, it should provide a level of detail that precludes the necessary use of a separate check-list, as such lists are often disregarded. The form should include provisions for noting the occurence of deficient construction, clearly identified on the form, in a manner that precludes the signing-off of the aspect of construction incorporating the deficient elements; and for the noting of action taken to correct the deficiency. The listing of the deficiency and the noting of corrective action should remain as permanent parts of the records of the unit. Similar forms should be developed for any required production testing.

Following the completion of the fabrication of the unit and the compliance control functions pertaining to it, the records should be forwarded to the person with the primary responsibility for the Compliance Control Program for review and final sign-off, and then permanently filed in a manner that facilitates their identification and retrieval.

3. FABRICATION TASKS DESCRIPTIONS. The production of compliant construction is totally dependent on the activities of the people performing the individual fabrication tasks. Detailed descriptions of each task should be provided to the person performing the task. These descriptions should be in terms that the people employed to do the work can be expected to be familiar with. The descriptions should contain sketches as necessary and should specifically list the materials to be used in fabricating the element, including the means of identifying these materials. Where the proper performance of a material depends on controlling moisture content, temperature, time of application, or similar conditions, this should be included. Specific information should be provided on fabrication tolerances, as well as how to determine the element meets these tolerances.

A form should be provided whereby the supervisor of a person involved in the fabrication processes makes an entry certifying this person has been furnished the description of the task he is to perform and is fully qualified to perform it, before he may do so without continuous supervision. The date of this certification should be included, so that the work of any individual may be identified with the units he works on. The completed form should be kept as a permanent record.

4. PURCHASING, CONTROL AND STORAGE OF MATERIALS AND EQUIPMENT. Administrative procedures should be developed whereby a properly qualified person reviews purchase orders prior to their issuance, to ensure that materials and equipment to be incorporated into the regulated aspects of the construction are those indicated in the approved documents. This process can be facilitated by the development and use of material lists and descriptions, prepared directly from these documents and indicating the

standard specification, listing agency approval, etc. the item must be identified as conforming with. Where alternate materials or equipment are approved for use, they should be included on this list.

Formalized instructions should be prepared directing how each purchased item is to be stored, including the degree of weather protection to be furnished. Included should be directions on the support of the item, the protection from mechanical damage, and the control of the temperature, humidity or exposure to sunlight, where these conditions could adversely affect the performance of the item. Information should be included regarding the procedures to be followed with respect to materials that have been damaged, such as the necessity to regrade or test materials that have been exposed to excessive moisture.

5. CONTROL OF FABRICATION DRAWINGS. Subsequent to the approval of the documents by the Analysis Agency as substantiating the adequacy of the units to be constructed, it is common practice for the manufacturer to prepare fabrication or shop drawings. The purpose of these drawings is to make maximum use of the materials and effort used to construct the units, by delineating detailed layout schemes to be followed by the fabricators. A specific individual in the manufacturer's organization should be assigned the responsibility for formally reviewing all such drawings for compliance with the approved drawings. This person should be knowledgable with respect to the information he is reviewing. It may be necessary to assign different individuals the responsibilities for reviewing the different building systems, i.e. structural, electrical, mechanical, and plumbing. It is desirable that such a review be performed by a person other than the one preparing the shop drawings. However it should be noted that the only drawings to be used in the verification of the construction for compliance are those approved by the

Analysis Agency.

6. PRODUCTION VERIFICATION MEASUREMENTS. A specific employee should be assigned the responsibility for each type of production verification measurement to be performed. This responsibility should not be delegated except to a designated alternate. Detailed instructions should be prepared describing each step in the measuring process, the recording of results, the method of determining compliance, including permissible tolerances and the frequency of measurement. These instructions should include the identification of the equipment to be used, and where applicable, the means to be used in determining it is properly calibrated. Equipment requiring calibration should be identified by serial number, and records kept of the date it was last calibrated and that when it is required to be calibrated. The person resonsible for the verification measurements should also be responsible for signing-off on the verification measurement. As previously noted, the report form should be sufficiently detailed to serve as a checklist.

7. DEFICIENT CONSTRUCTION. Formalized compliance control procedures should be established for the actions to be taken with respect to construction or materials found to be deficient. As this construction control program in many cases will be operated by the people involved in the production process, it should not require any duplication of administrative effort. However, it is extremely important that procedures are established to ensure that deficiencies in materials or workmanship are caught and corrected, and further, that information regarding the type and incidence of deficiencies and the corrective actions are communicated to the Compliance Control Program manager.

There must be a method of physically identifying deficiencies by attaching a piece of flagging or a tag to the item or element in question. It suggested this identification be removed by the person responsible for signing off that element of the construction only when the deficiency has been corrected. The inspection form accompanying the unit should contain a notation of all but minor deficiencies that are readily corrected, to provide the means of communicating the effectiveness of the Compliance Control Program to the Compliance Assurance Agency.

APPENDIX B

THIS IS LEAP*

Revised April, 1973

Administrative Agency

State of _____

*Laboratory Evaluation and Accreditation Program

building. (e.g., Analysis Agency performs the Analysis Function.)

A program, hereafter referred to as LEAP (Laboratory Evaluation and Accreditation Program), has been instituted under the rules and regulations of the Manufactured Building Act. Under this program, interested institutions may apply for accreditation to provide services and facilities covering any or all of the three building-evaluation functions.

WHAT DOES IT ALL MEAN?

FOR THE BUILDING-EVALUATION INSTITUTIONS -- Accreditation by the State Administrative Agency means that the work of the building-evaluation institution will be accepted by the Administrative Agency whether or not the manufacturer or the institution itself is located within the borders of this state.

FOR THE MANUFACTURER -- The LEAP Project is designed to assure equitable evaluation of manufactured building, products or techniques, including those of an innovative nature.

FOR THE CITIZEN -- The LEAP Project is one of the key elements needed to assure that building components, fabricated and assembled through an industrialized process, will be subjected to inspections equivalent to those given to on-site constructions.

FOR THE STATE -- The LEAP Project enables the Administrative Agency to summon the best combination of government and privately-owned technical resources to the task of evaluating the design of proposed manufactured building systems or components and of certifying

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conformance of production units with approved building system documentation by providing follow-up, compliance monitoring services. The LEAP Project also opens the door for government building-evaluation departments to request accreditation by the Administrative Agency. The credibility established by accreditation is intended to be the basis for interstate reciprocity of manufactured building certification programs, thus making possible the economics of large scale production.

INSTITUTIONAL ACCREDITATION

The accreditation "teams" lineup and relationships are illustrated in Figure 1. A summary of the functions and responsibilities of each member of the team follows.

STATE MANUFACTURED BUILDING ACT

Authority for the LEAP Project stems from the State Manufactured Building Act. Basic elements of the Rules and Regulations promulgated under the authority of this act include:

- Objectives and scope
- Establishment of a State Administrative Agency
- Authority to designate accredited Analysis, Testing and Compliance Assurance Agencies and recognize those of other states.
- Adoption of nationally recognized consensus building standards(s).
- Establishment of an Appeals Procedure.

ADMINISTRATIVE AGENCY

The State Administrative Agency is charged in part with statutory responsibility for approving building-evaluation institutions. Functions of the Administrative Agency or it's designee include:

INSTITUTIONAL EVALUATION AND ACCREDITATION

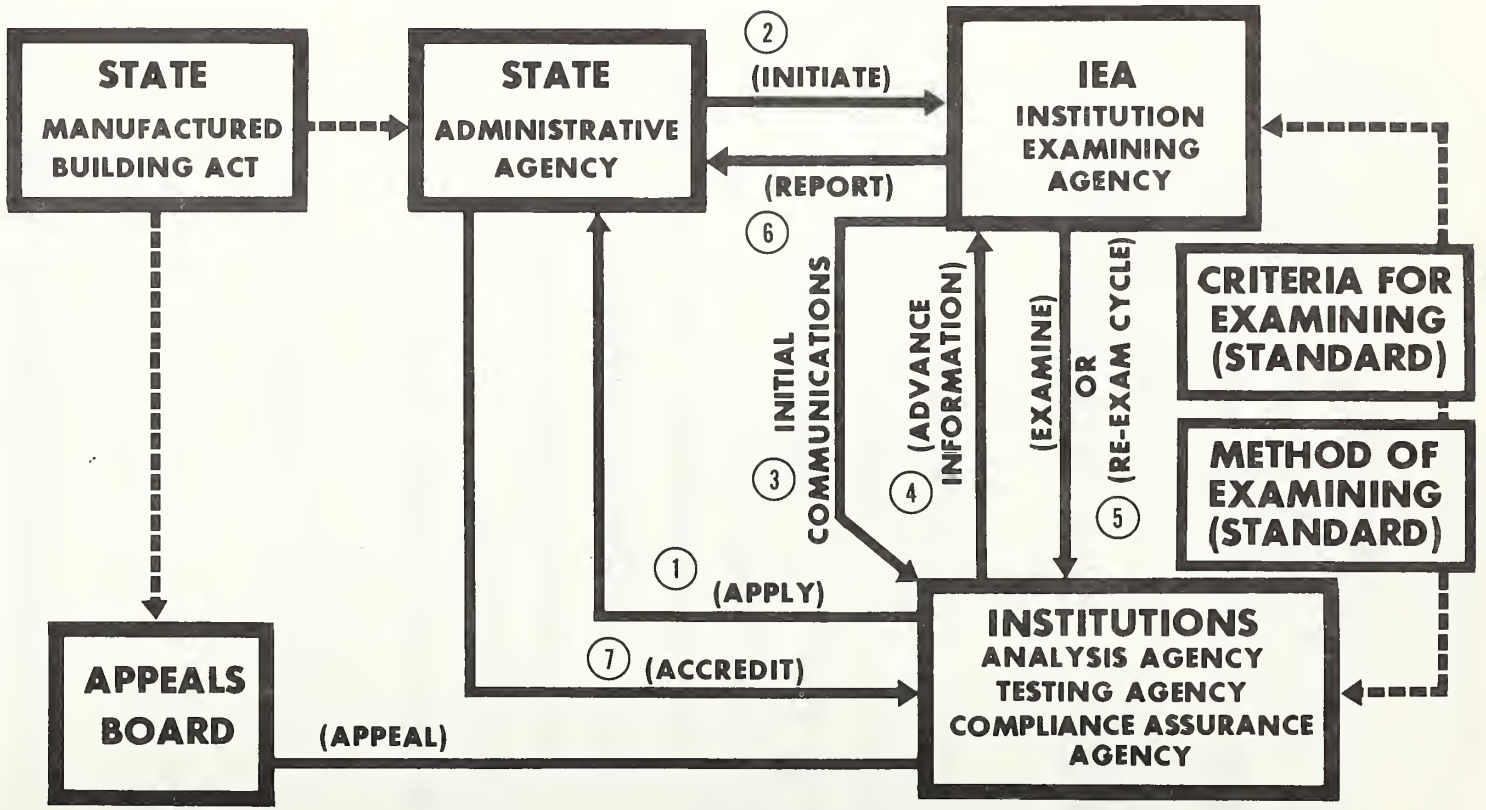

Figure 1

- Answers requests for institutional accreditation.
- Initiates the processing of an accreditation request by employing a designated examining agency, utilizing nationally recognized standard criteria and methodology.
- Investigates non-technical aspects of an applicant's operations, such as finance, corporate relationships, credit, insurance, business reputation, objectivity and independence.
- Accepts a report from the examining agency covering the applicant's capability to do the required work.
- Grants or denies initial accreditation based on results of it's own investigation of the institution operations and the examination of technical capability.
- Withdraws accreditation, for cause, based on follow-up reports on agency operations or technical performance, or the results of the regular, periodic re-examinations specified in the Rules and Regulations for the Manufactured Building Act.

Information gathered by the Administrative Agency or it's designee, and by the examining agency, is considered proprietary and will be handled as provided by the rules and regulations.

INSTITUTION
EXAMINING
AGENCY

The Institution Examining Agency (IEA) is designated by the Administrative Agency to determine the capability of applicant institutions to perform tests, analyses or monitor compliance control programs conducted under the Rules and Regulations. The agency is composed of examiners skilled in the respective building system disciplines.

The standard for examining institutions[1] provides the criteria and methodology for IEA's examination of an applicant building-evaluation institution. Cost of the examination is borne by the applicant. The examination itself is composed of three parts:

- Review of advance information on technical resources furnished by the applicant upon request of IEA.
- On-site examination of administrative procedures and technical resources including procedures for conducting required tests, analyses or compliance assurance tasks.
- Submission of a report of findings by the IEA to the Administrative Agency or it's designee.

While the examining agency operates at the convenience of the state, the agency is staffed and supervised by an independent,

[1]Development of the standards to be used by the examining agency was begun in August 1972 by ASTM Committee E-32.

nationally-recognized organization and functions neither as an arm of state government nor as a commercial or public analysis, testing or Compliance Assurance Agency (See "Institutions" below).

INSTITUTIONS
  ANALYSIS AGENCY
  TESTING AGENCY
  COMPLIANCE ASSURANCE AGENCY

The term "Institution" is used here to describe organizations applying for accreditation to serve as agents of the state in performing any one or a combination of the three building-evaluation functions. Applicants may include public or private, profit or non-profit institutions. Organization and functions of the state and the building system producer, are briefly summarized in "Interagency Relationships" below. These relationships are defined in greater detail in the standard criteria and methodology.[2]

An institution having the appropriate competence may apply for accreditation in any or all three of the above building-evaluation functions. However, the institution will be examined for competence using separate criteria for each of the functional areas requested. Continuation of the accredited status of an agency is contingent on successful re-examinations, which are periodically conducted in accordance with the Rules and Regulations for the Manufactured Building Act.

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[2] Ibid.

Test Agencies only are specifically accredited in one or more of the following building-system diciplines. The Analysis Agency is accredited only if it has access to all of the building-system diciplines. Accreditation by building-system discipline is considered to be unnecessary for the Compliance Assurance Agency.

- Electrical
- Fire Safety
- Mechanical (HVAC)
- Plumbing
- Structural

CRITERIA FOR EXAMINING (STANDARD)

METHOD OF EXAMINING (STANDARD)

The standards used in the examination of institutions provide the criteria and procedures used by the IEA in examining the capability of a particular applicant. IEA examines the applicant's stated capability to analyze, test, or provide compliance assurance services with reference to nationally accepted building standards adopted under the Rules and Regulations. As discussed under "Institutions," the standard provides that a qualified applicant may apply for state accreditation to perform services covering any one or all three of the building-evaluation functions.

APPEALS
BOARD

If the institution believes that improper interpretation or application of the Rules and Regulations by the Administrative Agency or it's designee has caused the denial of accreditation or the withdrawal of previous accreditation, the institution has recourse. The Rules and Regulations include an appeals procedure and the establishment of an objective appeals board.

RECIPROCITY OF BUILDING EVALUATIONS

The previous section describes how interested government or private institutions may become accredited to act as agents of the State Administrative Agency. If the Administrative Agency finds that the standards for the fabrication and evaluation of manufactured buildings or building components prescribed by statute or rules and regulations of another State, or other governmental agency, meet the objectives of the Manufactured Building Act, the Rules and Regulations provide that the Administrative Agency shall accept manufactured buildings or building components which have been certified by such other State or governmental agency, and shall assure that the appropriate label is attached thereto. Reciprocity is extended by the Administrative Agency by:

(1) Notifying the requesting manufacturers;

(2) Notifying the Administrative Agency of the other jurisdiction;

(3) Publishing a notice of the grant of reciprocity in [3]

(4) Giving notice to all local enforcement agencies in this State.

Figure 2 illustrates the process of reciprocal certification of building evaluations. The manufacturer submits a request for approval to the Administrative Agency of State "A" (Step 1). Depending on workload and organizational accredited arrangement, the Administrative Agency assigns the work to its own accredited government Analysis Agency or to an independant, accredited Analysis Agency (Step 2). The state will also select accredited Compliance Assurance and Test Agencies to participate in appropriate phases of the building-evaluation process.

The assigned Analysis Agency then carries the project through to approval. Submittal of documents and communications takes place directly between the manufacturer and the Analysis Agency (Step 3). Approved sets of documentation are sent to the manufacturer and to the Administrative Agency of State "A" (Step 4).

Subsequently, the manufacturer from a jurisdiction to which reciprocity has been extended may submit to the Administrative Agency of this state evidence that his building system and

[3] Insert name of journal designated by State for publication of legal notices.

RECIPROCITY OF BUILDING EVALUATIONS

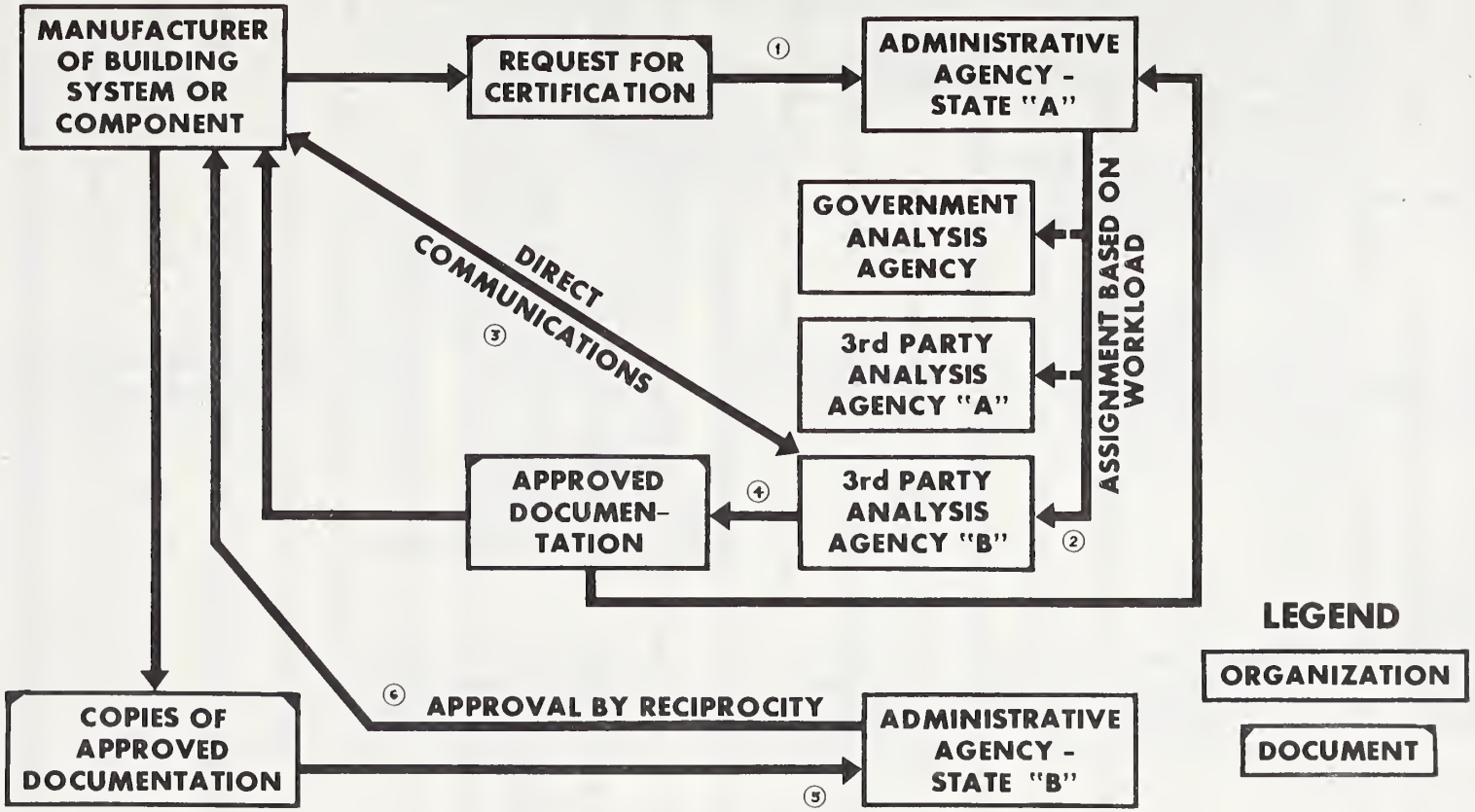

Figure 2

pliance assurance program have been approved by such state or governmental agency. The Administrative Agency then verifies the approval and notifies the manufacturer in writing of such verification and that properly labeled buildings or building components of his manufacture will be accepted.

INTERAGENCY RELATIONSHIPS

A system has been described of recognizing the capability and work of building-evaluation institutions and of achieving reciprocity of building evaluations among the states. One manner in which these agencies might work together to approve and certify a particular building system is illustrated in Figure 3. After the work has been assigned by the Administrative Agency,the scope of effort is defined in a meeting between the manufacturer and the Analysis Agency. The subsequent submittal of required building system documentation and all related communications take place directly between the Analysis Agency project manager and the manufacturer until the project is approved, is abandoned or is under appeal (Step 1).

If it is not possible to approve the building system through analytical means alone, a Testing Agency may be required to perform supporting tests. The resulting test reports then become part of the submittal documentation. (Step 2 - optional.)

In order to grant full approval of a proposed building system, the Analysis Agency must approve three documents; the

INTERAGENCY RELATIONSHIPS

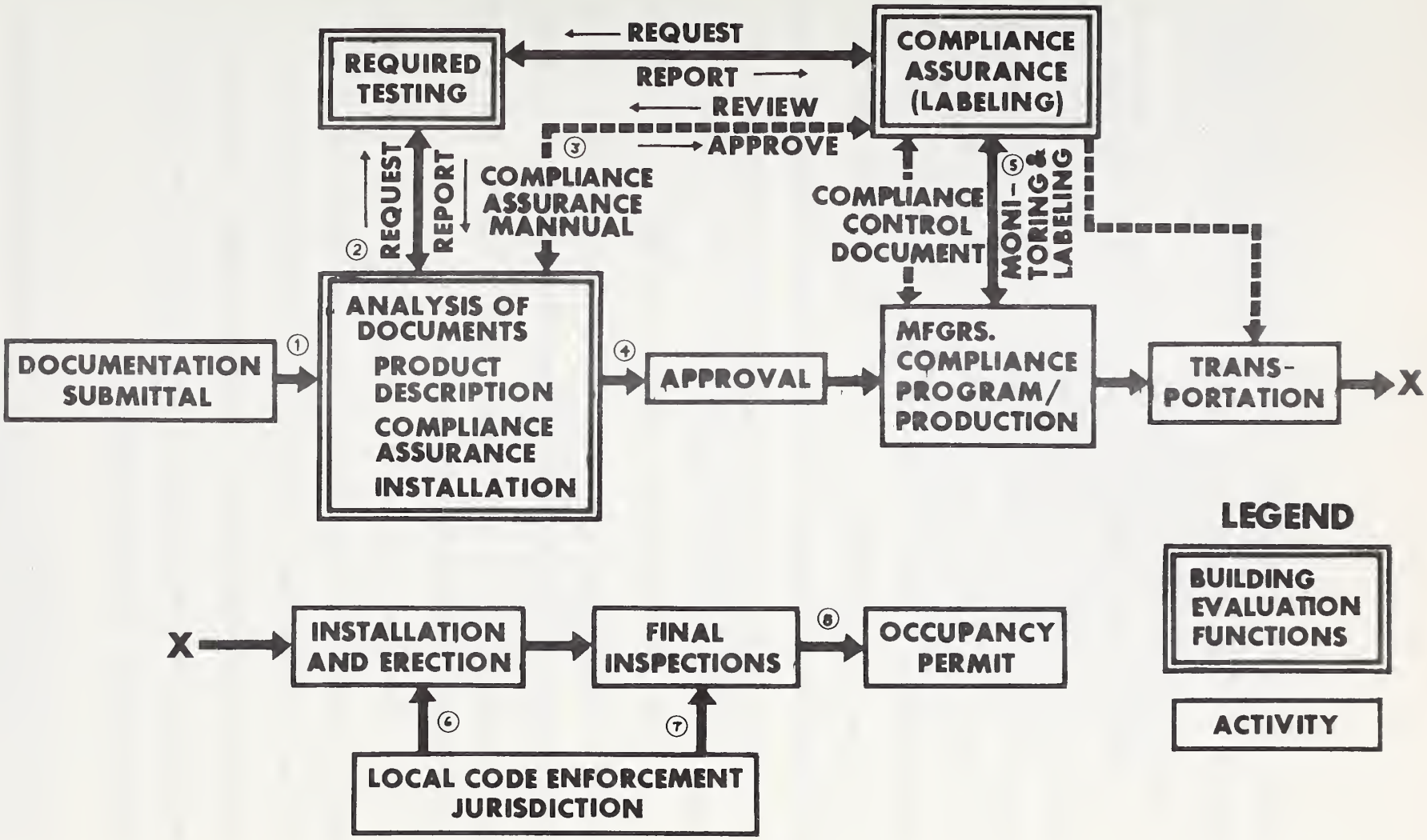

Figure 3

Product Description, Compliance Assurance and Installation Documents. Submittal of these documents may be made at one time or in phases, at the discretion of the manufacturer.

Preparation and submission of the Product Description and Installation Documents are the responsibilities of the manufacturer. To assure completeness as well as effective implementation during the production phase, the Compliance Assurance Agency designated by the Administrative Agency reviews the manufacturer's Compliance Control Document for preliminary approval. (Step 3.) The approved Compliance Control Document is then incorporated by reference as part of the Compliance Assurance Manual, which is submitted to the Analysis Agency for overall approval.

When the building system is approved and goes into production (Step 4), the Compliance Assurance Agency continously monitors the effectiveness of the manufacturer's Compliance Control Program and may be designated to control the product certification labels issued by the Administrative Agency (Step 5).[4]

If, after production commences, significant tests are necessary which (a) require the issuance of a full test report and (b) are necessary to demonstrate equivalency of substitute materials or processes or the correction of a defective process, such work is performed by the Testing Agency at the request of the Compliance Assurance Agency or Analysis Agency.

[4] Details regarding the monitoring of the transportation function are not included in this brochure.

The local code enforcement jurisdiction provides inspection services during the Installation (Step 6) and Final Inspection Activities (Step 7), and issues the Occupancy Permit (Step 8).

By building-in a high degree of flexibility for the method of application, the type of process suggested in Figure 3 can accommodate a broad scope of products ranging from wall panels to complete buildings, whether prescriptive or innovative in nature, while providing the necessary assurance of compliance with applicable codes and standards.

NEED MORE INFORMATION?

If you want additional information or you desire to apply for accreditation, contact:

Administrative Agency
State of _____
_____, _____
Phone _____

APPENDIX C

TYPICAL INSPECTOR CHECKLIST

1. General

The information contained in this appendix has been based on the data obtained by John C. Dunlop through the surveys of cooperating manufacturers. In some instances, it has been extrapolated to apply to more general cases.

As a means of illustrating the functions of an inspector of manufactured building and the interdependency of the inspector's qualifications, the documents prepared to delineate the construction of the units and the procedures established for the inspection of a particular system, the following approach has been taken.

As shown by the tabulated information in subsequent sections of this appendix, the typical individual fabrication tasks associated with the construction of a specific manufactured building system have been listed. Coordinated with these listings are entries in sections of the tabulation indicating the sources of approved information available to the inspector to determine the intent of the approval of the applicable regulatory agency, and the means available to him to determine that the accomplished construction complies with this intent. Following is a discussion of the organization of a typical checklist that is presented for wood structural systems. Similar checklists should be prepared for metals, concrete and plastic structural systems, if the Compliance Assurance Agency inspects them.

2. Organization

The following information applies to the checklist shown in Section 3 of this appendix:

An "X" in a particular column indicates that the information is applicable to the inspection task associated with listed fabrication task or material. The similar entry of a number or letter or combination thereof should refer to information contained in a tabulation following the listing of fabrication tasks for that specific system, under the heading of the column in which it occurs. Where such an entry in the data is accompanied by an asterisk, i.e. *A, it is suggested that the standard be noted and referenced on the drawings with respect to the item involved, to serve as a means of identification of the actual item which must bear this standard number on its label, etc. However, standards so designated are not necessarily recommended for inclusion in the inspection document.

A. Source of Intent. Sources of intent includes all the information that is relied upon to delineate the construction of a manufactured building. Usually, this information is in the form of documents that have been evaluated and approved by the Analysis Agency. A discussion of these documents follows.

Drawings and Specifications. These are the drawings and specifications evaluated and approved by the Administrative Agency or by the Analysis Agency to whom it has delegated this authority. To ensure that the inspector's activities remain independent from those of the manufacturer's personnel, the use of shop drawings for inspection functions by the compliance assurance inspector should not be permitted. The approved drawings and specifications must make full provision for the level of expertise required of the inspectors. These documents must depict all regulated aspects of the construction completely. There should be no reliance on knowledge of standard practice, or the use of vocabulary or terminology beyond that an inspector can be expected to assimilate in the

brief training period, unless definitions are provided. Where the documents refer to a standard that is to followed in performing a fabrication task, the reference should be by specific section of the standard, and a copy included or the provision quoted in the approved documents.

Standards Referenced By the Drawings and Specifications. A review of the inspection tasks listed indicated there are certain sections of specific standards that must be made available to the inspector, to provide the information necessary to ensure an element of construction is correct. This information should be included on the drawings, or copies of the applicable sections should be included in the Compliance Assurance Manual.

Codes and Standards Referenced by Codes. There are sections of the governing codes and standards referenced by these codes that contain information that particularly is important to the proper performance of a specific fabrication task or the proper quality of a construction material or component, with respect to the types of building units surveyed. Copies or quotations of the applicable sections of these standards should be included in the documents furnished the inspector, except as noted.

In many instances, the inspector determined the adequacy of construction materials by means of the certification by the manufacturer that the material meets a standard identified on the product label or container. In these cases, the inspector does not require a copy of the standard, but it is important that the standard be noted on the drawings or specifications. The references to such standards are designated with an asterisk. As an example of such

a case, nails of various qualities may be obtained. It is important that the inspection documents inform the inspector that only those nails meeting the cited Federal Specification are acceptable. The determination of the compliance of nails by the inspector is then made by visual inspection of the label on the container, certification, or test report to see that it states that the nails meet the requirements of this specification. However, the inspector does not require a copy of the specification.

Compliance Assurance Manual. In addition to providing a listing of the specific items to be checked by the inspector and the frequency of inspections, the approved Compliance Assurance Manual provides the inspector with information necessary to the performance of his duties and which is not included on the drawings or in the specifications. The notations in this column with respect to specific tasks or materials indicate that it is recommended that detailed information pertinent to that item be included in the Compliance Assurance Manual. In some instances, this can be accomplished by including or quoting the standard also noted with respect to that item, or including a copy of an applicable listing agency approval describing an approved product or its installation. Regarding materials, the Compliance Assurance Manual is relied upon to provide the information the inspector needs to determine the required condition of materials or components, where such a determination would require more than a simple judgment by the inspector. With respect to fabrication, the Manual should contain the directions pertinent to the proper performance of construction tasks that require particular control, such as the control of temperature, pressure and humidity or functions dependent on time an specific directions for taking and

treating samples.

Listing Agency Approvals. A notation has been made in this column with respect to those materials or tasks where it is recommended a copy of the listing agency approval, specifically describing the product or its installation, be included in the documents provided the inspector. The information contained in these approvals or listing forms is considered essential to the proper application of the product. As in the case of the standards referenced previously, these approvals are offered as examples. Other or additional listing approvals may be applicable under varying conditions.

B. Determination of Compliance. The items and methods available to the inspector to use to determine that the materials acquired or the fabrication tasks completed comply with approved Compliance Control Manual have been listed under Determination of Compliance. A discussion of each of these follows.

Listing Agency Label. Particularly with respect to materials or equipment, the inspector may determine compliance on the basis of the item bearing the certification or label

of a designated agency, as specifically called for by the approved documents. Examples of this would be lumber or plywood bearing the trade and grade marking of a specified grading agency, electrical equipment labeled by Underwriters Laboratories, Inc. or other approved agency, etc.

Manufacturer's Label. A listing agency labeling required by the documents may indicate only that the item is adequate for use or possesses the characteristics indicated by the manufacturer's label or data plate. The inspector must then rely on both labels to provide the information that the item complies with the intent of the approved documents. In other instances, specifically cited by the documents, the inspector may rely on the manufacturer's label or directions for the information indicating the properties, proper methods of or limitations of use of a product. This would include information pertaining to the storage, age, and application of adhesives; substantiating that nails meet the require specification; etc.

Test Reports. The approved documents may require that the inspector receive and review production reports of the results of

testing of materials or fabricated products prior to their use in the elements incorporating them. It is assumed these reports are of the format that permits determination of the acceptability of the item primarily on a pass or fail basis, rather than requiring an analysis of the results. Reports of this nature are those from the testing of glued joints on composite lumber, plywood assemblies, etc.

Visual Inspection. The notations in this column are with reference to those fabrication tasks where the compliance is determined primarily by the inspector looking at the item to see that it has been constructed, or exhibits the properties, required by the approval documents. This includes the reading of labels to determine whether they specify if the item meets a particular standard, the observation of fabricated joints, etc.

Physical Verification. Where the determination of compliance requires that the inspector observe a measurement, an entry has been made in this column. The entires are keyed to a listing of the type of activity required following the fabrication task list. Also noted is the general type of equipment required to perform the activity.

Inspector Knowledge. Entries in this column indicate the inspector must possess technical knowledge beyond that obtained through the training and orientation period that is an element of the Compliance Assurance Program. Because of the structure of this program as discussed in this document, few if any entires have been made in this column.

Inspector Judgment. There are instances where specific directions are not available with respect to a fabrication task or material. In these instances, the inspector's judgment is necessary to determine compliance. This generally applies to situations involving tolerances, or the condition of materials that have deteriorated.

Sampling by Inspector. As an indicator of the complexity of the inspection tasks, entries have been made with respect to those items or tasks that require production sampling. These are tabulated following the listing of fabrication tasks.

3. WOOD STRUCTURAL SYSTEMS CHECKLIST

The structural system for which inspection tasks are described in the following table is a panelized system, but typical of conventional framed wood structures, adapted to factory construction. The data presented here are equally applicable to non-panelized wood units. The floor system utilizes stressed skin wood panels with plywood sheathing glued to lumber joists, designed to span between foundation footings. Wall systems are studs framed with plates and covered with sheathing (structural or non-structural depending on the location in the structure). Panels are fabricated with openings framed for doors and windows. The roof system is of conventional wood construction, structural plywood diaphragm and moisture barrier nailed to rafters with a composition board ceiling and composition shingle roofing. The panels are fabricated with electric, plumbing, heating, ventilating, and air conditioning elements installed at the factory. It is not possible to inspect most of these items at the site, as they are covered. Typically the wood frame system would be nailed. However, other means of connection are feasible and are indicated in the table.

Few standards are necessary for the inspection of non-structural items. Non-structural items will generally be described in the specifications and tolerances and

information pertinent to acceptable condition in the compliance assurance manual. The check for compliance with condition, and in most cases with tolerance, requirement is dependent on the inspector's judgment.

The primary sources of information regarding intent, for both materials and fabrication, are the drawings and specifications. With respect to structural materials, wood construction is extensively covered by standards (usually referenced by codes). The typical sources of standards for wood construction are the National Design Specifications, Federal Specifications, and Standards of ASTM (American Society for Testing and Materials). When properly described in specifications or compliance assurance manuals these standards will provide adequate background for the inspector. Listing agency approvals constitute an additional source of intent.

In confirming materials used, in many instances, the inspector relies on visual observations of manufacturers' labels, stamps, or marks to determine compliance. No special skills are required.

In confirming fabrication methods, the inspector places heavy reliance on visual inspection and simple measurements. Measurements required are fairly limited in number and involve primarily dimensional checks. Minor amounts of lumber and plywood moisture tests are

required. No special skills, instruments, or sophisticated apparatus are required. In addition, glue and joint tests maybe required to be performed for scarfed plywood joints and stressed skin joint connections. The inspector may be expected to perform the necessary sampling for those tests. Sampling requires skills with special coring saws and other sampling devices.

INDUSTRIALIZED HOUSING

Wood Structural System

MATERIALS	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
A. Structural Frame Members: beams, stringers, studs, etc.													
1. Species	X					X			X				
2. Size	X									1			
3. Grade	X					X			X				
4. Tolerances			AA	X						1			
5. Condition	X			X					X	2			
B. Structural sheathing:													
1. Type and grade													
a. Plywood	X	(1)				X	X		X				
b. Fiberboard	X	(2)				X	X		X				
c. Proprietary types	X			X	1	X	X						
2. Size	X						X		X	1			
3. Condition	X			X					X	3		X	
4. Tolerances			AB	X						1			
C. Connectors													
1. Nails	X		*AC				X		X				
a. Size	X			X			X		X	1			

Wood Structural System

MATERIALS (Con't.)	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
b. Type/grade	X						X		X				
c. Condition												X	
2. Bolts/screws			AD										
a. Size	X						X		X	1			
b. Type/grade	X						X		X				
c. Condition												X	
3. Staples	X		*AC		2		X		X				
a. Size	X			X			X		X	1			
b. Type/grade	X						X		X				
c. Condition									X			X	
4. Miscellaneous fasteners													
a. Type													
1) Trussplates	X				3	X	X		X				
2) Wallboard clips	X				1	X	X		X				
3) Joist Hangers	X				4	X	X		X				
b Size	X						X			1			
c. Condition									X				

Wood Structural System

MATERIALS (Con't.)

	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
5. Adhesives													
a. Type													
1) Structural	X		*AE				X		X				
2) Non-structural	X				5	X	X						
b. Age				X			X		X				
c. Condition				X					X			X	
D. Non-structural elements													
1. Moisture barrier													
a. Type and grade	X		*AF				X		X				
b. Condition				X								X	
2. Insulation													
a. Type and grade	X					X	X		X				
b. Size	X						X						
c. Condition	X			X								X	
3. Exterior wall siding													
a. Type and grade	X						X		X				
b. Size	X						X		X	1			
c. Condition				X			X					X	

Wood Structural System

MATERIALS (Con't.)

	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
4. Roofing													
a. Type and grade	X					X	X		X				
b. Condition				X					X			X	
5. Doors and windows													
a.Type and grade	X						X		X				
b Size	X						X		X	1			
c Condition				X								X	
6. Ceiling and interior wall panels													
a. Type and grade	X						X		X				
b. Size	X						X			1			
c. Condition				X					X			X	
7. Weather flashing													
a. Type	X						X		X				
b. Material	X						X		X				
c. Size	X			X						1			
d. Mastic	X						X		X				
e. Conditions				X					X			X	
8. Miscellaneous items: trim, screens, vents, etc.													
a. Type and grade	X						X		X				

Wood Structural System

MATERIALS (Con't.)

	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
b. Size	X								X	1			
c. Condition				X					X			X	
E. Storage of Materials													

INDUSTRIALIZED HOUSING

Wood Structural System

FABRICATION	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement of	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
A. Framing Members: Beams rafters, joists, studs blocking, bracing, etc.													
1. Measure and cut	X									1		X	
2. Drill and notch	X		A1	X					X	1			
3. Layout													
a. Dimensions	X								X	1		X	
b. Location and orientation	X								X	1			
c. Laps and splices	X								X	1			
4. Connections													
a. Nails													
1) Size	X						X		X	1			
2) Number	X								X				
3) Location and Installation	X		AG	X						1		X	
b. Bolts and screws													
1) Size	X						X		X	1			
2) Number	X								X				
3) Location and Installation	X		AH	X					X	1			
4) Washers			AJ	X					X	1			

Wood Structural System FABRICATION (Cont.)	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
c. Staples													
1) Size	X						X		X	1			
2) Number	X								X				
3) Location and Installation	X								X	1			
d. Miscellaneous fasteners													
1) Trussplates	X				3				X	1			
2) Wallboard chips	X				1				X	1			
3) Joist Hangers	X				4				X	1			
B. Composite Wood-plywood Structural members													
1. Nail or stapled See A4 above	X												
2. Glued	X	3		X			X		X				X
a. Application				X									
b. Pressure				X									
c. Curing				X									
C. Structural Sheathing: Plywood, Fiberboard, Proprietory types													

Wood Structural System

FABRICATION (Con't.)

	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
1. Measuring and cutting	X								X	1			X
2. Layout													
a. Dimensions	X								X	1			
b. Location and orientation	X								X				
c. Laps and splices	X								X				
3. Connections													
a. Nails or staples													
1) Size	X								X	1			
2) Location & spacing	X				2				X	1			
b. Miscellaneous fasteners	X				1								
1) Size	X												
2) Location & spacing	X												
D. Non-structural installations													
1. Moisture barrier													
a. Placement	X								X				
b. Attachment	X								X				

Wood Structural System

FABRICATION (Con't.)	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE								
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
2. Insulation	X												
a. Placement	X								X	1			
b. Attachment	X								X	1			
1) Type, location and spacing	X												
3. Exterior wall siding													
a. Placement	X								X	1			
b. Attachment													
1) Type, location and spacing	X								X	1		X	
4. Ceiling and interior wall panels													
a. Location	X								X				
b. Placement	X								X				
c. Attachment													
1) Type, location and spacing	X								X	1			
5. Roofing													
a. Layout	X								X	1			
b. Attachment													
1) Nailed	X								X	1			
2) Adhesive	X			X					X				
c. Finishing and covering	X								X				

Wood Structural System

FABRICATION (Con't.)	SOURCES OF INTENT					DETERMINATION OF COMPLIANCE							
	Drawings-Specifications	Standards Referenced by Drawings-Specifications	Codes & Standards Referenced by Codes	Compliance Assurance Manual	Listing Agency Approval	Listing Agency Label	Manufacturer's Label	Test Reports	Visual Inspection	Physical Measurement	Inspector Knowledge	Inspector Judgment	Sampling by Inspector
6. Weather flashings													
a. Location	X								X				
b. Attachment													
1) Type and spacing	X								X	1			
c. Mastic application	X								X			X	
7. Doors and windows													
a. Size and location	X								X	1			
b. Attachment	X								X				
8. Miscellaneous items: trim, screens, vents etc.													
a. Size and location	X								X	1			
b. Attachment	X								X				
E. Lifting and transporting	X			X					X	1		X	
F. Storage				X					X			X	

NOTES REFERENCED FROM TABLE: WOOD STRUCTURAL SYSTEM

Standards Referenced by Drawings and Specifications:

1 - U.S. Product Standard PS 1-66.

2 - ASTM Designations C208 and D2277.

3 - Quality Control and Trademarking Requirements Covering the Fabrication of Plywood Components - Product Fabrication Service, Inc., and Plywood Fabrication Specification SS-8.

Codes and Standards Referenced by Codes:[1]

AA - Grading Rules for Western Lumber (1970), Western Wood Products Assoc., Section 752.

AB - Plywood Product Standard Handbook (1970), American Plywood Association, page 40.

AC - Federal Specification FF-N-105A (1964).

AD - National Design Specifications (NDS) (1962), National Forest Products Assoc. (NFPA), Section 600-C.

AE - Federal Specification MMM-A-125, Type II.

AF - Federal Specification UU-B790 or U.L., Inc., Standard Specification 55-A (1968).

AG - NDS (1962), NFPA, Section 800-G.

AH - NDS (1962), NFPA, Sections 600-H, 700-H, 700-I, 800-G, 800-H, 802-H, 802-I, 802-M.

AJ - NDS (1962), NFPA, Section 600-I

* * * * *

A1 - UBC (1970), Section 2518 (d) 3.

Listing Agency Approval:

1 - * Research Recommendation No. _____

2. - * Research Recommendation No. _____

3 - * Research Recommendation No. _____

4 - * Research Recommendation No. _____

5 - * Research Recommendation No. _____

*Insert name of applicable Building Code Organization

Physical Measurement:

1 - Measurement with pocket tape or scale.

2 - Measurement of lumber moisture content - Electrical resistance type moisture meter.

3 - Measurement of plywood moisture content - Oven, scales, thermometer, timepiece, core saw.

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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

Criteria are proposed by which participating institutions may be judged for their capability to perform the Compliance Assurance Function in the evaluation and regulation of manufactured one and two family dwellings and components, including mobile homes. The criteria are intended as guidelines for objective examination of applicant, public or private, institutions who desire to serve as designees of a state government to conduct and supervise the Compliance Assurance Program for manufactured building units or components. Based on a study of the state-of-the-art and current model enabling legislation, a description of the required compliance assurance activities is provided as a basis for proposing a level of capability acceptable to the states. Appendices describe proposed institutional mechanisms and provide supporting information and forms. Adoption of the proposed criteria, in a national standard developed by the ASTM E32 Committee, could provide the states with a basis for informal reciprocity of institutional accreditations and of building-evaluation findings.

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